Type of fabric expansion joint

**SINGLE LAYER TYPE**
This type is comprised of one or more reinforcement plies with coating of elastomers or fluoroplastics to form a homogenous material.

**COMPOSITE TYPE**
A layered product that consists of various plies of materials which are laid one over the other and are usually bonded, sewn or mechanically fastened together in the clamped flange area.

**ANATOMY OF TYPE**

---

**F Type**

- Metal liner or baffle
- Flexible element
- Fasteners (bolt nut, washers)
- Back-up bars
- Metal flanges or frame

**INTEGRALLY FLANGED TYPE EXPANSION JOINT**

**B Type**

- See illustration
- Flexible element
- Fasteners (bolt nut, washers)
- Back-up bar
- Cavity pillow
- Metal liner or baffle

**BELT TYPE EXPANSION JOINT**
megaflexon provides from designs for various application.

**Standard internal flanged type (F type) expansion**
- Low to moderate temperatures application.
- Primary used for field installation application.
- Lower initial cost and shipping cost.
- Molded corners provided for rectangular.

**ECONOMIC BELT TYPE EXPANSION JOINT**
- High temperature ductwork applications
- Pre-fabricated flame reduce cost
- Easy accepts pillow design
- Large lateral movement
- Outside belt assembly

**BELT TYPE EXPANSION JOINT**
- Suitable normality temperature applications
- Frequently fan application
- Economic and Standard frame
- Facilitate belt replacement
megaflexon provides from designs for various application.

**MB-04**

- Low temperature applications with low level
- Future belt replacement
- Used frequently with fan application
- Shop welded flow liner

**MB-05**

- High temperature application and high level
- Large Lateral Movements
- Integral telescopic flow liners
- Provide protection for belts and pillows
- Pillow design
- Future belt and pillow replacement

**MB-06**

- Single Integral-flow liner
- Low level and vertical duct work applications
- Provide protection for belts and pillows
- Future belt and pillow replacement
- Large lateral movements

**MB-07**

- Well suitable field assembly installation
- Utilized for all temperature ratings
- Economic frame
- Facilitates field assembly
megaflexon provides from designs for various application.

- Flanges are not present
- Future belt and pillow replacement
- Standard structural steel channel
- Field assembly is required and fill up

Cavity Pillow

The Cavity Pillow fills the cavity between the flexible element and the metal liner or baffle and helps prevent the accumulation of particulate matter, and in some applications unburned fuel, from becoming trapped in the expansion joint cavity.

If there is no cavity pillow, fly ash or other solid particulates can accumulate in the expansion joint cavity in such quantities that they can cause damage to the flexible element if they solidify to a cementatious state. Also, certain noncementatious particles (fly ash) can create a severe corrosive (acidic) environment when subjected to cooling (below HSO₄' dew point) during a maintenance outage.
**Back up Bar**

The Back-up Bars are metal bars used for the purpose of clamping the flexible element of the expansion joint to mating ductwork flanges or to metal adapter flanges. Standard size back-up bars are $2 \frac{1}{4} \times \frac{3}{8}$. Back-up bar selection depends upon the bolt spacing, bolt hole size and expansion joint flange height or width.

**Liner or Baffles**

Metal Liner or Baffles are metal shields designed to protect the flexible element and cavity pillow (if present). Metal liners or baffles reduce fluttering caused by air turbulence as it passes over the flexible element.

### TABLE D1: BOLT HOLE SPACING

<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Flange Bolt Hole Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 bolt</td>
<td>4 inch C-C</td>
</tr>
<tr>
<td>5/8 bolt</td>
<td>4 or 6 inch C-C</td>
</tr>
</tbody>
</table>

**Design**

**Installations**

- **STRAIGHT STYLE**
- **AIRFOIL STYLE**
- **SEMI-AIRFOIL STYLE**
- **TELESCOPIC STYLE**
- **SHOP WELDED TO EXPANSION JOINT**
- **FIELD WELDED TO DUCT PLATE**
- **BOLTED TO DUCT FLANGE**
- **INTERGRAL WITH EXPANSION JOINT FRAME**
Power Plant Schematic

1. Boiler Furnace Area
2. Silencer
3. Economizer Ash Hopper
4. Coal Tripper
5. Coal Silo
6. Pulverizer
7. Forced Draft Fan
8. Air Preheater
9. Electrostatic Precipitator
10. Flue Gas Desulphurizer
11. Stack
12. Turbine
13. Generator
14. High Pressure Heater
15. Degenerator
16. Condenser
17. Boiler Feed Water Pump
18. Condensate Pump
19. Control Room
20. Main Transformer

FOSSIL FIRED POWER PLANT
Movement Capabilities

Non metallic ducting movements can be calculated at both the design and maximum excursion temperatures. Fabric expansion joints can handle combined axial, lateral, angular and torsional movements with just one unit, the expansion joint locations should be carefully selected to keep the number of expansion joints in the system to a minimum and still absorb all of the duct movements. Should an expansion joint location have very large axial and/or lateral movements, consult manufacturers for a recommendation on how these large movements can best be handled.

- Breach Opening Tolerances: Axial: 1/4" (6mm), extension 1/2" (13mm) compression Lateral: 1/2"
- Lateral movements exceeding 3" (75mm) should be pre-offset one half the required movement.
**Set Back Requirements**

The distance the expansion joint is moved outward from the gas stream to allow for lateral movements and to prevent the joint from protruding into the gas stream when operating under negative pressures. Proper setback also reduces the thermal transfer effect on the inner face of the expansion joint from particles in the gas stream.

<table>
<thead>
<tr>
<th>ACTIVE LENGTH</th>
<th>6 (150mm)</th>
<th>9 (230mm)</th>
<th>12 (305mm)</th>
<th>16 (405mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illustration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure</td>
<td>3 (75mm)</td>
<td>3 (75mm)</td>
<td>4 (100mm)</td>
<td>6 (150mm)</td>
</tr>
<tr>
<td></td>
<td>4 (100mm)</td>
<td>6 (150mm)</td>
<td>6 (150mm)</td>
<td>7 (175mm)</td>
</tr>
<tr>
<td></td>
<td>1 (25mm)</td>
<td>1 1/2 (38mm)</td>
<td>2 (50mm)</td>
<td>2 1/2 (63mm)</td>
</tr>
<tr>
<td></td>
<td>2 (50mm)</td>
<td>3 (75mm)</td>
<td>4 (100mm)</td>
<td>5 (125mm)</td>
</tr>
</tbody>
</table>

**ACTIVE LENGTH**

In general, by increasing the active length of expansion joint, greater movements can be accommodated.

**<TYPICAL MOVEMENT CHART>**

<table>
<thead>
<tr>
<th>BELT TYPE</th>
<th>ACTIVE LENGTH</th>
<th>AXIAL COMPRESSION</th>
<th>AXIAL EXTENSION</th>
<th>LATERAL MOVEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Layer Elastomer or Fluoroplastic Flexible Element</td>
<td>6 (150mm)</td>
<td>2 (50mm)</td>
<td>1/2 (43mm)</td>
<td>+/- 1 (25mm)</td>
</tr>
<tr>
<td></td>
<td>9 (230mm)</td>
<td>3 (75mm)</td>
<td>1/2 (43mm)</td>
<td>+/- 1 1/2 (38mm)</td>
</tr>
<tr>
<td></td>
<td>12 (305mm)</td>
<td>4 (100mm)</td>
<td>1 (25mm)</td>
<td>+/- 2 (60mm)</td>
</tr>
<tr>
<td></td>
<td>16 (405mm)</td>
<td>5 (125mm)</td>
<td>1 (25mm)</td>
<td>+/- 2 1/2 (63mm)</td>
</tr>
<tr>
<td>Composite Type Flexible Element</td>
<td>6 (150mm)</td>
<td>1 (25mm)</td>
<td>1/2 (43mm)</td>
<td>+/- 1/2 (13mm)</td>
</tr>
<tr>
<td></td>
<td>9 (230mm)</td>
<td>2 (50mm)</td>
<td>1/2 (43mm)</td>
<td>+/- 1 (25mm)</td>
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<td></td>
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<td>3 (75mm)</td>
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<td>+/- 1 1/2 (38mm)</td>
</tr>
<tr>
<td></td>
<td>16 (405mm)</td>
<td>4 (100mm)</td>
<td>1 (25mm)</td>
<td>+/- 2 (60mm)</td>
</tr>
</tbody>
</table>
Megaflexon multi-ply rectangular expansion joint with round corners are dimensioned to match the duct. Megaflexon rectangular expansion joints with integral multiply-walls and round corners for large dimensions. These expansion joints are welded together on job site.

The service life of an expansion joint is influenced by following factors:
- number of cycles
- movement to the taken up
- operating temperature
- pressure load
- pressure pulse
- thermal transients during operation
- corrosion
- vibration

The permissible movements can be calculated subject to relevant factors and according to operating conditions. A cycle is represented by the total movement from the initial position, to one extreme value, to the other extreme value and back to the initial position.

Metallic Rectangular Expansion Joint
200 × 570mm, type fru
Material SS316, P=2bar, T=450
Bellow: Corten Steel

Metallic Rectangular expansion joint for flue gas line
11182 × 3482 × 3000mmL
Double miter corner type
Intermediate pipe, sleeve:A387Gr12
Bellows: Corten Steel
MEGAFLEXON BELLOWS

Bellows walled megaflexon circular or rectangular bellows are menu featured from a multi-ply cylindrical package. To this end, strip sheet is compactly coiled around a longitudinally-seam welded liner cylinder, in as many layers as required for pressure stability. By pressing out undulations the cylindrical package is formed into a bellows.

The multi-ply bellows stands for the principle of the breaking up a single-wall bellows into multiple walls. This method meets the requirements for high movement absorption in a short built-in length.

**MEGAFLEXON BELLOWS**

**Specification**

Travel<movement>: Axial, Lateral, Angular

Materials of the bellows,
Materials/600
Incoloy 800/ operating temperture
Incoloy 800H/900
Incoly 825/450
Incoly 600/450
Incoly 600H/900
Hastelloy C4/400
Hastelloy C276/400
Monel/425
Nickel/600
Titanium/250
Zirconium/
F-1. **Storage**

The storage environment and storage time can be important factors in the condition and performance of a fabric expansion joint. The materials used in fabric expansion joints exhibit excellent resistance to various forms of environmental attack; however, recommended storage practices must be observed and an awareness of deviations must be maintained. After prolonged storage (over one year), inspection by the expansion joint manufacturer can assure that performance will not be affected. In cases of storage abuse, expansion joint warranties may be invalid. Special storage methods should be used when long-term field storage is anticipated for spare expansion joints.

**F-1.1. Length of Storage**

The storage warranty period is specified by the manufacturer based upon the expansion joint style. Notify the manufacturer for inspection if storage period exceeds one year. Inspections should be made at least sixty (60) days before anticipated installation. Notify the manufacturer if the start-up date is to be more than twelve (12) months after the installation of the expansion joints. Notify the manufacturer, regardless of storage time, if any unusual appearances are noticed when unpacking or installing the expansion joints.

**F-1.2. Indoor Storage Recommendations**

Do store the expansion joints in their original shipping containers. Do protect the containers from physical damage and abuse. Do store in cool, dry areas. Do Not store where the temperature will exceed 150°F (65°C). The ideal storage temperature is between 50°F and 70°F (10°C to 20°C). Expansion joints should not be stored near sources of heat such as radiators and baseboard heaters.

**F-1.3. Outdoor Storage Recommendations**

Do store the expansion joints in their original shipping containers. Do protect the containers from physical damage and abuse. Do store at least one (1) foot above the ground in a dry area where flooding will not occur. Do cover the containers with a tarpaulin or heavy plastic to protect them from the weather. Do Not store where the temperature will exceed 150°F (65°C). The ideal storage temperature is between 50°F and 70°F (10°C to 20°C). Expansion joints should not be stored near sources of heat.

F-2. **Handling and Installation**

Expansion joints, whether ordered assembled, unassembled or as components, must be packaged to arrive at the job site in good condition. The purchaser should, immediately upon receipt at the job site, verify that all parts shown on the packing slip have been received undamaged. All expansion joint manufacturers provide detailed instructions with each shipment and these instructions should be reviewed before installation. To insure proper performance and service life it is important to prevent damage by careful handling and by supporting the expansion joint during installation.
F-2.1. Pre-Erection Requirements:
The breach opening and ducting should be checked for proper alignment. The opening should not exceed the following tolerances: Axial+1/4, -1/2, Lateral 1/2. If the breach opening exceeds these tolerances then the expansion joint manufacturer must be notified. Mounting flanges or expansion joint attachment area of the ductwork must be smooth, clean, flat, and parallel. All welded areas must be ground smooth at attachment points. The area around the ductwork must be cleared of any sharp objects and protrusions. If not removable they should be marked for avoidance. The expansion joint and components should be kept packaged until immediately before installation. If any handling devices such as crane hooks or fork lifts are utilized in handling the expansion joints, the contact surface must be protected by cushioning materials. If welding or burning operations are being performed in the vicinity of the exposed expansion joint, fabric welding blankets or other protective covering must be used. These covers must be removed before system start-up.

F-2.2. Installation

It is important that the expansion joints be installed at the proper face-to-face dimension as specified by the manufacturer. Never extend, compress or laterally distort expansion joints to compensate for dimensional errors without the manufacturer’s concurrence. When an expansion joint must be precompressed or laterally preset, follow the manufacturer’s detailed instructions for installation. All expansion joints provided with baffles or liners should have flow arrows or other suitable means of assisting the installer to properly orient the expansion joint to flow direction. Care must be taken to assure that back-up bar ends butt up to each other without overlapping or allowing large space between ends. Follow the manufacturer’s specific instructions. Installers must follow the manufacturer’s bolt installation and torque recommendations. If impact tools are used then they must have torque limiting devices properly set before use. Do not install insulation over the expansion joint or mounting area unless it is in accordance with the manufacturer’s instructions. In areas where coal dust can collect on the expansion joint outercover, protective shields may be required. Coal dust can cause spontaneous combustion, resulting in burning outer covers of expansion joints. Consult the expansion joint manufacturer for details and requirements for a shield. Proper installation of the expansion joint is critical to the service of the product and should be checked by the installer.

F-3. Commissioning

It is very desirable to have a representative of the manufacture provide a Final Walk Down inspection of the installation prior to system start-up. This inspection should consist of verifying installed dimensions, bolt torques, and general condition of installation.
1. Medium
- Flue gas
- Air
- Waste gas
- Others: ______________________________
- Composition according to enclosed analysis
  - dry
  - moist
dust: no; yes: __________________
  - solid particles: no; yes: __________________
- Flow rate: ________ mn/h
- Flow velocity: ________ m/s
- Direction of flow: horizontal; vertically up; vertically down; diagonally up; diagonally down
- Dew point: __
- Condensate: strongly acid; slightly acid; neutral; slightly basic; strongly basic

2. Temperatures
- Temperature of medium: ________
- Design temperature: ________
- Excursion temperature: ________
- Duration of individual excursions: days: ________; hours: ________; minutes: ________
- Duration of excursions per year: days: ________; hours: ________; minutes: ________
- Ambient temperature: ________ (standard value: 50°C with a free convection)
- Radiation impeded: no; yes, by: ________________________________
- Passive radiation by components: no; yes, by: ________________________________
- External insulation: no; yes, to be confirmed by manufacturer

The Quality Committee of the Quality Association for Fabric Expansion Joints.

3. Pressure
- Operating pressure: ________ mbar
- Neg.op. pressure: ________ mbar
- Design pressure: ________ mbar
- Transient pressure: yes, from ________ mbar to ________ mbar
- Frequency:
- Surge load: yes, from ________ mbar to ________ mbar
- Excursion pressure: ________ mbar
- Neg.exc. pressure: ________ mbar
- Frequency of excursions: ________ per: ________ at a temperature of: ________

4. Specified tightness
- without
- flue gas tight acc. to MG-002
- nekal tight acc. to MG-003

5. Movements
- Axial compression
  - Axial elongation
  - Lateral offset
  - Angular movement
  - Torsion
  - Vibration
  - Z: ________ mm
  - + Z: ________ mm
  - X: ________ mm
  - Y: ________ mm
  - aX: ________°
  - aY: ________°
  - aZ: ________°

6. Design
- Type of connection: tubular connection; flange connection
- Delivery: open; endless
- Baffle/sleeve: no; yes; welded; bolted
- Insulation between expansion joint and baffle/sleeve: yes; no
INSTALLATION & APPLICATION

View of round "F" type fabric expansion joint after installation

View of rectangular "F" type fabric expansion joint after installation

View of round type metal expansion joint under construction

View of rectangular type fabric expansion joint after installation

View of fabric expansion joint which is installed front of stake
INSTALLATION & APPLICATION

View of Viton-B expansion joint which is installed in FGD flue gas duct line

View of storage after complete production rectangular & round type expansion joint

View of Viton-B expansion joint under construction fossil power plant

View of produce rectangular metal expansion joint at Kimpo plant

View of operating fabric expansion joint at 390 °C flow gas line

View of fabric expansion joint which is installed in FGD flue gas duct line