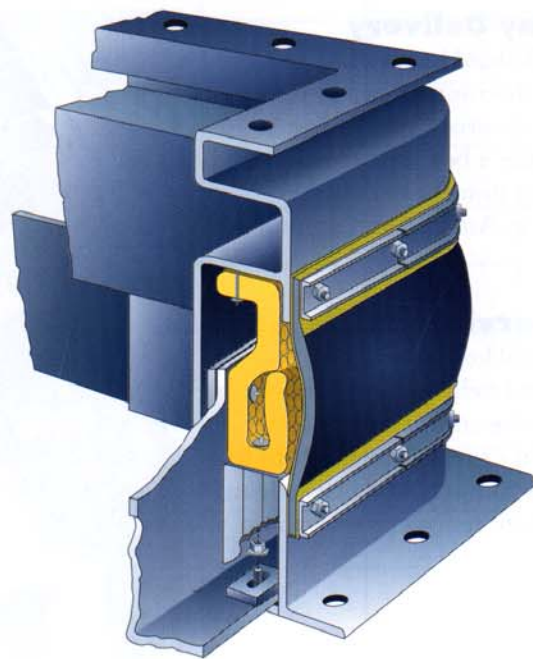
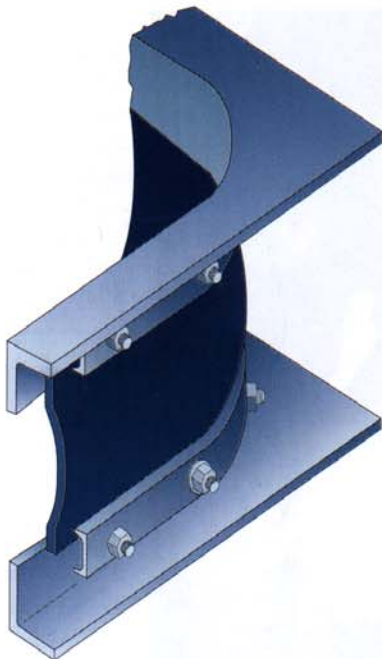
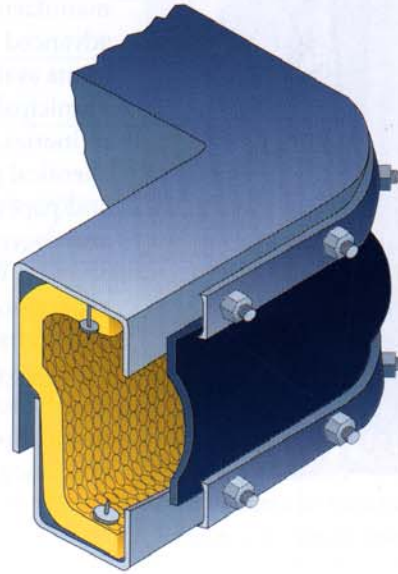
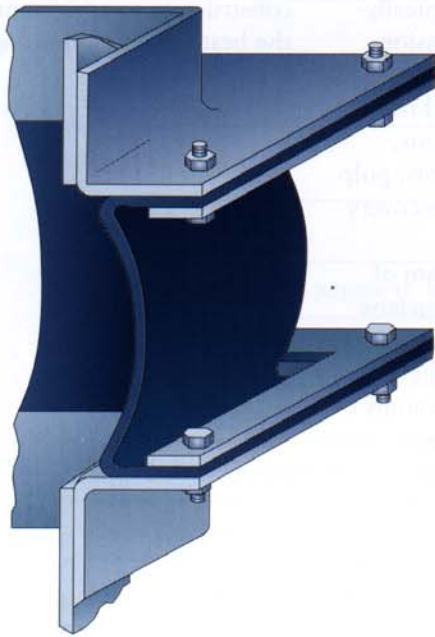
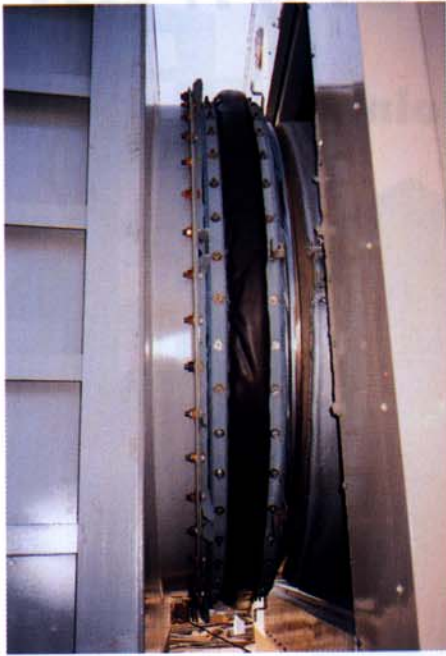


# ***Wahlco/Metroflex, Inc.***

## **Non-Metallic Expansion Joints**





A WahlcoMetroflex expansion joint installed on the outlet flange of a General Electric Frame 6 gas turbine.

#### *WahlcoMetroflex*

manufactures non-metallic expansion joints that have been used around the world. With modern, fully-equipped plants, *WahlcoMetroflex* manufactures the most technically-advanced non-metallic expansion joints available for utilities, municipalities, smelters, steel mills, refineries, petrochemical plants, chemical plants, cement plants, pulp and paper mills, waste heat recovery and cogeneration facilities.

*WahlcoMetroflex's* team of experienced engineers, technicians and craftsmen regularly produces innovative designs to meet clients' specific requirements for economy of installation/operation, energy efficiency, and operator safety.

#### **Technical Sales Support**

The *WahlcoMetroflex* network of experienced and dedicated sales representatives works closely with end-users, consulting engineers and constructors to consistently provide the best possible value-engineered solutions.

#### **One-Day Delivery**

*WahlcoMetroflex* has an extensive inventory of expansion joint raw materials, permitting us to manufacture a belt replacement in one day for immediate delivery anywhere in America and around the world.

#### **Field Service**

*WahlcoMetroflex's* experienced field service technicians can supervise any expansion joint installation or replacement, including assembly and frame and belt splicing. Full erection/retrofit crews are also available.



A *WahlcoMetroflex* technician prepares to hot splice an expansion joint. An overview of the splicing procedure is shown on page 9.

## Durable Elastomers

WahlcoMetroflex's reinforced elastomers provide a cost effective and lasting solution to the difficult operating conditions encountered in flue gas systems.

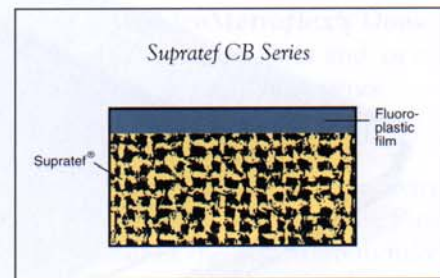
**Chlorobutyl (CIIR)** is a chlorinated isobutylene isoprene rubber that is inherently resistant to ozone and oxidizing chemicals. Chlorobutyl expansion joints are suitable for wet and/or dry chemical applications at continuous temperatures up to 250°F (120°C) and pressures up to 3 psig.

**Fluoroelastomer (FKM)** is a fluorocarbon rubber which is a copolymer of vinylidene fluoride and hexafluoropropylene. Compounding of the fluoroelastomer is equivalent to Du Pont's Vitons® B or 3M's Fluorels®, using the magnesium oxide and C cure system. WahlcoMetroflex uses only 100% virgin material-no reprocessed, reclaimed or blended polymers are ever used in our fluoroelastomers. FKM expansion joints are suitable for wet and/or dry applications at continuous temperatures up to 400°F (205°C), with excursions to 700°F (370°C), and pressures up to 3 psig. The material has excellent abrasion resistance and generally does not require protection from flue gas media.

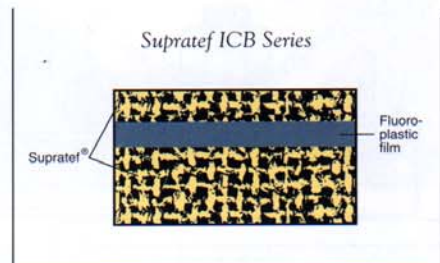
## Rugged Fluoroplastics

WahlcoMetroflex provides three basic fluoroplastic expansion joint materials: Supratef®, Supratef® CB, and Supratef® ICB. The Supratef series of materials are a combination of fluorocarbon resins (for chemical resistance) and a specially designed woven fiberglass reinforcement (for high strength). A chemically-inert fluoroplastic film is laminated onto the basic Supratef material to eliminate chemical degradation in harsh applications with wet, corrosive conditions. For unusual applications, such as two-sided acid attack or extreme movements, strategic modifications can be made to the orientation of the layers.

Supratef materials are standard for dry applications and are ideally suited for composite expansion joints used in flue ducts. These materials have a "stand alone" continuous temperature range of -60 to 550°F (-50° to 285°C).



**Supratef CB (Chemical Barrier)** material is standard for wet applications. A fluoroplastic film is added to the gas side of Supratef material to prevent chemical attack on the load-bearing component. This material can be successfully used in services with temperature ranges of -60 to 600°F (-50° to 315°C).

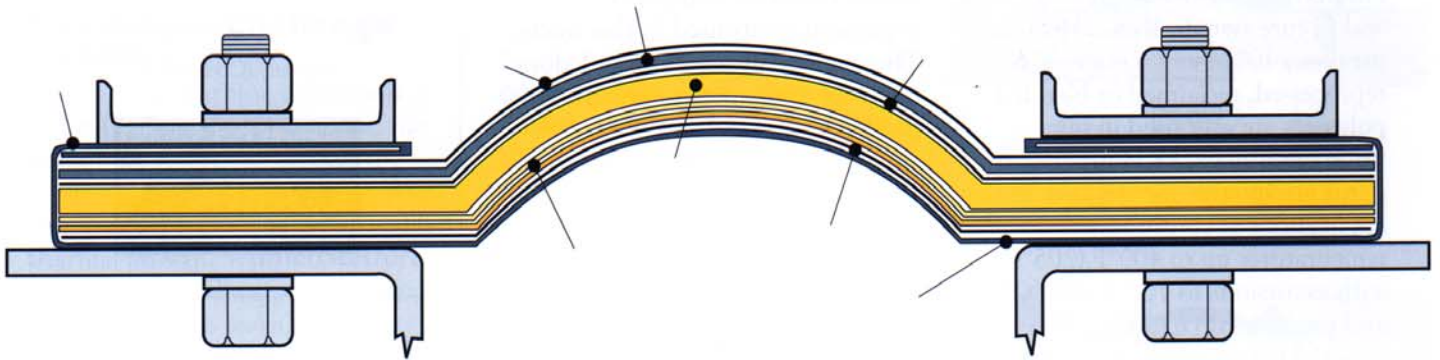


**Supratef ICB (Internal Chemical Barrier)** material consists of an internal chemical barrier of a fluoroplastic film which is sandwiched between two layers of standard Supratef material. Optional fluoroplastic films are available for use on the gas side and/or exterior side to give the ultimate in protection against chemical attack. Supratef ICB material has proven successful in some of the harshest chemical applications known, including sulfuric acid recovery systems.



## Designed For "Full Temperature"

WahlcoMetroflex's Supratel<sup>®</sup> fabric is designed to withstand the ductwork's full temperature-even without the added protection of WahlcoMetroflex's joint cavity insulation. (Inferior designs make the fabric dependent upon the cavity insulation for their survival at high system temperatures.)



## Layers of Strength, Insulation & Gas Barriers

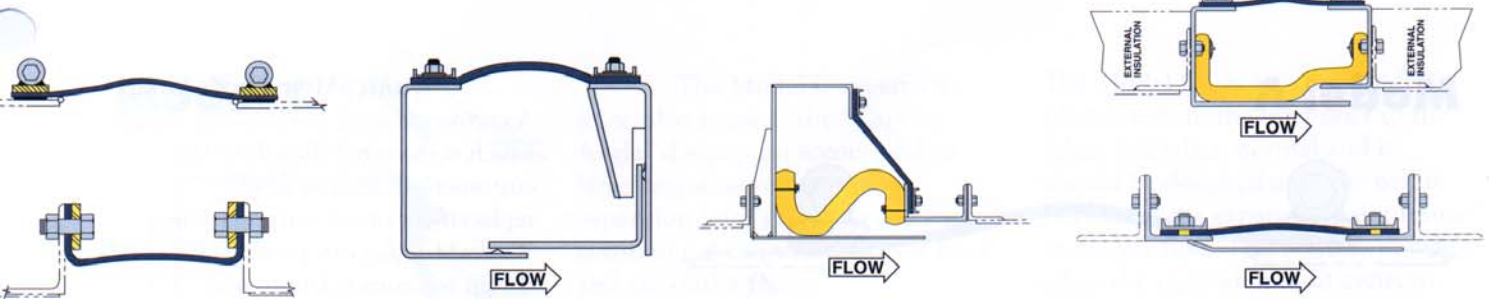
Supratel<sup>®</sup> composite "buildups" are based on PTFE (Teflons<sup>®</sup>) coated fiberglass. The extremely chemical resistant Supratel<sup>®</sup> material can be used as an outer cover to protect the joint from weather, ozone and various chemicals. The internal layer of Supratel<sup>®</sup> fabric has a coating of PFA film to create a non-porous, chemical-proof, gas seal.

Stainless steel wire mesh increases the tensile strength of the build-up and is used with a high-temperature silica-based cloth.

Fiberglass and/or ceramic insulation can also be added to the build-up to protect the outer cover from excessive heat. Vapor barriers can also be used to prevent dew point condensate from attacking the insulation materials.

## Acid & Folding Tests

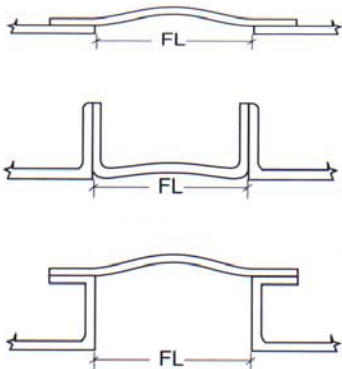
WahlcoMetroflex's Supratel<sup>®</sup> fabric has been subjected to numerous tests, including hydrochloric acid, sodium hydroxide, and temperature and puncture tests.



Duty/Service	Model A	Model B	Model C	Model D	Model E	Model F
Movement:						
Axial 0-2"	●	●	●	●	●	●
2"-6"	○	○	●	●	○	○
≥6"	NR	NR	NR	●	NR	NR
Lateral 0-2"	●	●	●	●	●	●
≥2"	NR	○	●	●	○	○
Temperature °F:						
-40/250	●	●	●	●	●	●
250/450	●	●	●	●	●	●
450/800	○	○	●	●	●	○
800/2000	NR	NR	●	NR	●	NR
High External Temp. (Flammable)	WahlcoMetroflex Metallic Expansion Joint Is Recommended					
Pressure:						
±50"WC	●	●	●	●	●	●
±80"WC	○	○	○	○	○	○
>80"WC	NR	NR	NR	NR	NR	NR
±Press. Change	NR	○	○	○	○	○
Pulsation	WahlcoMetroflex Metallic Expansion Joint Is Recommended					
Medium:						
Corrosive	●	●	●	●	●	●
Abrasive	NR	● w/Liner	●	●	●	● w/Liner
Encrusting	●	●	○	○	○	●
Sticky	●	●	○	○	○	●
Dusty	●	●	●	●	●	●
Dewpoint (Thermal Function)	●	●	○	○	○	●
Purge Against Dust Infiltration	NR	NR	●	●	○	NR
Seal Against Dust Infiltration	NR	NR	●	●	●	○

● Excellent    ○ Good    NR Not Recommended

## Movement Capabilities



"FL"	Axial Compression	Axial Extension	Lateral Offset
<b>For Applications Below 450°F (232°C)</b>			
6" (150mm)	1½" (40mm)	½" (15mm)	1" (25mm)
9" (230mm)	2¼" (60mm)	½" (15mm)	2" (50mm)
12" (300mm)	3¾" (100mm)	1" (25mm)	3" (75mm)
<b>For Applications Above 450°F (232°C) to 1200°F (650°C)</b>			
6" (150mm)	1" (25mm)	½" (15mm)	¾" (20mm)
9" (230mm)	2" (50mm)	½" (15mm)	1" (25mm)
12" (300mm)	3" (75mm)	1" (25mm)	1½" (40mm)

Note: Movement capabilities are given for general guidance only. Specific details will be given for each application by WahlcoMetroflex, Inc.

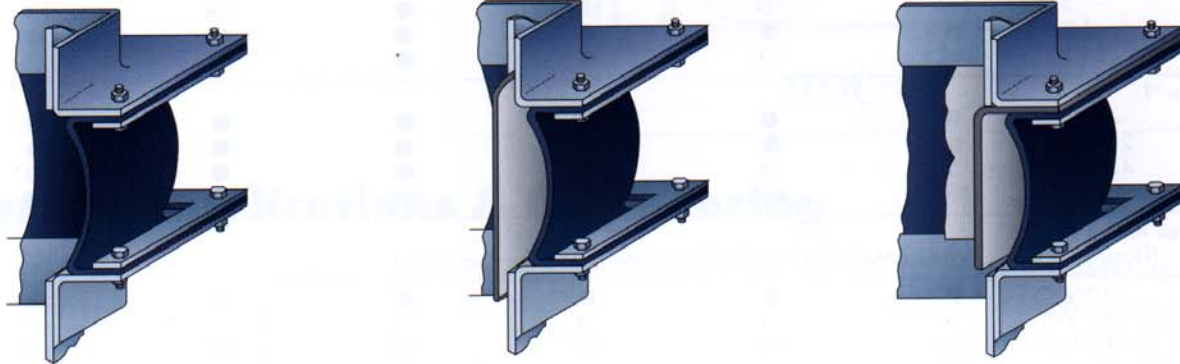
## Model A



### WahlcoMetroflex's Model

A expansion joint is a belt-only design which is mounted directly to the customer's duct or as a belt replacement on an existing frame. WahlcoMetroflex can provide clamping design recommendations and clamping hardware if desired.

## Model B



WahlcoMetroflex's Model B expansion joint features integrally-molded reinforced elastomer belt corners. Flat mounting-bars connect the fabric to the integrated flanges.

The Model B has many advantages including maximum movement capabilities and low cost

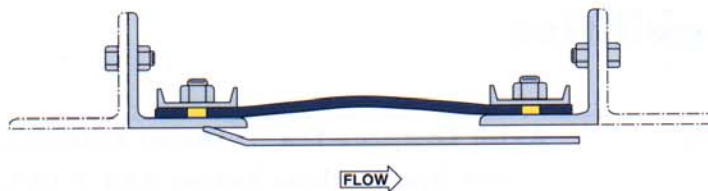
design eliminating the need for an additional metal frame (corrosion-affected hardware) and installation time is minimized.

Temperature ranges are from  $-60^{\circ}$  to  $+600^{\circ}\text{F}$  ( $-51^{\circ}$  to  $315^{\circ}\text{C}$ ), depending upon the elastomer/fluoroplastic fabric selected. Weld-in

or bolt-on flow liners may be added if the medium contains erosive dust or heavy particulate matter.

Higher temperature capabilities are possible utilizing the Supratex composites build-up.

## Model F

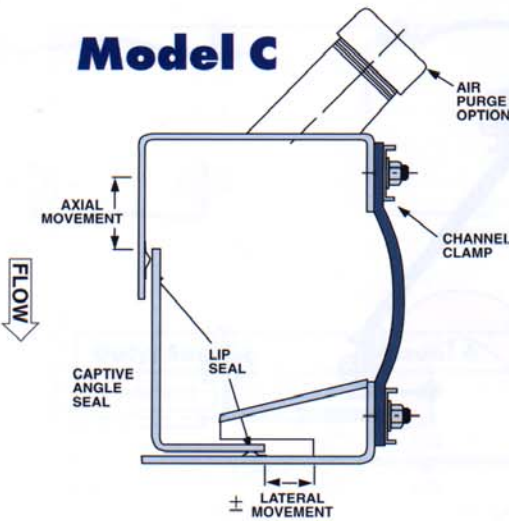


WahlcoMetroflex's Model F expansion joint is a general purpose, industry standard joint incorporating a flat flexible belt mounted to an angle frame.

The Model F can be internally or externally mounted on the angle frames. A modified Fabric Inside Metal (FIM) mounting system allows for the cost effective sealing of existing (leaking) joints without removing the failed joints.

The standard Model F has low to moderate temperature ranges up to  $450^{\circ}\text{F}$  ( $230^{\circ}\text{C}$ ) without the addition of optional liners or insulating layers.

## Model C



The Model C expansion joint, also known as the “Captive Angle” design, can accommodate large lateral movements. The expansion joint’s floating angle is in constant contact with the inlet liner and the outlet frame.

A lip seal made from stainless or nickel alloy can be incorporated to provide a primary dust seal. A dome seal (see page 9) can be used as a secondary seal to prevent fines from accumulating in the expansion joint cavity. An optional positive air purge system may also be added to prevent fines from entering the cavity.

The Model C has a larger standoff (distance from the inlet liner to the fabric belt) than normal and it should be designed with the major portion of the expansion joint frame in the gas flow. This placement will allow the expansion joint cavity to heat evenly and prevent distortion caused by differential thermal expansion.

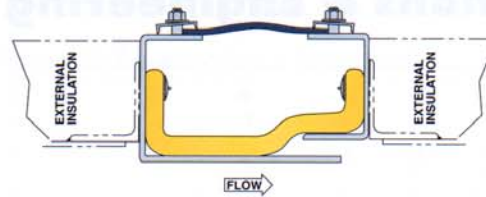
## Model E

### Wahlco Metroflex’s Model E

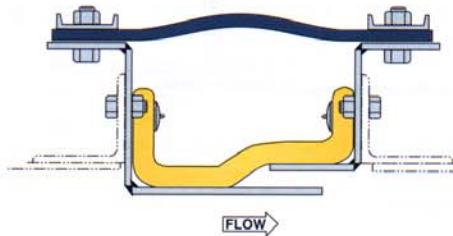
expansion joint features overlapping (telescopic) liners to allow smooth gas flow while protecting the insulation and fabric belt from abrasive particulate.

An important installation benefit of the Wahlco Metroflex standard Model E1 design is the belt flange design. The belt flanges point towards each other, allowing installation in existing ducts without field compressing the joints. (Flanges pointing away from the joint require a 6" field compression to fit into an existing breach opening and are recommended for new installations only. This field compressing may be harmful to the belt and internal insulation.)

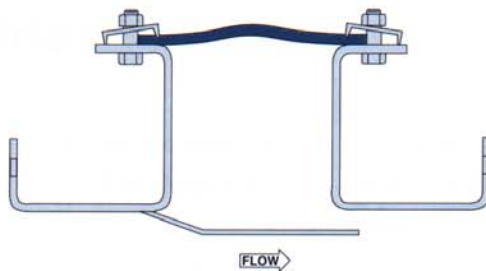
- The Dome Seal serves as an acoustic barrier and will prevent particulate infiltration while providing thermal insulation.



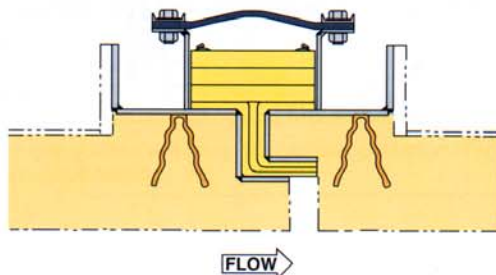
Shown is the Wahlco Metroflex Model E1 expansion joint with belt flange fastening pointed inward, channel clamp-under method, dome seal and frame welded to the mating duct/flange.



The Wahlco Metroflex Model EO expansion joint has the belt flange fastening pointing outward, with channel clamping plug (holes through belt), dome seal and bolt-to-mating flange design.

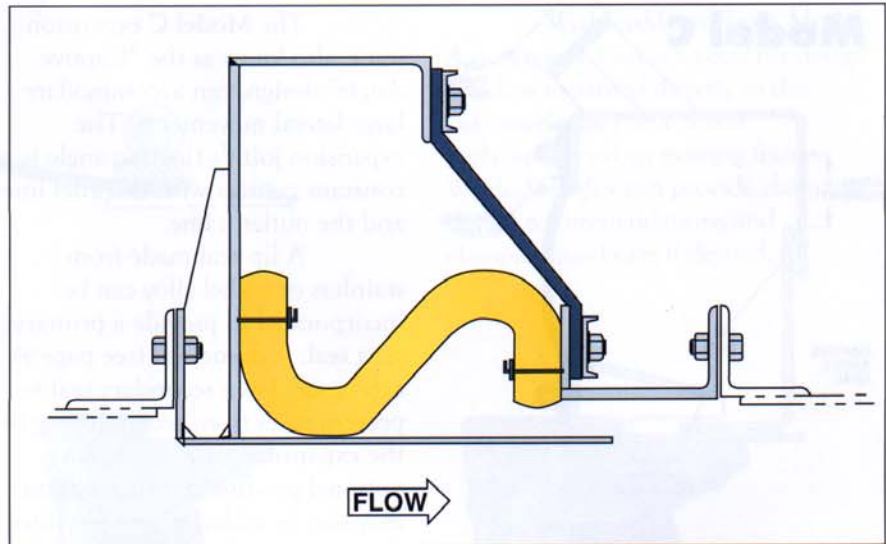


The Wahlco Metroflex Model E-MOD expansion joint is used in applications where external bolting to mating flanges is required, as well as to cover large breach openings left from previous metallic expansion joint installations.

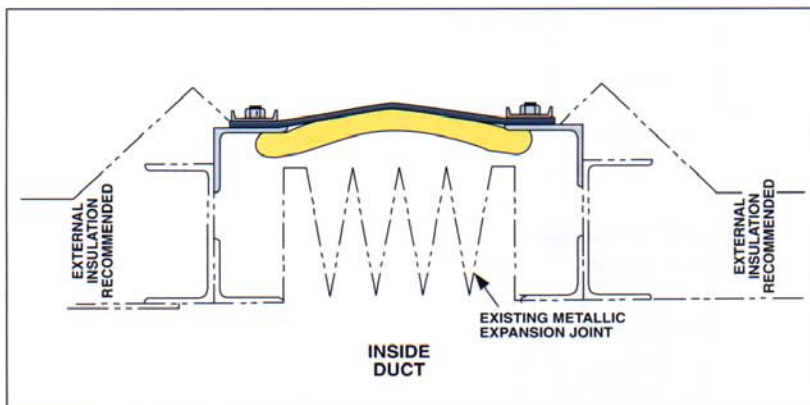
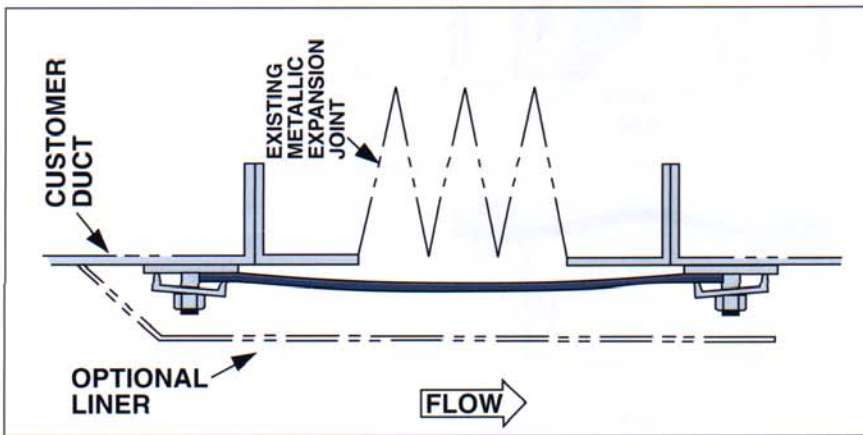


The Wahlco Metroflex Refractory Lined Expansion Joint provides protection against abrasive media as well as preventing thermal efficiency losses in high temperature applications 1000°F to 2300°F (540°C to 1260°C).

The Model D expansion joint has a diaphragm design for accommodating very large axial movements. The special belt geometry eliminates stress and overlap problems. A Captive Angle may be added, as well as many of the Model C sealing features.



## Custom Applications & Engineering



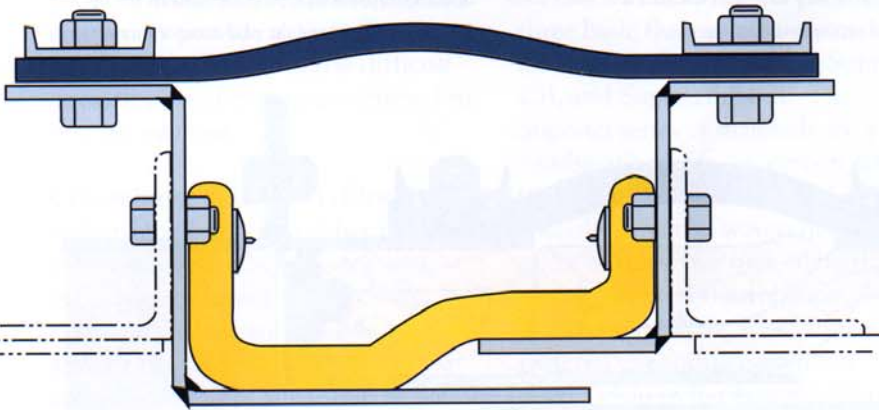
**WahlcoMetroflex** is a full-service engineering and manufacturing company capable of providing unique, cost-effective solutions to all your expansion joint requirements. **WahlcoMetroflex** can:

- Design the appropriate joints for new system installations.
- Design retrofit joints for failed installations done by other manufacturers.

**WahlcoMetroflex** can comprehensively review your entire gas flow system to determine the most cost-effective solutions to your expansion joint requirements. Because **WahlcoMetroflex** also manufactures metallic expansion joints, we provide unbiased "nonmetallic vs. metallic" comparisons for the best solution for your application.



## Dome Seal Insulation



*WahlcoMetroflex's Dome Seal* is used as an insulator and/or a fly ash seal. As a seal, it prevents particulates from filling the joint cavity. The flexible ceramic or fiberglass material insulates the cavity and provides an acoustic barrier. Pins and clips allow the insulation to fully expand after compression cycles. A strong stainless steel wire mesh and silica-based cloth (optional) are wrapped around the insulation to help prevent erosion.

FLOW →

## Joint Splicing Overview



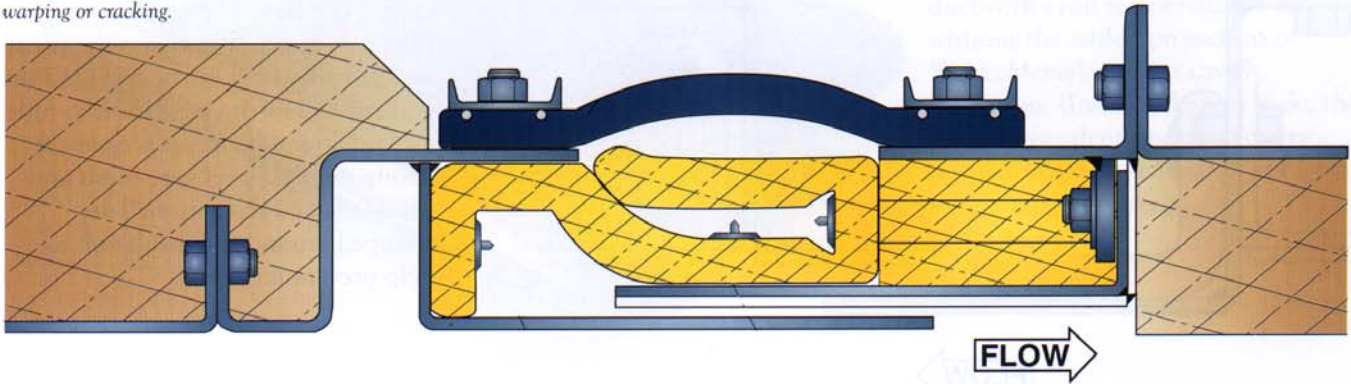
Note: Contact *WahlcoMetroflex* for detailed splicing instructions, equipment and/or field service assistance.

# Gas Turbine Expansion Joints

The joint's flange and the duct's flange are made from like materials and are externally insulated, so they have the same thermal expansion coefficient. This eliminates expansion differences that can produce warping or cracking.

Silica-based cloth is used as insulation underneath the clamping bars to protect the bars and outer cover material against overheating.

WahlcoMetroflex flow liners are thermally decoupled to allow differential expansion between the hot internal surfaces and the cold exterior frame.



A thermal cavity allows the even distribution of heat along the entire length of the joint's inlet frame, minimizing the frame's expansion differentials.

Pins and clips attach the ceramic material to both the inlet and outlet liners, allowing the flexible insulation to fully expand after each compression cycle.

Flexible ceramic material insulates the joint cavity and is an acoustical barrier. The insulation is wrapped in stainless steel wire mesh and a high-temperature, silica-based cloth to prevent erosion.

Short corner Liner sections allow the free floating side liners to expand without corner cracking.

## The Unique Challenge Of GTEJs

Gas Turbine Expansion Joints (GTEJs) must withstand the potential for stress caused by the rapid temperature rise of gas turbine start-ups. By accommodating sudden thermal growth, **WahlcoMetroflex** GTEJs can avoid warping, binding, cracking and gas leakage.

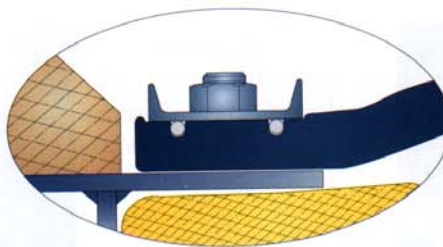
## WahlcoMetroflex Designs Anticipate & Minimize Thermal Stresses

Numerous **WahlcoMetroflex** design techniques are used to combat the thermal extremes faced by expansion joints operating under gas turbine exhaust temperatures of 850°F to 1,250°F (454°C to 676°C).

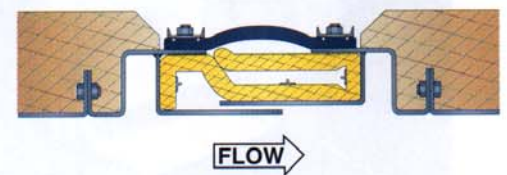
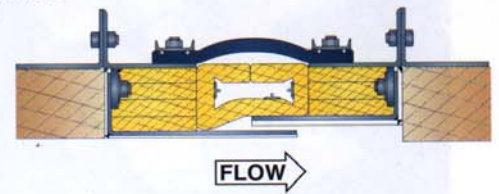
- Wherever hot metal components are permanently joined or fastened to one another, they are made of like

materials. This means their thermal growth coefficients will be the same—eliminating the potential for damaging stress.

- By controlling the length of liners attached to the frame, we greatly reduce the threat of binding, warping and cracking due to thermal differentials.
- Careful attachment of joint cavity insulation (also known as the “Dome Seal”) allows the insulating materials to fully expand after compression. This eliminates “hot spots” on the fabric belt that could cause early failure.



Close-up of the Key Mounting System used to attach the fabric belt to the joint's frame.



## Three Models for Three Thermal Designs

All combinations of internally and externally insulated components can be joined by our three models: GTEJ-1 for Cold Frame to Cold Frame, GTEJ-2 for Hot Frame to Cold Frame, (or Cold Frame to Hot Frame), and GTEJ-3 for Hot Frame to Hot Frame.

# Application Data Form

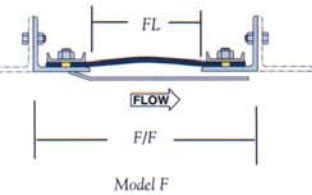
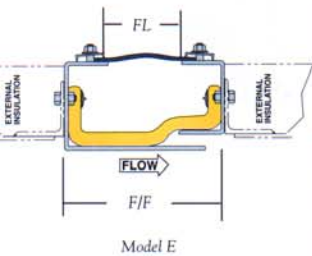
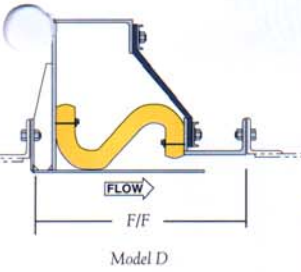
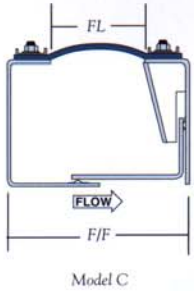
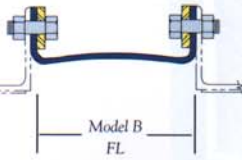
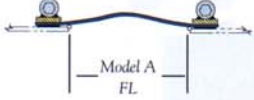
## For WahcoMetroflex Fabric Expansion Joints

Company Name \_\_\_\_\_

Address \_\_\_\_\_

Contact Person \_\_\_\_\_

Phone \_\_\_\_\_ Fax \_\_\_\_\_



Joint Item Number				
Quantity/Model	/	/	/	/
Location (Nearest Equipment, Inlet/Outlet)				
Flow Direction (Up, Down, Horizontal)				
Flow Media				
Duct Inside Dimensions				
Duct Thickness				
Duct Breach (Face-to-Face) Opening				
Design Pressure				
Operating Pressure				
Operating Temperature				
Excursion Temperature & Duration	/	/	/	/
Ambient Temperature Maximum & Minimum	/	/	/	/
Axial Compression				
Axial Expansion				
Lateral Movement Parallel to Long Side "X"				
Lateral Movement Parallel to Short Side "Y"				
Flow Liner Material				
Flow Liner Thickness				
Torsional/Angular Movement (In Degrees)	/	/	/	/

Additional application comments. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

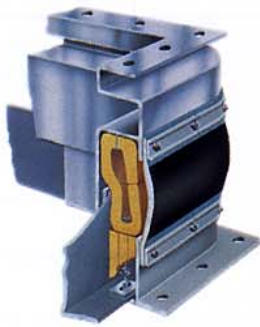
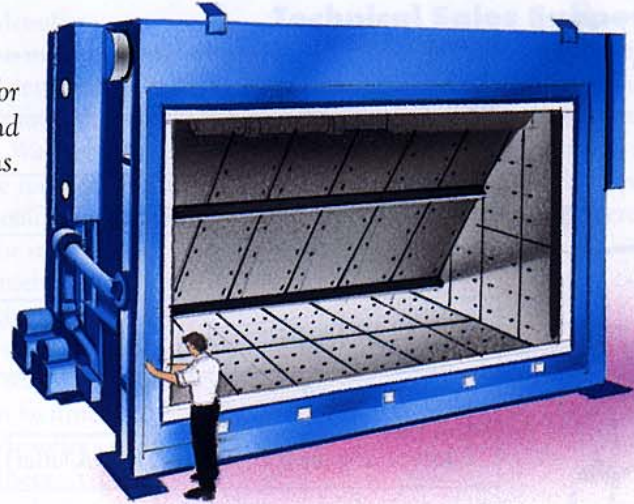
"FL" = Free Length  
"F/F" = Face-to-Face Length

# Additional Gas Flow Control Products

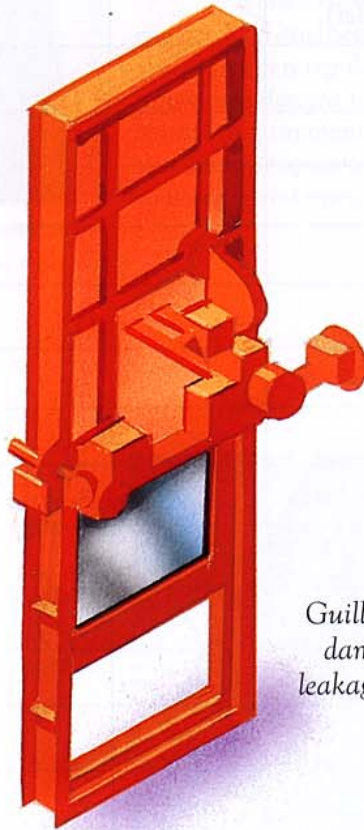


Multi-lower damper for control and tight shut off application.

Diverter damper for combined cycle and co-generation systems.

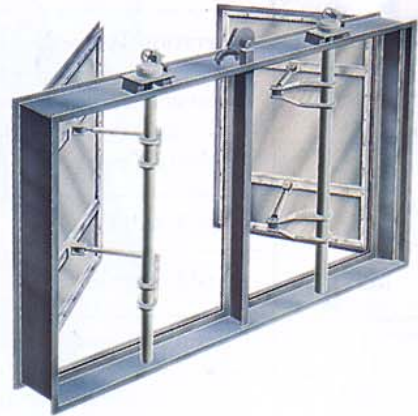


WahlcoMetroflex's fabric expansion joints are designed for applications over 2000°F (1100°C).



Guillotine and flap dampers for zero leakage applications.

Rolled bellows for control of expansion and contraction in high temperature/high pressure piping.



## WahlcoMetroflex, Inc.