MEGA FLEXON

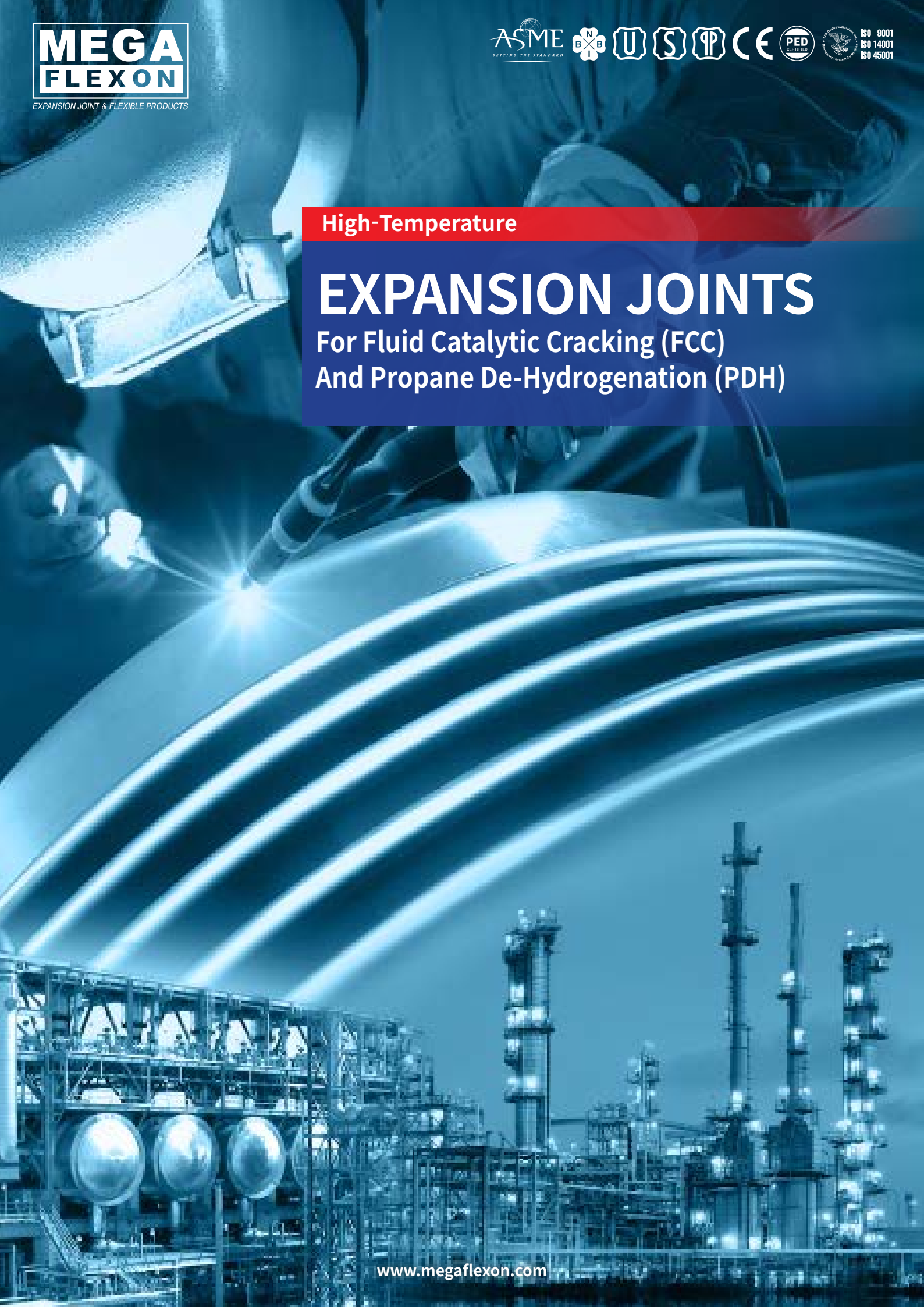
EXPANSION JOINT & FLEXIBLE PRODUCTS

ISO 9001
ISO 14001
ISO 45001

High-Temperature

EXPANSION JOINTS

For Fluid Catalytic Cracking (FCC) And Propane De-Hydrogenation (PDH)



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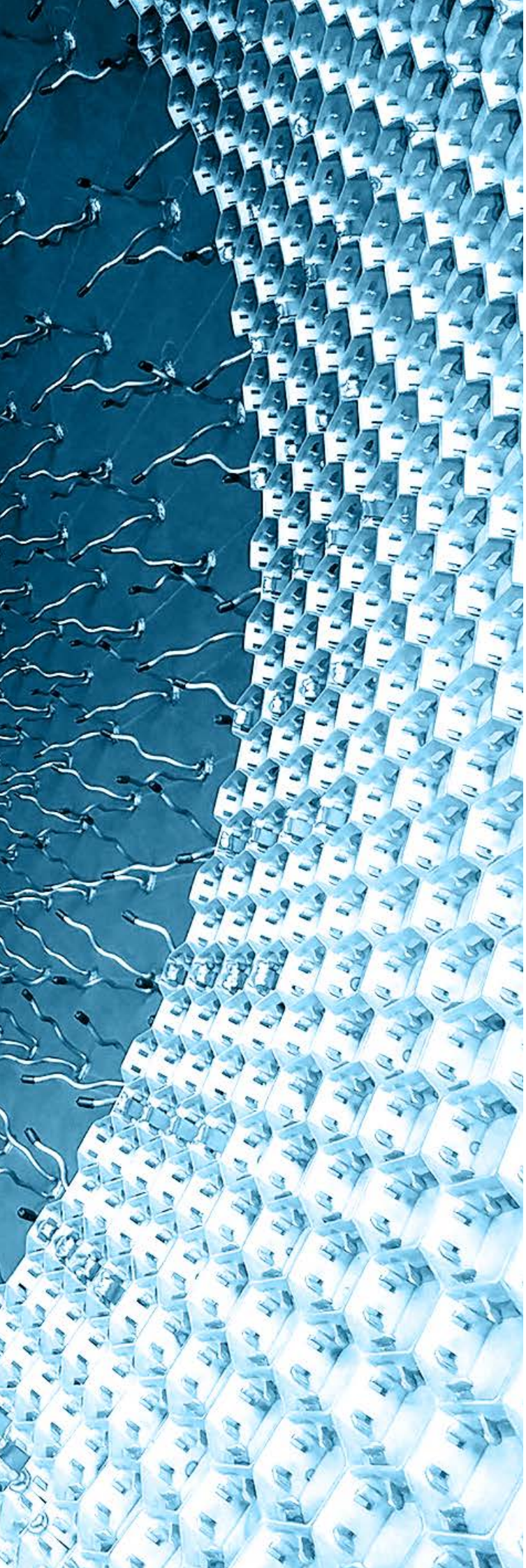
MEGA FLEXON
EXPANSION JOINT & FLEXIBLE PRODUCTS

SPECIALIST

In Expansion Joints for Fluid Catalytic Cracking (FCCU) And Propane De-Hydrogenation (PDH)



ISO 9001
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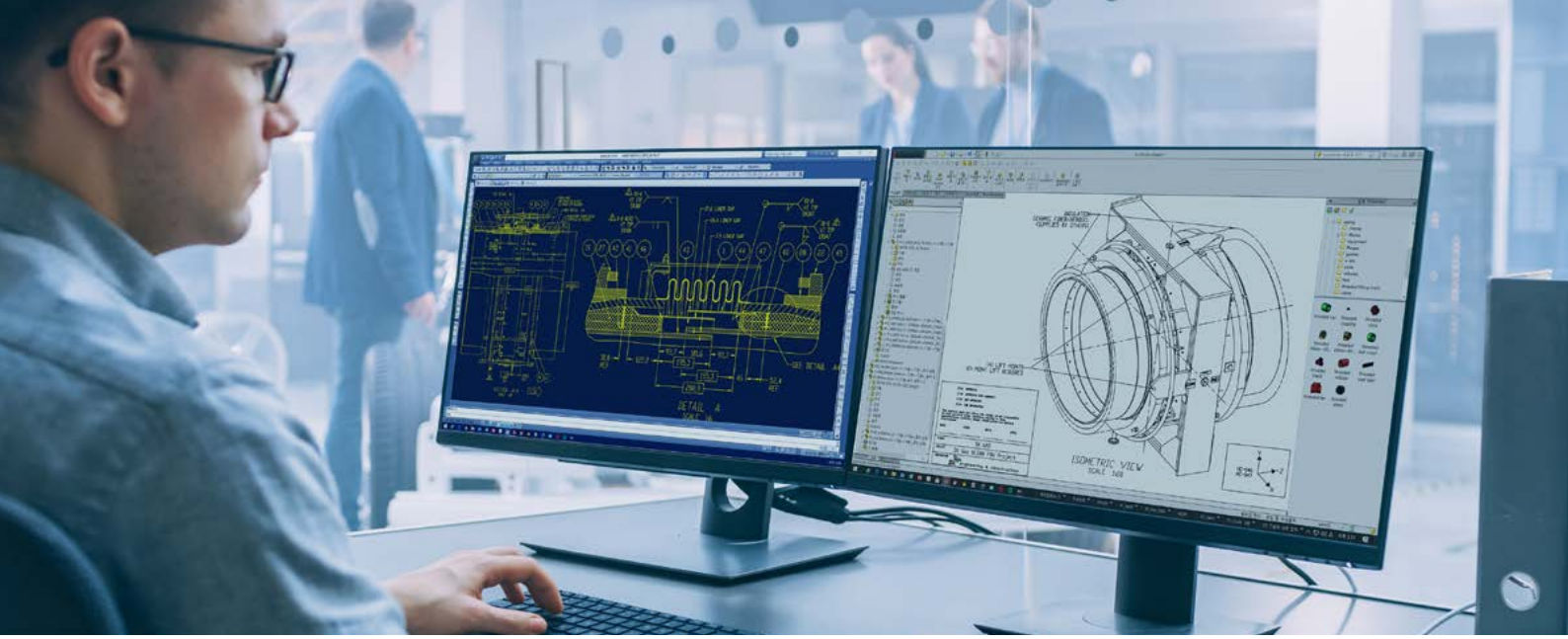
Megaflexon

has specially engaged in expansion joint industry since 1986.

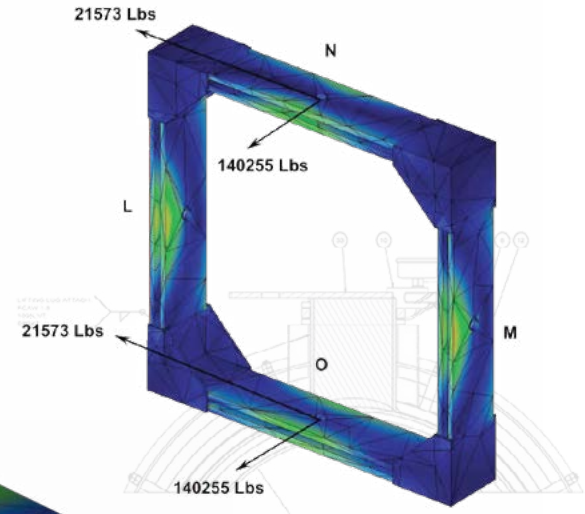
Since its founding in 1986 we have devoted ourselves to research, development and manufacture of high level of expansion joints in quality and reliability.
Based on our accumulated experience and know-how, all of our staff has an in-depth understanding of each industrial application and has done our best to meet customers' specialized needs.
As an expert in expansion joint industry, we will never stop exploring new solutions for expansion joint applications and will continuously provide high quality products and on-site service to our customers.

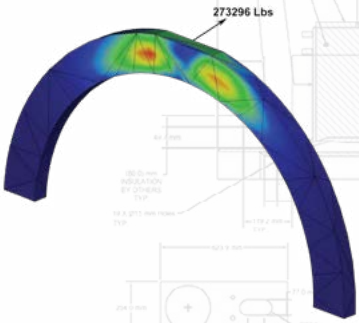


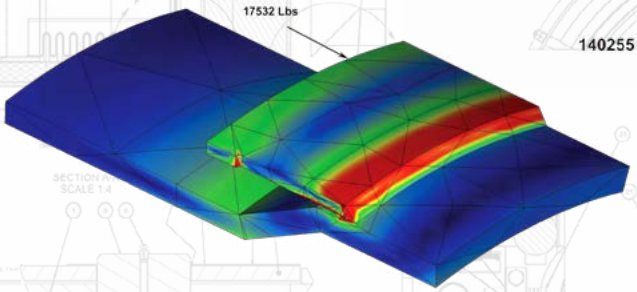
Engineering Approach

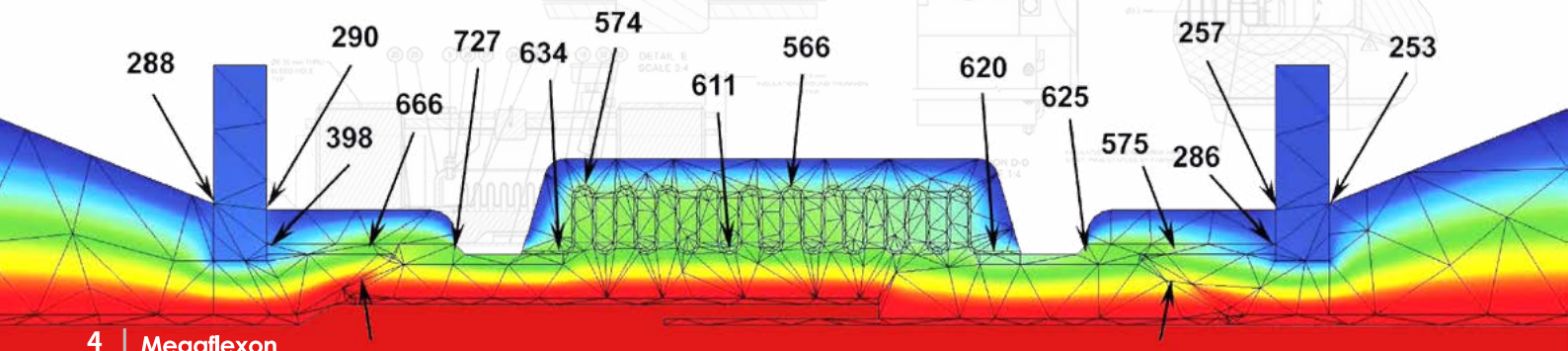
The designs of metallic expansion joint, rubber expansion joint and non-metallic expansion joint are based on and complies with the following:

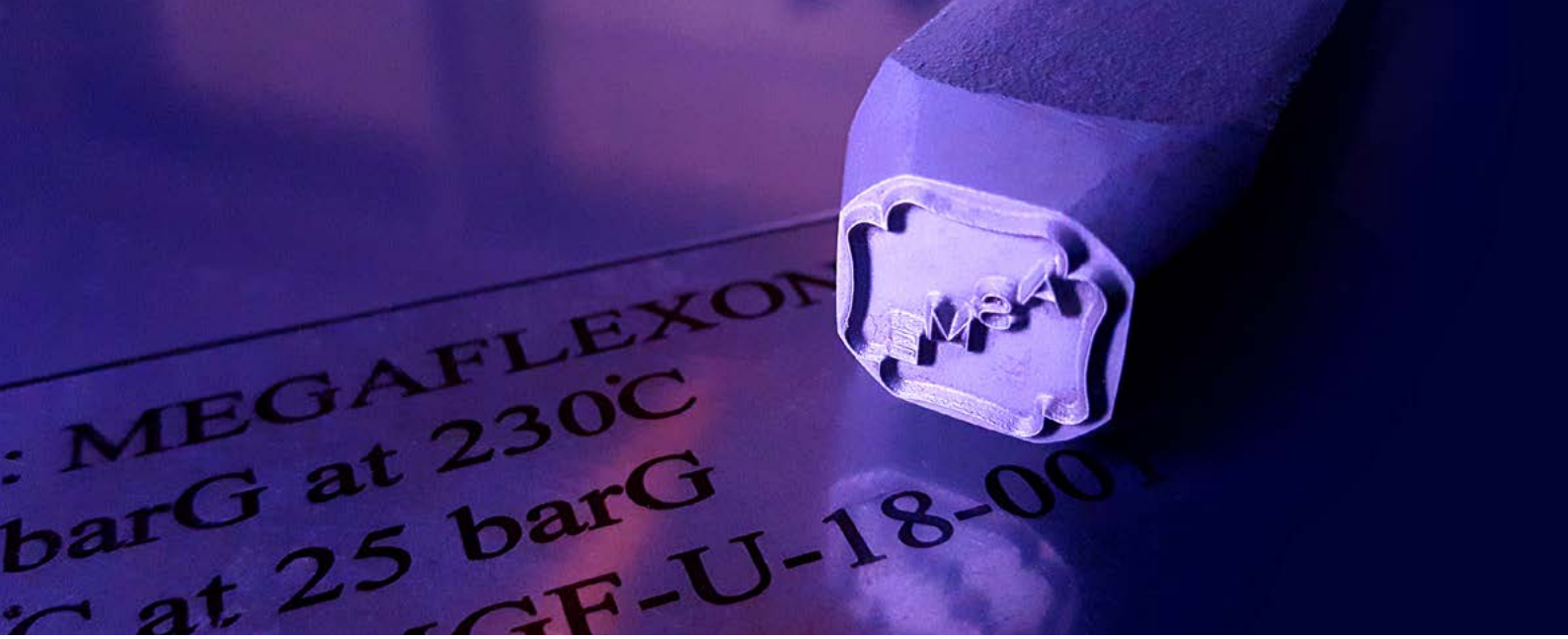
- **EJMA latest edition**
- **ASME Section VIII**
- **ASME Section IX**
- **ASME B31.1 (Power Piping)**
- **ASME B31.3 (Process Piping)**
- **TEMA latest edition**
- **FEA Finite Element Analysis**











Certifications

Megaflexon declares that Quality and Service are our most TOP priority. We always put quality and service on our most top priority and will make sure to deliver zero-defect products and service on time to our customers.
In order to ensure our quality commitment, our degreed quality specialists do strictly carry out all required activities for quality assurance.

- The National Board
- ASME "U" Stamp
- ASME "S" Stamp
- ASME "PP" Stamp
- CE PED
- ISO 9001
- ISO 14001
- ISO 45001

Introduction of Expansion Joints for FCCU

Critical Application

In Oil Refinery industry, the FCCU is the most important and critical unit for its main function is to convert heavy distillates into lighter ones (gasoline and diesel), improving the yield and efficiency of the refining processes.

DESIGN

In general FCCU expansion joints are divided into 3 types: HOT wall, COLD wall and UNLINED.

CAPABILITY

Megaflexon designs and manufactures FCCU expansion joints up to DN 4000 And up to 30 meters in length.

- Dimension: Up to DN 4000
- Bellows: Punch formed or Hydraulic formed bellows
- Design pressure: Up to 150 bar, depending on the required diameter and design conditions

COLD WALL

Cold Wall expansion joints are refractory lined to ensure the outside wall temperature does not exceed the maximum.
The wall is made from stainless steels and the lining is designed inside of the expansion joint.

HOT WALL

Hot Wall expansion joints are designed with the refractory lining on the inside as a thermal barrier.
The purpose of the lining is to withstand abrasion from the catalyst flow medium.

UNLINED

Unlined expansion joints are designed in the same format as the hot wall expansion joints but without the hex mesh.
Unlined expansion joints normally do not carry catalyst in the media and used for inlet air, outlet air and transferring gases from the reactor.

▲ *Cold Wal Expansion Joint*

▲ *HotWal Expansion Joint*

▲ *Unlined Expansion Joint*

The Bellows Membrane

THE BELLOWS MEMBRANE

For many FCCU applications Inconel 625LCF (low cycle fatigue) is typically the material of choice. Almost identical to the original Inconel 625, this special bellows grade of Inconel 625 is used for its high strength, excellent fabricability (including joining), and outstanding corrosion resistance. Service temperatures range from cryogenic to (982°C) and this material provides tighter controls over the carbon, silicon and nitrogen contents. This produces a microstructure that enhances low-cycle fatigue.

Bellows are subject to high bending stress well into the plastic range to achieve the movements required by the thermal expansion of the system. The finished bellows should be uniform in shape and pitch with no forming scratches or heavy tooling marks.

The bellows forming process introduces work hardening into the bellows that for the majority of applications is acceptable. This work hardening increases the bellow's ability to withstand pressure however; it reduces the cycle life of the bellows.

(EJMA cycle life formula is based on as formed bellows). If the bellows is annealed after forming, the reduced pressure capability needs to be taken into account. FCCU bellows are often designed to work at elevated temperatures well into the creep fatigue range of the material. To reduce the creep fatigue effect, some specifications call for the bel-lows to be annealed, or solution annealed, after forming. As most FCCU bellows are designed to absorb large movements, beginning with a completely annealed bellows is usually advantageous.

▲ *Hydraulic Mandrel Punch Forming Machine (Max. : 4,500mm)*

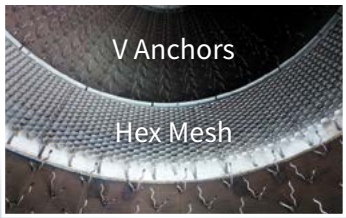
Cold Wall Design Expasnion Joint

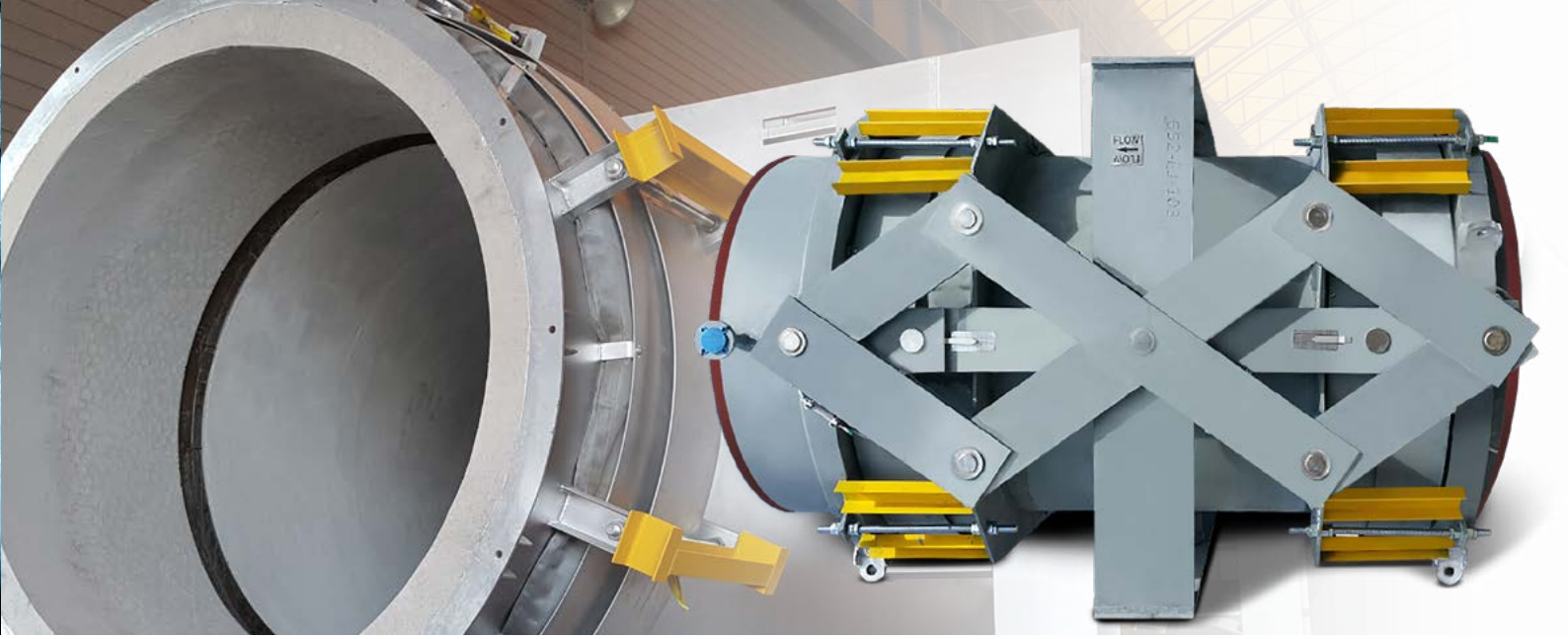
FEATURES

- Heavy duty expansion joints for high temperature, high pressure and high movement applications
- Withstand abrasive media like powder catalyst entrained in hydrocarbon flow
- Used in fluidized catalytic cracker units(FCCU's)
- Shell wall temperatures do not exceed 340 °C (650 °F)

ADVANTAGES

- Reliable expansion joints in critical applications
- Extensive experience in FCCU business





▲ *Refractory Lining of Cold Wall Design Expansion Joint*

OPERATING RANGE

Diameter: Up to 4,250 mm (170”)
Process temperature: Up to 900° C (1,650 °F)
Pressure: Up to 8 bar (120 PSI)
Typical axial movement: ±175 mm (±7”)
Typical lateral movement: 125 mm (5”)
Typical angular movement: 1°
Movements are concurrent.

INSTALLATION, DETAILS, OPTIONS

Depending on the application:

- 2-ply testable design (Optional) Each ply capable of performing the application requirement; either inner ply failure testing with zero maintenance pop-up gauge; or inner/outer ply failure testing with inter-ply pressure/vacuum and manometer.
- Reinforced ply (root rings) available
- Annealing depending on the specification
- Packed or purged bellows annulus
- Covers
- Liners
- Sampling pipes
- Control rods / limit rods / tie rods
- Pantographic linkage
- Hinge
- Slotted hinges
- Gimbal
- Sealable covers
- Thermocouples
- Clamshell-ready rings

QUALITY CONTROL AND TESTING

Standard quality control and testing:

- Full x-ray of bellows longitudinal seam weld before formation of convolutions.
- Full dye penetrant test of bellows longi tudinal seam weld inside and outside before and after forming of convolutions.
- 100 % dye penetrant test of bellows attachment welds.
- Pneumatic test
- Third-party inspection

Additional quality control and testing options:

- Ultrasound weld tests
- Helium leak check
- Impact testing of weld ends
- Hardness test
- Magnetic particle examination
- Positive material identification

Service(Optional)

- Skilled field service
- Expert clamshell (split bellows, for in situ repair) bellows welding service
- Experienced supervision service

STANDARDS

- B31.3 process piping
- European Pressure Equipment Directive (PED) 97/23/CE
- Expansion Joint Manufacturers Association(EJMA)
- ISO 9001:2008

FUNCTIONAL DESCRIPTION

Metal expansion joints are used in pipelines to compensate for thermal growth, typically in applications with high internal temperatures; or to prevent vibrations from being transmitted beyond the expansion joint.

APPLICATIONS

- Petrochemical industry
- Refining technology
- Chemical industry
- Process industry
- Hydrocarbon gases
- FCCU applications with carbon steel (lower temperature) piping
- Petrochemical applications with large movements, high process temperatures and carbon steel (lower temperature) piping
- Applications with large movements, high internal temperatures and carbon steel piping

MATERIALS

- Bellows material: Inconel© 625 LCF (low cycle fatigue) nickel alloy is a typical bellows material. Other materials on request.
- Bellows basics: formed by punch mandrel, thin-wall ply thickness≤1.6 mm (0.060”)
- Duct: A516 GR.70, 12 ... 16 mm (0.5 ... 0.625”) High-density vibrocast refractory material, 100 ⋯ 200mm (4⋯ 8”) thick with ANSI 304 anchors.

▲ *Hot Wall Design Expansion Joints for PDH Installation View / SK GAS ULSAN PDH PLANT, KOREA*

Hot Wall Design Expasnion Joint

FEATURES

- Heavy duty expansion joints for high temperature, high pressure and high movement applications.
- Withstand abrasive media like powder catalyst entrained in hydrocarbon flow.
- Used in fluidized catalytic cracker units(FCCU's).
- Shell wall temperatures do not exceed 600 °C (1,100 °F)

ADVANTAGES

- Reliable expansion joints in critical applications.
- Extensive experience in FCCU business.

▲ *Hot Wall Type Hinged Expansion Joints*

▲ *Hot Wall Type Gimbal Expansion Joints*

▲ *Propane De-Hydrogenation(PDH) Plant View*

OPERATING RANGE

Diameter: Up to 3,750 mm (150”)
Process temperature: Up to 800°C (1,475 °F)
Pressure: Up to 7 bar (105 PSI)
Typical axial movement: ±175 mm (±7”)
Typical lateral movement: 125 mm (5”)
Typical angular movement: 1°
Movements are concurrent.

INSTALLATION, DETAILS, OPTIONS

Depending on the application:
• 2-ply testable design (Optional) Each ply capable of performing the application requirement; either inner ply failure testing with zero maintenance pop-up gauge; or inner/outer ply failure testing with inter-ply pressure/vacuum and manometer.
• Reinforced ply (root rings) available
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• FCCU applications with carbon steel (lower temperature) piping
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• Applications with large movements, high internal temperatures and carbon steel piping

MATERIALS

• Bellows material: Inconel© 625 LCF (low cycle fatigue) nickel alloy is a typ ical bellows material.
Other materials on request.
• Bellows basics: formed by punch mandrel, thin-wall ply thickness≤1.5 mm (0.060”)
• Duct: Chrome-Moly
Post weld heat treatment of ducting required. Inco 8L weld inlay for bellows attachment required. Abrasion resist ant lining, 19 .. 25 mm 0.75 .. 1”) thick.

Design Considerations

Packed and Purged Bellows

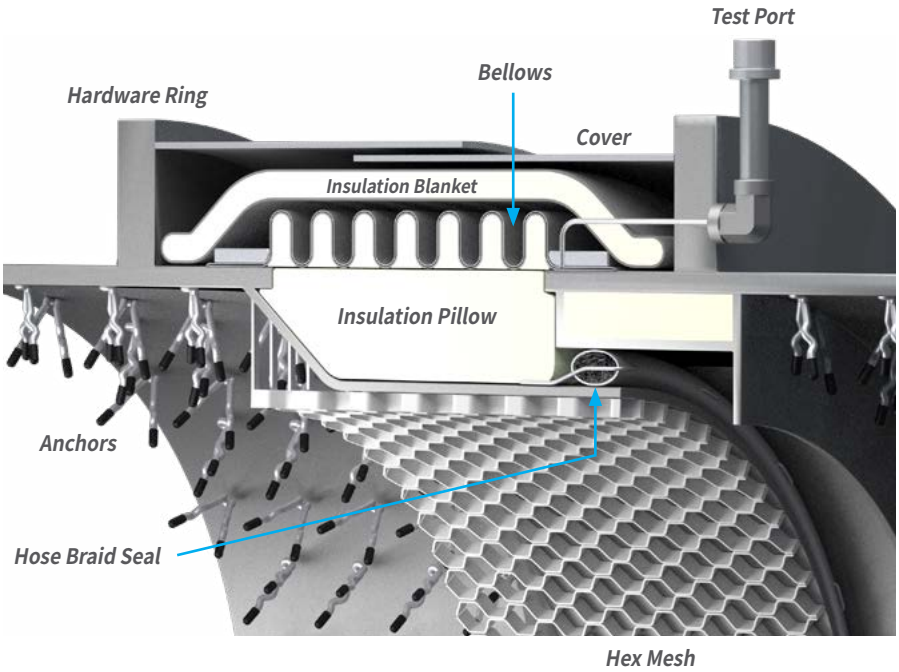
When the expansion joint is carrying catalyst, the fines and dust can collect under the bellows. The catalyst can solidify and destroy the bellows mem-brane or inhibit the joint movement capability. The problem exists irrespective of installation position, however the more the joint moves towards a vertical flow up position, the easier it is for the catalyst to fill the void between the bellows and liner (bellows annulus). There have been various methods used to stop catalyst ingress into the annulus. The two pre-dominant methods used today are:

- Packed bellows
- Purged bellows

By far the most common is the packed bellows. A packed design incorporates a ceramic insulation pillow filling the annulus and a catalyst seal between the liner faces.

Packing the annulus of the bellows creates various design considerations to be examined carefully. This cross section shows that the liner is connected to the shell wall by a conical section. The thermal gradient between the hot liner and cooler shell would cause severe thermal stress if the liner were attached with a simple ring. For this same reason, the downstream liner is not welded directly to the shell.

The joint is internally packed with ceramic insulation to protect the shell from becoming hot where refrac-tory cannot be installed due to the liner arrangement.



▲ *This is a typical liner seal arrangement. Usually the type and placement of the seal is indicated on the individual specification for the expansion joint.*

The surface of the liner has an abrasion resistant lining. The hexmesh is transformed into full refractory by suspending the hexmesh from bars that are attached to the shell wall. The seal itself is usually made in two parts, both stainless steel.

The outer cover is braided hose that is filled with wire mesh rope. The seal is attached to the liner with stainless clips that are secured into the seal itself. Because the liner gap changes during lateral and angular movement, the diameter of the seal has to be calculated in order to maintain a seal when the liner gap opens and closes in service.

When a packed design is used, the inner insulation pillow can reduce the bellows temperature below the media's dew point. If the media contains chlorides, acids or other elements that will attack the bellows membrane as they condense, it is important to maintain a minimum bellows temperature during operation. The outer pillow is used to ensure a minimum bellows temperature above the media's dew point. It is also important to maintain the gap between the shell and liner end ring allows the end ring to grow thermally. The growth is absorbed along the liner seal tube. The opposite end of the liner seal tube is connected to the shell with a smaller ring that is protect-ed from the full media temperature.

▲ *Gimbal Expansion Joints with Purged Bellows*

Purged Bellows

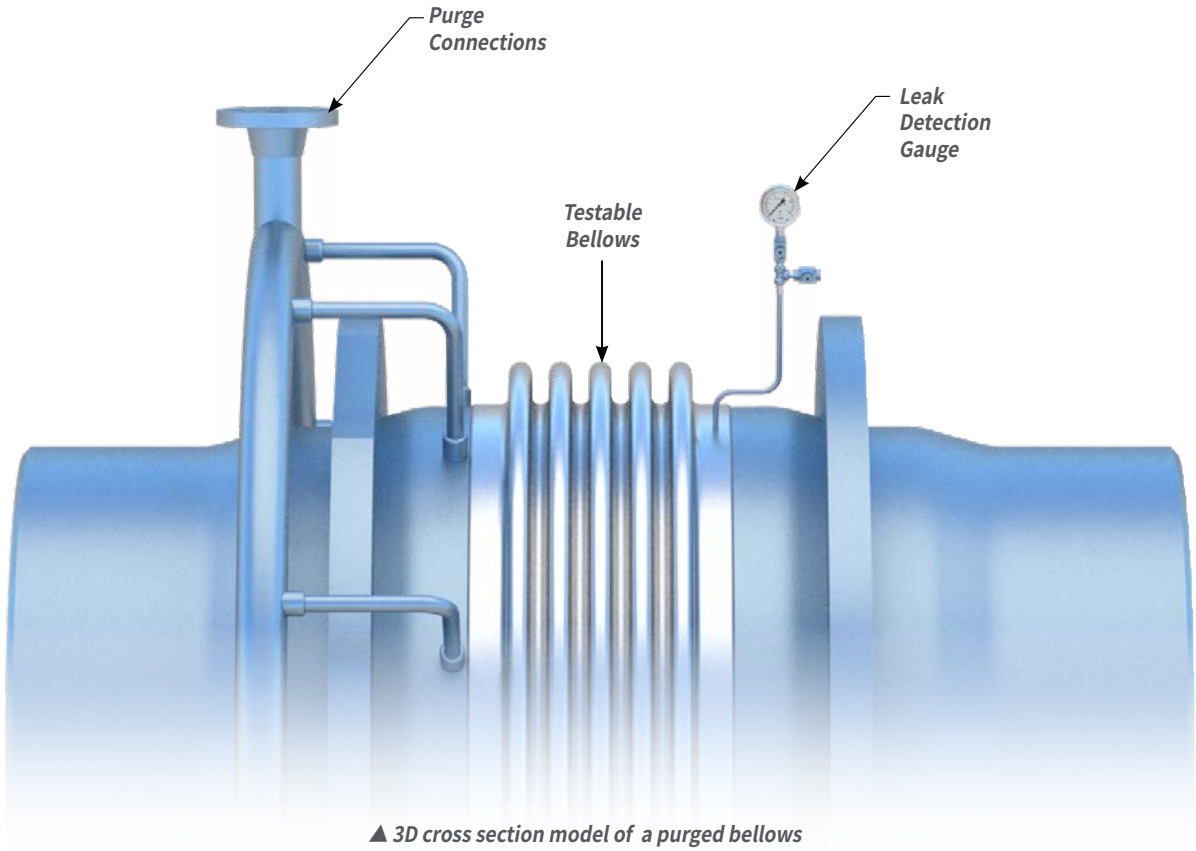
Purged bellows are not as commonly used today, but they are still installed successfully on some FCCU units when required.

The purge is applied to the bellows annulus in the form of air or steam. The continuous flow under the bellows introduces a high-pressure area and a flow going back into the gas stream. The purges stop the catalyst from entering the bellows annulus.

Caution should be taken so that the media used to purge the bellows is compatible with the process conditions and does not cause corrosion problems within the bellows element.

Typically numerous nozzles are used to introduce the purge equally around the annulus. The noz-zles are connected to a circular pipe manifold that surrounds the bellows on the outside of the joint.

▲ *Installation View*



▲ *3D cross section model of a purged bellows*

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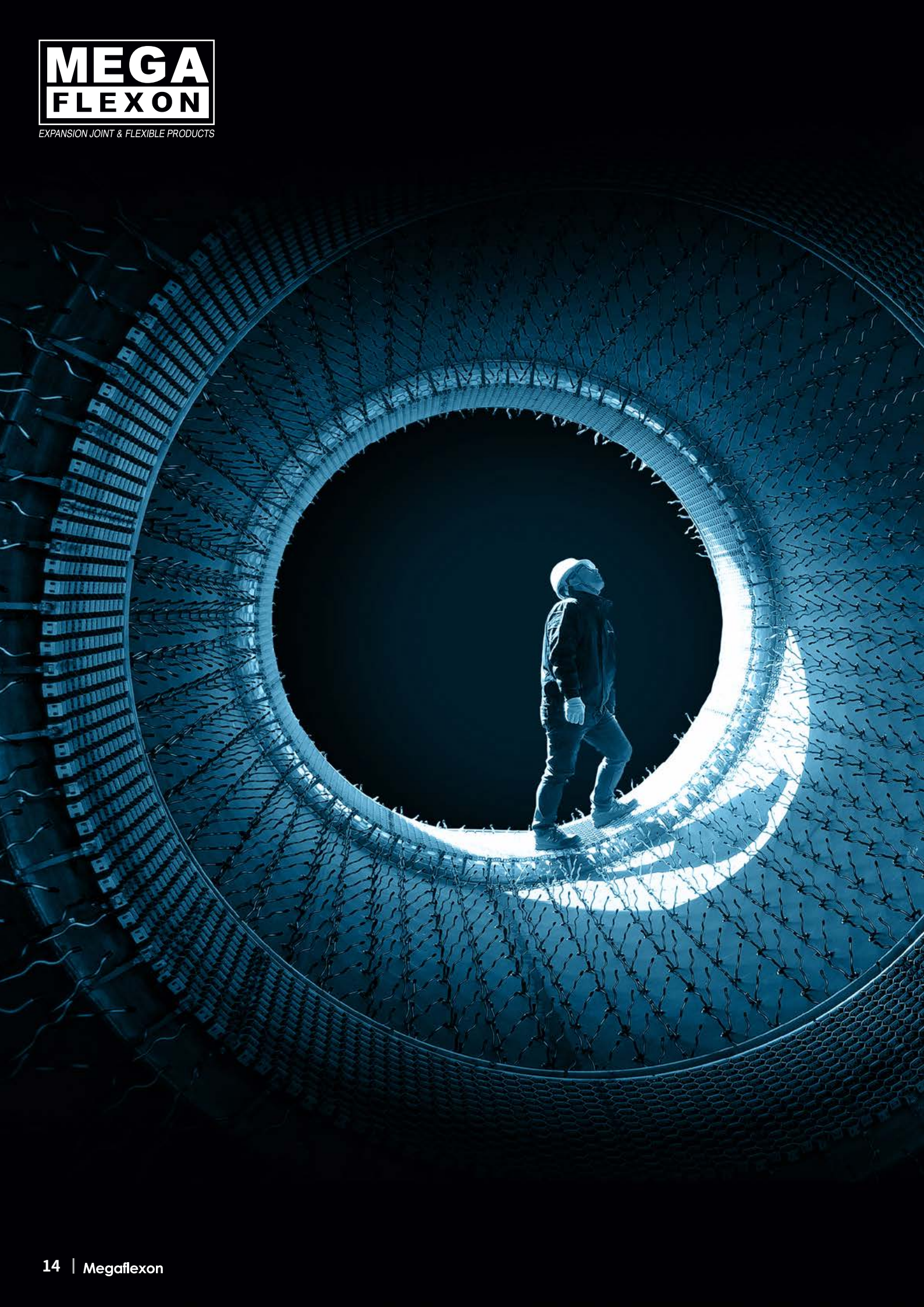

Our stage is All of the World

Megaflexon has supplied our quality products to worldwide leading partners located in America, Europe, Middle East, Japan and Asia. As an expansion joint specialist, we do every possible effort to produce the very best products which meet customers' demands and requirements. As usual, we will do our best to be the benchmark of this industry.

OVERSEAS

UOP A Honeywell Company
CB&I
CTCI Discover Reliable
DOLPHIN ENERGY
FLUOR
ADNOC
GE Power
HITACHI Inspire the Next
IHI
JGC
Kawasaki
KIPIC
Maire Tecnimont
MCDERMOTT
PETRONAS
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SAIPEM
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Sinopec
Taiwan Power Company
Technip
TECNICAS REUNIDAS
TOYO ENGINEERING

DOMESTIC

SK E&C
SK innovation
DAEWOO E&C
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DOOSAN Heavy Industries & Construction
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GS E&C
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HYUNDAI HEAVY INDUSTRIES
HYUNDAI ELECTRIC
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ICEPCO
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posco
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KOREA DISTRICT HEATING CORP.
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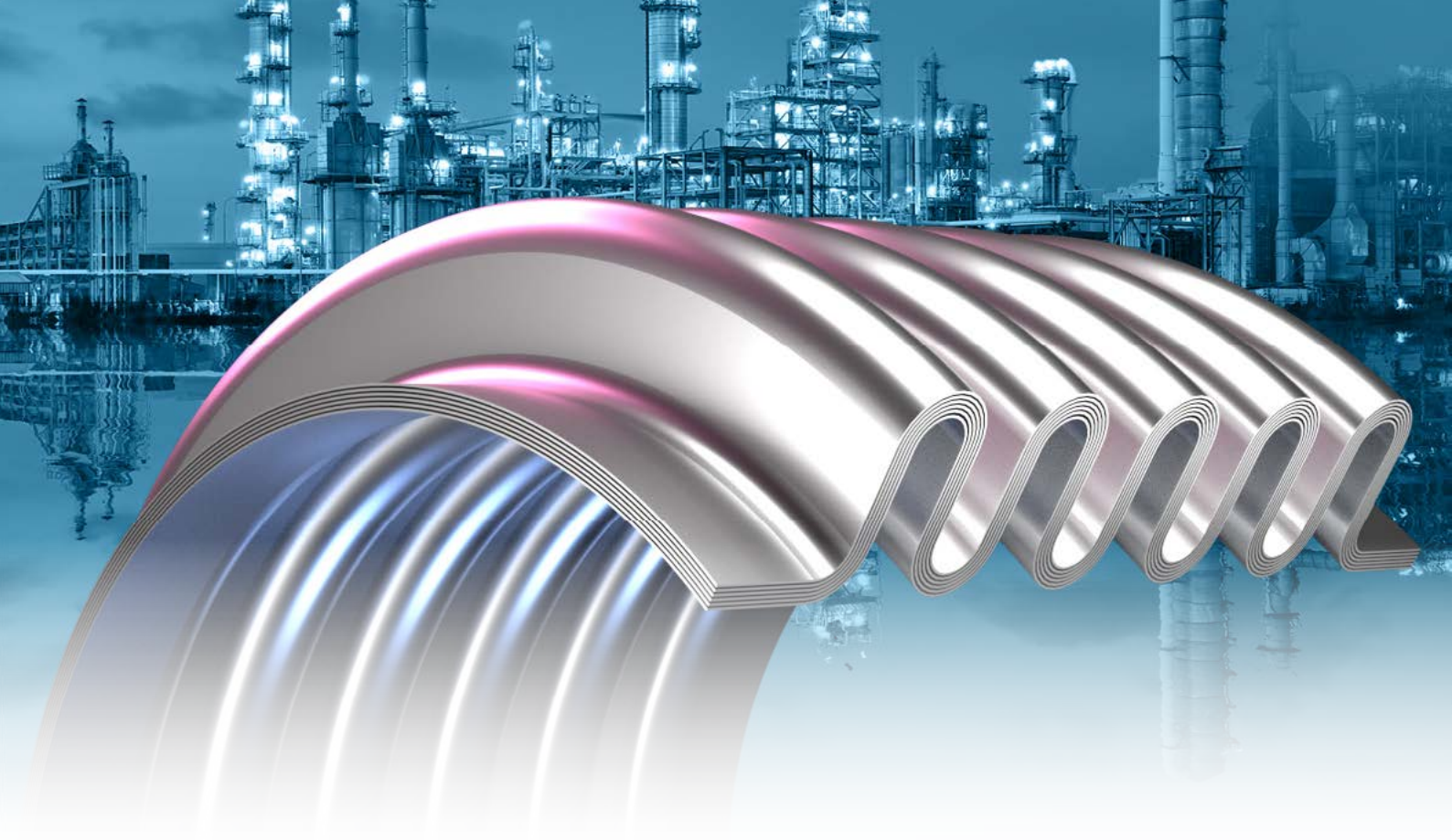


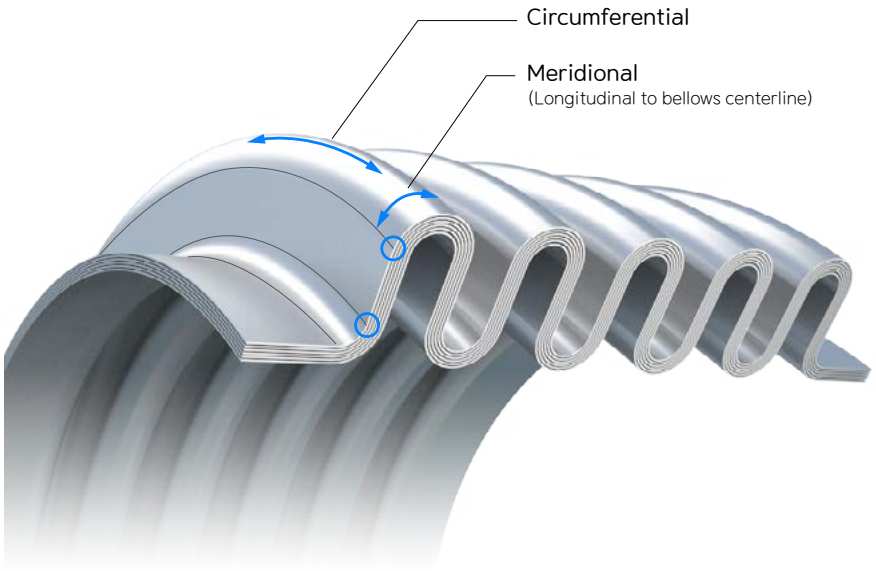
Bellows Monitoring

Bellows Monitoring

The use of multi-ply bellows on FCCU expansion joints is widespread today. Various reasons exist for the use of multi-ply bellows, ranging from redundant ply design to simple monitoring for early warning of failure.

Multi-ply Bellows

Multi-ply bellows in themselves allow the bellows designer to design for higher movements combined with high pressure and still achieve good cycle life. In laymen's terms the thicker the bellows wall thickness the lower the cycle life for a given movement. By using two plies of a thinner material the cycle life will increase for the same movement without a dramatic drop in pressure capability. A simple two ply bellows is designed to use the strength of both plies to ensure pressure capability. Redundant ply bellows are designed so that each ply is strong enough to withstand the operating conditions even after one ply fails. These types of multi-ply designs are usually monitored to alert the user when one ply fails.



▲ *Multi-Ply Bellows*

Normal Two-Ply Monitoring

Monitoring a normal two-ply design still offers great advantages for the operator. A very small leak through the inner ply will normally not cause a catastrophic failure. The indicator will show the leak and the unit can be shut down for repairs without a total failure of the unit.

Redundant Ply

Redundant ply designs offer safety and outage scheduling benefits. The intent is to enable the unit to continue to operate until the next scheduled outage even after one ply has failed. The inner ply typically fails before the outer ply. The operators can see the failure and plan for changing the unit at the next scheduled outage.

Two-ply Testable Bellows Monitoring Solution

The two-ply testable bellows (also referred to as a redundant ply design) can, in the majority of cases, provide early warning about bellows failure. Alt-hough a representative sample performs in a statistically predictable way, any single expansion joint's exact fatigue life is unpredictable. Installation of two-ply testable bellows can, in a majority of cases, provide early warning about bellows failure.

Many refineries use two-ply testable bellows especially in critical process equipment such as the FCC unit, but they are also used in the spent catalyst standpipe, regenerated catalyst stand-pipe, recirculation cooled catalyst flue gas piping and the turbo expander. Gas and steam turbine applications also find these bellows ideal in the exhaust, crossover and flue gas piping.

What is a two-ply testable bellows? A two-ply testable bellows consists of two plies of identical thickness, with a small cavity between the plies.

The two-ply design is used when it is necessary to monitor the integrity of the bellows inner or outer ply. Both plies are designed for the full pressure and temperature cycles required. If one ply fails, the second will ensure pressure integrity and take over until a scheduled repair or replacement can be facilitated. This allows maintenance personnel to take action and plan solutions accordingly to minimize downtime.

Active and passive monitors

There are various methods to monitor a two-ply testable bellows, from simple pressure gauges to electronic sensing devices. Overall they are cat-egorized as active and passive monitors. Passive monitors utilize the line pressure to indicate an inner ply failure. When the inner ply fails, the inter-nal pressure between the plies activate the moni-toring device. Passive monitors will only sense an inner ply failure. Active monitors will detect both inner and outer ply failures. A vacuum is created between the plies before the monitoring device is installed. In case the inner ply fails, the pres-sure between the plies will increase to the line pressure. If the outer ply fails, the vacuum will be lost. In both cases the monitoring device will be activated.

Monitoring devices used are most commonly pres-sure gauges, pressure transducers and pop up detectors. Direct monitoring to the control room is also an option and can be attached directly to the test ports.

In case the monitoring device indicates pressure between the plies, our recommendation is (1) dur-ing operation, use the bleeder valve to evacuate the pressure and close valve immediately. Then check for pressure build up. (2) If pressure builds up again, the inner ply may have cracks that allow the system pressure to fill the space between the two plies. A replacement bellows should then be considered.

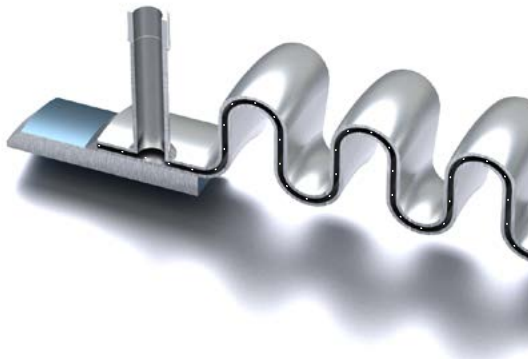
Technical characteristics

Two cylindrical tubes are formed with thin wire mesh between, to generate a cavity between the plies in the two-ply testable bellows. The purpose of the mesh is to ensure that there is a flow path between the plies. The test ports are placed at each end of the bel-lows, 180° apart; a test port tube is welded to the outer bellows ply. Typically, one test port will be blinded off with a pipe cap and the other con-nected to the desired monitoring device.

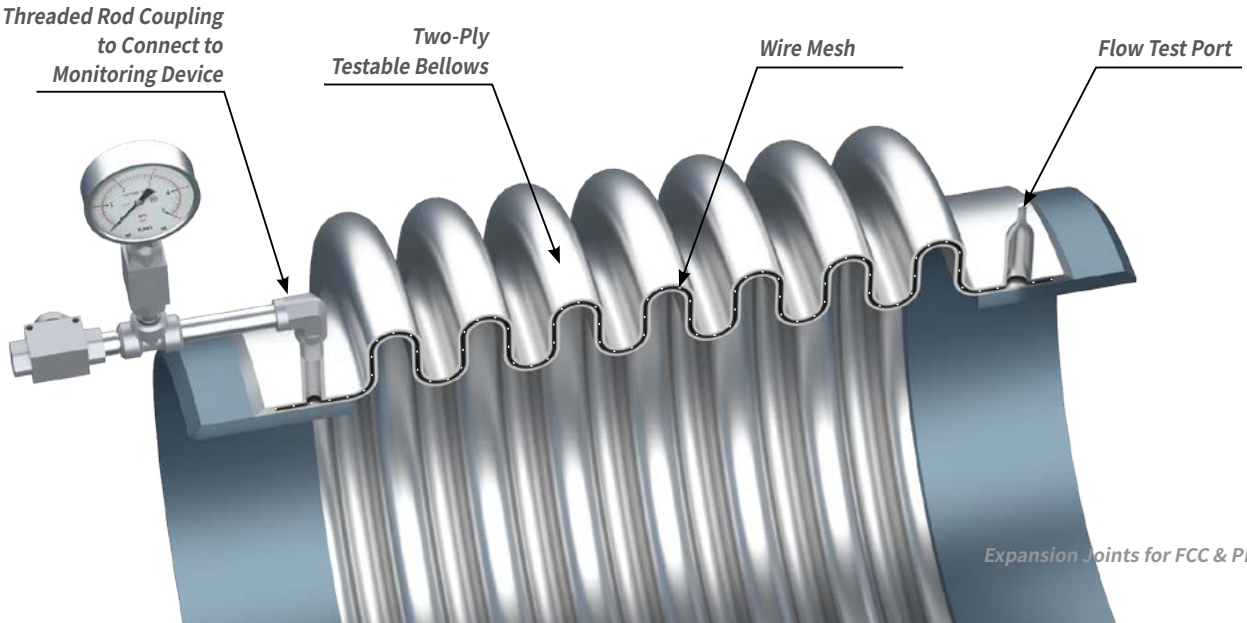
Note: When installing an expansion joint with two-ply testable bellows, test ports/ valves must be kept open the first 24 hours to release any moisture or condensate that may have collected between the plies during storage or manufacturing.

Benefits of Two-Ply Testable Bellows

- Bellows monitoring (deterioration & leakage)
- Early warning of leak detection
- Two (2) plies designed for the full system design conditions
- Minimizing the risk of unplanned shutdowns
- The system can maintain operation while a suitable repair or replacement can be arranged
- Reduced downtime in services where the bellows failure could cause a forced outage



To monitor the integrity of the bellows, pressure gauges and pressure transducers are most commonly used for measuring the pressure between the plies. A test tube connects the pressure gauge, valve and pipe cap as illustrated above.



Exterior Hardware

Exterior Hardware

Many different types of hardware are used to perform various functions on FCCU joints. This brochure covers the most widely used hardware.

Control Rods

Control rods, as their name suggests, are used to control and limit the movement of the bellows. By definition, control rods are not designed to withstand pressure thrust.

Pressure retaining covers

Pressure retaining covers are typically telescopic and have rings at each end. The covers are designed to retain the pressure in case of bellows failure. The cover can be welded at the end rings and in the middle to seal the bellows. Since the bellows will no longer absorb any thermal movement, care should to be taken if this is performed.

Sampling pipes

Pipes which penetrate the shell wall are used for various reasons and are specified by the end user. The pipes can often interfere with other hardware on the joint. When specifying these pipes, it is important to be flexible with their position if possible.

Yellow shipping bars and setting bars After installation these bars must be removed.

Pantographic linkages

Pantographic linkages are devices that equalize the amount of axial compression each bellows absorbs. They ensure that each bellows takes exactly half of the axial movement imposed on the unit.

Single plane pantographs

Joints that absorb lateral deflection in only one plane can utilize simple pantographic linkages.

Gimbal Pantographs

Joints that need to absorb lateral deflection in two planes should be fitted with a gimbal type pantograph. The center gimbal ring allows the joint to offset in the opposite plane to the pantograph without the linkage binding.

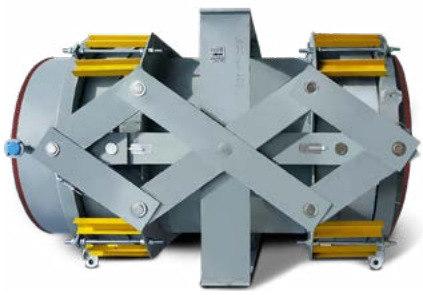
This picture shows the pantograph center pins connected through the gimbal. The end pins on the gimbal are hinged to allow lateral movement in the opposite plane.

Slotted Hinges

The slotted hinges can also be seen in the photograph above. The main purpose of the hinges is to fix the center of rotation for the bellows while at the same time ensuring each bellows shares the angulation caused by lateral deflection equally.

Slotted hinges are also used to take the dead load of the center spool off the bellows. This is only effective when an expansion joint is close to a horizontal position.

▲ *Pantograph Type*



▲ *Center Gimbal with Pantograph Type*

▲ *Slotted Hinge Type*

▲ *Expansion Joint with Self-Equalizing Rings*

Self Equalized and Non-Equalized Bellows

Self Equalized and Non-Equalized bellows

As previously mentioned, bellows for FCC units are subject to large movement deflections in the axial and lateral planes. Due to these large movements, the individual convolutions absorb high deflections. To prevent the convolutions from contacting each other, self-equalizing rings are commonly used. The individual convolution deflection is determined by the resultant total deflection for the sum of the movements divided by the number of convolutions in the bellows. If a 10 convolution bellows is compressed 2”/5 cm the individual convolution movement is 0.2”/.51 cm. Theoretically each convolution will share equally in the total movement.

This is true in reality if several important conditions are achieved:

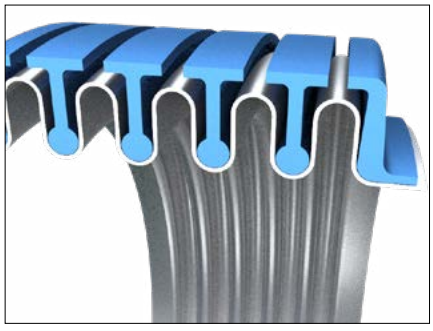
- The convolutions are uniform
- The induced work hardening is uniform
- The material grain structure is uniform

When one of the above is not achieved the result is non-uniform movement in the individual convolutions. If one or two of the convolutions in the bellows are geometrically different to the rest of the convolutions, this will result in a non-uniform movement distribution over the convolutions making up the bellows. The non-uniform convolutions will absorb more movement than others. This may result in the convolutions touching (bottoming out) and rubbing in service consequently leading to premature failure. Increasing the movement for this bellows to 4”/10 cm will distribute 0.4”/1 cm of movement to each individual convolution.

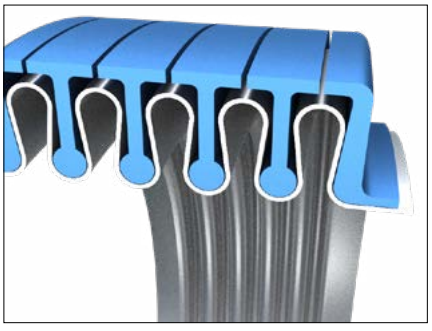
This allows for a much smaller error.

Utilizing self-equalizing rings ensures that non-uniformity does occur even if the convolutions move slightly differently. Self-equalizing rings have no effect on extension movements. The drawback of using self-equalizing rings is that the root ring in each convolution that supports the equalizing ring reduces the amount of movement each convolution can absorb as the bending stress caused by the deflection is increased.

Equalizing rings will also increase the cost of the bellows portion of the expansion joint. Most FCCU applications do not need self-equalizing rings should be used only in cases when the movement conditions cause severe compression should they be considered. (Seek the advice of a professional before specifying equalizing rings.)



▲ *Simple equalizing (root) rings*



▲ *Ring gap closes before convolutions touch*

▲ *RAPID Package 1 Project Expansion Joints Supply View*

Installation, Service and Preventive Maintenance

Servicing our customers is vital

Operational reliability and long service life of expansion joints is crucial. Unplanned shut downs are not only troublesome, but expensive. The right installation can save hundreds of manhours with a proper and safe installation.

Megaflexon Expansion Joint Solutions offers field service 7 days a week, within 24 to 48 hours.

The key to long-term and reliable expansion joints is dependent on a professional installation team. Megaflexon Expansion Joint Solutions' service team has extensive installation experience and supervision on projects worldwide.

Our field service team is dedicated to provide customer satisfaction by reducing cost, decreasing downtime and eliminating installation problems, quickly and safely.

Safety is the highest priority

Not only for our production and field service personnel but for our customers and users of our products. The safety of all employees and personnel working on your plant or refinery is our greatest concern.

Our service teams complete routine safety training and certification to ensure each member observes current industry safety practices as well as site specific policies and procedures.

Our Comprehensive Service includes:

- Evaluations and troubleshooting
- Initial dimensional measurements
- Installation & refurbishment
- Supervision and training
- Plant surveys
- Emergency services
- Final inspection and experienced service engineers.

Hanwha Chemical Plant Installation View ▶ (Gimbal Type & Hinge Type Expansion Joint)

EXPERIENCES
OF FCC & PDH PROJECT

MEGAFLEXON EXPANSION JOINT SOLUTION

EXCELLENCE IN FCC & PDH
SELECTED REFERENCES

- **APPLICATION** : FCC UNIT SPENT CATALYST STAND PIPE EXPANSION JOINT
- **PROJECT** : GS CALTEX VGOFCC PROJECT
- **OWENER** : GS CALTEX
- **TYPE** : PANTOGRAPH TYPE
- **SIZE (ID x L mm)** : 54" (DN1350) x 3492mmL
- **DESIGN CONDITION** : 5.47 kg/cm^2, 538°C

EXCELLENCE IN FCC & PDH
SELECTED REFERENCES

- **PROJECT** : PETRONAS RAPID P1 RFCC PROJECT
- **OWENER** : PETRONAS
- **TYPE** : TIED UNIVERSAL TYPE
- **SIZE (ID x L mm)** : 2400mm x 19930mmL
- **DESIGN CONDITION** : 5.5 barG, 538℃

- **PROJECT** : PETRONAS RAPID P1 RFCC PROJECT
- **OWENER** : PETRONAS
- **TYPE** : DOUBLE GIMBAL TYPE
- **SIZE (ID x L mm)** : 1960mm X 6500mmL
- **DESIGN CONDITION** : 5.5 barG / 538℃

- **PROJECT** : PETRONAS RAPID P1 RFCC PROJECT
- **OWENER** : PETRONAS
- **TYPE** : TIED UNIVERSAL TYPE
- **SIZE (ID x L mm)** : 2400mm x 7340mmL
- **DESIGN CONDITION** : 3.5 barG, 538℃

- **PROJECT** : PETRONAS RAPID P1 RFCC PROJECT
- **OWENER** : PETRONAS
- **TYPE** : DOUBLE HINGE TYPE
- **SIZE (ID x L mm)** : 2900mm x 8000mmL
- **DESIGN CONDITION** : 3.5 bar / 538℃

EXCELLENCE IN FCC & PDH
SELECTED REFERENCES

▲ *Refractory Lining Works (DN 2900mm x 8000mmL)*

▲ *Universal Type Expansion Joint Pneumatic Testing View (DN 2900 x 18500mmL)*

▲ *Fabrication Inspection View (DN 2400 x 18500mmL)*

▲ *V-Anchor and Hex Mesh Welding Works Inspection View*

EXCELLENCE IN FCC & PDH
SELECTED REFERENCES

- **PROJECT** : CPC TAOYUAN RFCC PROJECT
- **OWENER** : CPC Corporation
- **TYPE** : DOUBLE GIMBAL FLOATING TYPE
- **SIZE (ID x L mm)** : 98”(DN2450) x 13800mmL
- **DESIGN CONDITION** : 0.4 kg/cm^2, 777℃

▲ *Single Expansion Joint Shipping Works*

▲ *Tied Universal Type Expansion Joint Shipping Works*

EXCELLENCE IN FCC & PDH
SELECTED REFERENCES

- **PROJECT** : SK GAS ULSAN PDH PROJECT
- **OWENER** : SK GAS
- **TYPE** : DUAL GIMBAL FLOATING TYPE
- **SIZE (ID x L mm)** : 96”(DN2400) x 6500mmL
- **DESIGN CONDITION** : 2.81 kg/cm^2, 649℃

- **PROJECT** : SK GAS ULSAN PDH PROJECT
- **OWENER** : SK GAS
- **TYPE** : UNIVERSAL PANTOGRAPH TYPE
- **SIZE (ID x L mm)** : 96”(DN2400) x 4400mmL
- **DESIGN CONDITION** : 2.81 kg/cm², 649℃

- **PROJECT** : SK GAS ULSAN PDH PROJECT
- **OWENER** : SK GAS
- **TYPE** : SINGLE GIMBAL TYPE
- **SIZE (ID x L mm)** : 96”(DN2400) x 1950mmL
- **DESIGN CONDITION** : 2.81 kg/cm², 649℃

EXCELLENCE IN FCC & PDH
SELECTED REFERENCES

- **PROJECT** : SK GAS ULSAN PDH PROJECT
- **OWENER** : SK GAS
- **TYPE** : SINGLE SLOTTED HINGE TYPE
- **SIZE (ID x L mm)** : 48”(DN1200) x 1700mmL
- **DESIGN CONDITION** : 649℃ / 2.81 kg / cm^2g

MEGAFLEXON has specially engaged in expansion joint industry since 1986

Since its founding in 1986 we have devoted ourselves to research, development and manufacture of high level of expansion joints in quality and reliability.
Based on our accumulated experience and know-how, all of our staff has an in-depth understanding of each industrial application and has done our best to meet customers' specialized needs.
As an expert in expansion joint industry, we will never stop exploring new solutions for expansion joint applications and will continuously provide high quality products and on-site service to our customers.

ISO 9001
ISO 14001
ISO 45001

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