

Product brochure

**EagleBurgmann®**  
expansion joint solutions

# Metal expansion joints



# EagleBurgmann®

## expansion joint solutions

### Value engineering raised on global experience

Over 50 years of challenges in the expansion joint industry proves that EagleBurgmann KE is one of the worlds most experienced and innovative expansion joint manufacturers.

Experience is sourced from all continents and various market sectors to provide our customers with the latest technologies and solutions.

Metal and fabric expansion joints are flexible connections, installed in piping and ducting systems to accommodate expansion and vibration caused by changes in temperature, pressure and media comprise.

### EagleBurgmann KE's major focuses:

- Value engineering to decrease operational downtime
- Lean manufacturing to reduce costs
- 3D smart design to maximize overall service life

### EagleBurgmann KE's comprehensive service:

- Evaluations and troubleshooting
- Initial dimensional measurements
- Installation and refurbishment
- Supervision and training
- Plant surveys
- Emergency services
- Final inspection by experienced Service Engineers

### EagleBurgmann KE is approved to:

- PED 97/23/EC
- ISO 3834-2
- ISO 9001
- ISO 14001
- OHSAS 18001
- ASME U Stamp
- ASME R Stamp
- Other approvals are available upon customer request

### EagleBurgmann KE is a respected member of:

- The European Sealing Association (ESA)
- Fluid Sealing Association (FSA)
- Expansion Joint Manufacturers Association (EJMA)
- Euro-Qualiflex

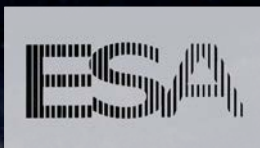
EagleBurgmann KE is proud of the appreciation given from hundreds of customers around the world.

### EagleBurgmann KE's global manufacturing footprint:

- Europe
- Americas
- South East Asia
- India

We have a worldwide sales network supported by EagleBurgmann and Freudenberg offices.

[www.eagleburgmann-ej.com](http://www.eagleburgmann-ej.com)







**P4.** Metal expansion joint introduction

**P5.** Certificates and tests

**P6.** Engines & flue gas systems

**P7.** Penetration seals & PS seals

**P8.** Pressurized metal expansion joints

**P10.** District heating

**P11.** Rectangular ducting

**P12.** Petrochemical & styrene processing

**P13.** FCCU, CCR & turbo expander units

**P14.** Installation, Service & Preventive Maintenance

**P15.** Expansion Joint Product Range

# Introduction

## Metal expansion joints

are flexible connections, installed in piping and ducting systems to accommodate expansion and vibration caused by changes in temperature, pressure and/or media.

Metal bellows are made of one or multiple plies of stainless steel in austenitic steel, Incolloys, Inconels or other formable materials.

Metal expansion joints can be designed with hardware, intended to retain system pressure thrust load, while allowing intended design movement.

EagleBurgmann KE offers reliable and innovative expansion joints solutions for many applications worldwide:

- Power Generation
- Ship power and ship building
- District Heating
- Steel Mills
- Water Treatment
- Wind Power
- Pulp and Paper Plants
- Desulphurization plants
- Off shore
- Refineries
- Chemical and Petrochemical Plants

## Our complete product range

of metal expansion joints ranges from low pressure exhaust bellows to sophisticated engineered solutions for fluid catalytic cracking units.

In any duct or piping system with a high temperature or a closed system with high pressure, where movements and pressure need to be accommodated, metal expansion joints are installed as flexible solutions.

EagleBurgmann KE offer innovative customized solutions developed in cooperation with Original Equipment Manufacturers and end user customers worldwide; optimal solutions for piping systems in engines, flues gas systems and any pipeline worldwide.

EagleBurgmann KE add Value Engineering to metal expansion joint solutions through experience and proven technology.

## In-house design and engineering

including FEA together with modern, automated production technology and welding equipment, gives us superior performance for optimal productivity and welding quality. On time delivery is a very important parameter in the successful installations of metal expansion joints worldwide.

EagleBurgmann KE is specialized in metal expansion joint design for a varied range of applications. Some of the special applications are:

- Engine exhaust systems
- Gas Turbines
- Steam turbines
- FCCU's
- HRSG's/WHRB's
- Flue gas duct systems
- Conventional boilers
- Fluidized Bed Boilers
- Filtration/ precipitators
- Scrubbers/ absorbers

EagleBurgmann KE offer a full range of metal expansion joints from round and rectangular ducting expansion joints to highly engineered and complex FCCU assemblies with a long history of welding and forming of special materials including a wide range of nickel alloys. Documentation is offered according to the latest industry standards.



*Metal expansion joints are installed in flue gas piping systems.*



*Metal expansion joints can be designed in many shapes and sizes.*



*Metal expansion joints are installed in engines and exhaust gas systems.*



# Certificates and Tests



## EagleBurgmann KE holds Type Approval Certificates from:

- Bureau Veritas
- Germanischer Lloyds
- American Bureau of Shipping
- Lloyds Register of Shipping
- Russian Maritime Register of Shipping

## EagleBurgmann KE is approved to:

- European Pressure Equipment Directive (PED) 97/23/EC
- ASME U Stamp
- ASME R Stamp
- ISO 9001
- ISO 14001
- OHSAS 18001
- Other approvals is available upon customer request

## EagleBurgmann KE is designing according to:

- EN 13445
- EN 13480
- EN 14917
- AD 2000-Merkblatt
- EJMA
- ASME VIII, Div. 1
- ASME B31.1
- ASME B31.3

## EagleBurgmann KE offers

non-destructive testing (NDT) to ensure welding integrity and product quality:

- Dye Penetrant test
- Magnetic Particle test
- Radiography
- Ultra sonic test
- Pressure test
- Helium leak test
- Complete documentation packages including certificates and NDT reports
- Other product testing is available upon customer request



Welding a pipe end to a metal bellows.



EagleBurgmann KE holds a varied range of approvals and certificates.



Testing a metal expansion joint with helium.

# Engines & Flue Gas Systems

## UM-type Expansion Joints

are designed for diesel and gas engines to accommodate thermal movements in a high temperature environment where vibration greatly influence the designing.

UM-types are placed between the engine and the turbocharger where high temperatures, vibrations and pressure fluctuations occur.

The bellows, the flexible part of the expansion joint, is a multi-layer construction with thin layers of heat resistant stainless steel or nickel alloys.

Typical bellows materials:

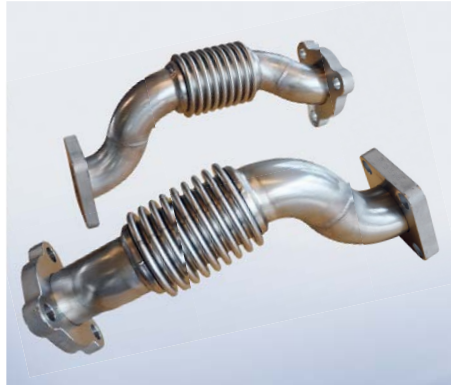
- EN 1.4541 – AISI 321
- EN 1.4828 – AISI 309
- EN 1.4835 – 253 MA
- EN 1.4571 – AISI 316Ti
- EN 2.4856 – Alloy 625

The expansion joint provides superior flexibility and is corrosion resistant in the aggressive exhaust gas applications. They are designed for the specific engine operating conditions, looking at e.g. pressure, temperature, flow velocities and location.

UM-types are usually fitted with fixed, swivel or V-clamp type flanges, but can instead be equipped with weld ends if desired.

Metal Expansion Joints for engines are installed in:

- Cylinder exhaust (1st position)
- Exhaust receiver/ manifold
- Turbocharger air outlet / exhaust inlet / by-pass



*UM-type metal expansion joints for engines are designed to be placed between the engine and the turbocharger.*



*UM-types are manufactured with semi or fully automated operations for large series production.*



*US-type flue gas metal expansion joints are designed for positioning in the flue exhaust gas system.*



*US-types installed in a flue gas system.*

## US-type Expansion Joints

are designed for high temperature and low pressure to accommodate large thermally derived movements, located in a high temperature environment. They provide the flexibility required in e.g. flue gas ducting, boilers, silencers and general exhaust gas piping.

US-types are installed in the flue gas/exhaust system, where the vibrations are small and where a compensation of large axial and/or lateral expansions is needed. This product type can be equipped with fixed or loose/ swivel type flanges or weld ends.

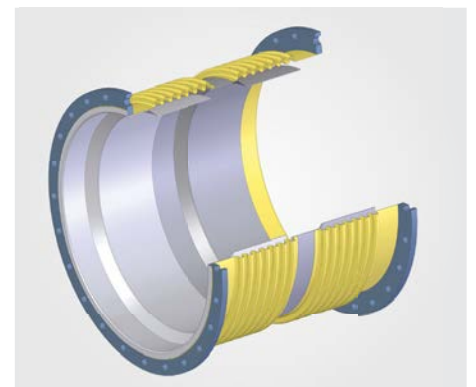
At high temperatures and flow velocities, internal sleeves are recommended. The sleeves protect the bellows from impact of particles, amongst others.

US-types are typically designed with AISI321 bellows and CS flanges. A range of other custom options and materials are available on request.

An external shroud can be added to protect the metal bellows against external mechanical damage during installation and permanently.

Exhaust Expansion Joints for flue gas systems are installed in:

- Diesel / Gas Engines Power Plant
- Marine Exhaust line
- District Heating Power Plant
- Coal / Gas / Biomass / Power Plant
- Gas Turbines
- Heat and Ventilation Systems
- Heat Recovery Boiler and Silencers



*3D model of a US-type flue gas metal expansion joint.*



# Pipe Penetration Seals & PS Seals



## Pipe penetration seals

are used to allow tubes or pipes to expand thermally by penetrating the shell or pressure casing typically at boilers. It eliminates the leakage of heat and other emissions, reduces noise and protects maintenance personnel.

These seals are designed to absorb axial, lateral and angular movements and lowering the stress on tubes and pipes to which they are connected.

Pipe penetration seals are 100% leak proof, improving operational efficiency, while designed for large movements generated from boiler tubes and pipes. They can be designed to accommodate most applications from original manufacturer to retrofits of existing installations.

Pipe penetration seal advantages:

- Reduces pipe stress
- Increased boiler efficiency
- Noise reduction
- No maintenance

If damaged, metal penetration seals can normally be replaced with a clamshell to avoid having to cut the steam piping.

## PS Seals

(our boiler penetration seals) are used in heat recovery steam generators (HRSG) for boilers and are an easy way to capture more value from the fuel budget. PS Seals can significantly lower energy loss while reducing the maintenance load and risk of unplanned outage.

The PS seal offers easy installation and disassembly and can be repaired without cutting the the pressure piping. No need for specially trained welders to install the replacements. The internal stainless steel wire mesh seal can be replaced easily during shutdowns, eliminating the need to replace the entire unit.

The PS Seal uses a floating ring design with patented stainless steel flow reducing seals in contact with the penetration pipe outside diameter and lateral movement plates. The seals are compressed on assembly to provide minimal gas leakage during operation.



Pipe penetration seals installed in a HRSG system.



Metal pipe penetration seals.



Penetration slider seal, installed on bottom of boiler.

# Pressurized Metal Expansion Joints



## Pressure Type Metal Expansion Joints

are used in piping systems to allow axial, lateral or angular motion. Expansion joints can be categorized as tied/restrained or untied/unrestrained solutions. Restrained types can be equipped with hardware such as tie rods, hinges or gimbals.

## AX-type expansion joints

are used to absorb only movements along the longitudinal axis (axial) of the pipeline. They can be equipped with weld ends, fixed or loose flanges.

## LA-type expansion joints

are intended for lateral movement only. Lateral expansion joints are available in two principal types. One with tie rods, and one with hinges that controls how the bellows move.

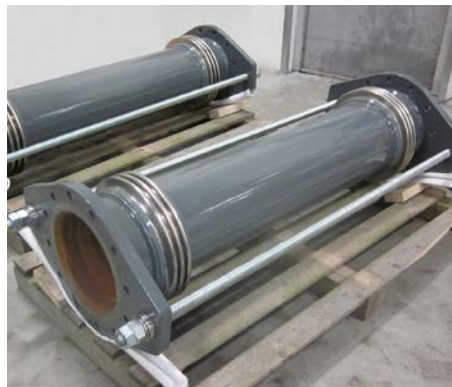
Tie rods and hinges retain the load generated by the system pressure (pressure thrust), within the expansion joint.

## AN-type expansion joints

are intended for angular movement only. They are divided into two types. For one plane angular movement a hinged type is appropriate. For two plane angular movement a gimbal type must be used.



*AX-type metal expansion joint.*



*LA-type metal expansion joint with tie rods.*



*AN-type single hinged metal expansion joint.*





### Hinged Types

are tied solutions, and can be provided as a single or a double, depending on requirements. The hinge enable angulation/ rotation in the piping where the expansion joint is installed. System generated pressure thrust is retained within the expansion joint hardware by the hinge assembly.

### Gimbal Types

are tied solutions, and can be provided as a single or a double, depending on requirements. The gimbal hardware assembly is designed to retain full pressure thrust, while enabling two plane angulations. External loading can be included in the design if special cases require so.

### Leak monitors

can be added to the design if necessary. The bellows then has two plies, where each ply is independently designed for the full system design conditions. The bellows is equipped with test ports, connected to a gauge or monitor. This will indicate in case a leakage occur.

### Pressure Balanced Expansion Joints

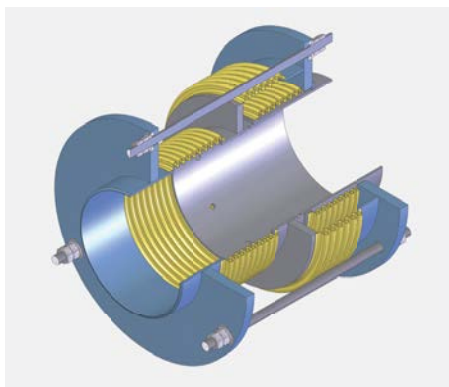
are used where pressure thrust loads are undesired and are designed to eliminate the pressure thrust from the internal pressure, by a force balancing principle. Pressure balanced metal expansion joints can be designed as in-line or elbow type.

The pressure thrust force developed when using bellows in a piping system, is balanced within the expansion joint, reducing pressure thrust forces to a minimum.

Pressure balanced expansion joints are used e.g. when connection to-or-from load sensitive equipment, vessels or where modification/addition of main anchor point are not feasible.



*AN-type single gimbal metal expansion joint.*



*3D model of a TB-type in-line, pressure balanced expansion joint.*



*HA-type pressure balanced elbow (crossover expansion joint).*

# District Heating

## Danmuff Expansion Joints (DH1S)

have been designed specially for installation in district heating pipe systems. Constructed in such a way that when the bellows is fully compressed the axial compressive forces in the pipeline can be transferred directly through the adjoining end surfaces of the media pipes without the bellows being overloaded.

If the temperature in the pipe network drops to such an extent that tensile stresses occur, the maximum tensile stresses in the media pipe will be transferred to the stop ring through the outer casing pipe and the contact faces of the slide guide. Danmuff is also protected against torsion.

This design means that the number of guides/anchor points in the pipe system can be reduced, as the

expansion joint can be installed in series in sections of pipe without intermediate guides/anchor points.

The expansion joint will trigger each other individually. Together with the media pipe, the guide pipe forms a telescopic union in the expansion joint with regard to direction of flow. This telescopic union also forms a guide, allowing lengths of pipe to be welded together, including the expansion joints, and then laid in the trench without the expansion joint being damaged.

The expansion joint is pre-stressed 100% at the factory using explosive bolts, which are fitted through the stop ring and into the slide guide. When the installation is put into operation, the explosive bolts are activated, triggering the movements of the expansion joint.

## DanOne Expansion Joints (DX3S)

are axial one cycle or startup expansion joints. This expansion joint is used in pipe systems where variations in temperature around a desired mean temperature are not to be absorbed as expansion movements, but as tensile and compressive stresses in the pipe system.

The DanOne is installed in the system at ambient conditions and allowing the system to expand, the first time the system is heated up to desired temperature. In this position of the expansion joint is seal welded, and thereby locked in place. Expansions in the pipe system caused by variations in temperature will be absorbed as tensile and compressive stresses when the system cools down and heats up respectively in relation to the mean temperature.



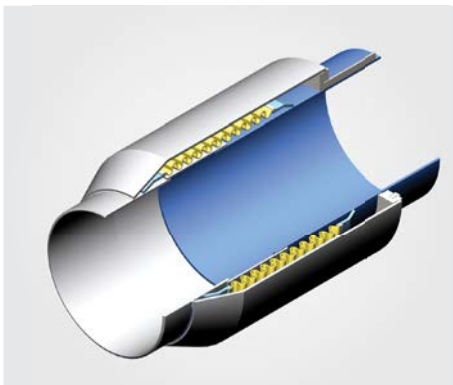
*Bellows for district heating.*



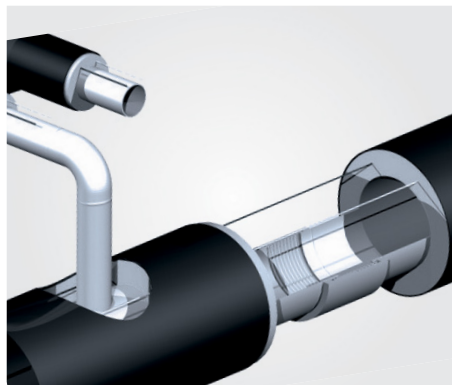
*Finished DanOne Expansion Joints ready for shipping.*



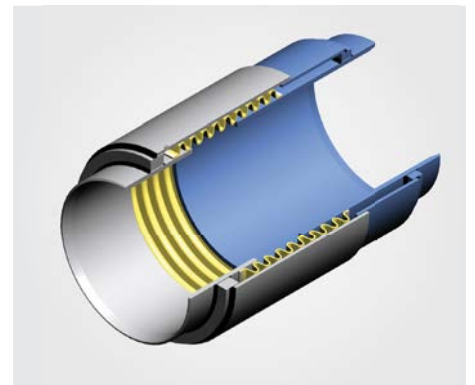
*District heating pipeline.*



*3D model of a Danmuff Metal Expansion Joint.*



*District heating pipeline system with a Danmuff Metal Expansion Joint.*



*3D model of a DanOne Metal Expansion Joint.*



# Rectangular Ducting



## RE-type expansion joints

are rectangular expansion joints used to accommodate the need for mainly axial and lateral movements over a broad range of operating conditions.

Rectangular expansion joints can be designed and manufactured with convolutions more than 200 mm of height to provide the necessary movement ability, while keeping reaction forces of the expansion joint very low.

RE-type expansion joints are used in industries such as:

- Power Generation
- Steelwork
- Petrochemical Plants
- Refineries
- Chemical Industries

And applications such as:

- Gas turbine exhaust systems
- Boiler breaching
- Forced draft fans
- Flue gas ducts
- Precipitators
- And other hot gas, large volume ducting systems

## Corner configurations and bellows profiles:

- Four different corner configurations (see below)
- U shaped or V span convolution profiles

The selection of profile type and corner configuration depends on requirement for e.g. movements, cycle life and price. The two profile types and four corner configurations gives the flexibility to combine choices into the ideal solution.

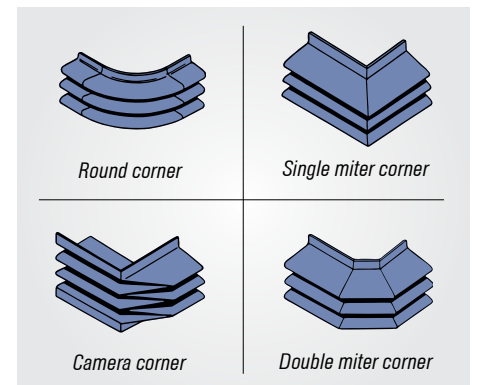
EagleBurgmann KE calculate rectangular metal expansion joints according to the latest edition of EJMA.



RE-type metal expansion joint with round corners being welded.



RE-type metal expansion joint with double miter corners.



4 types of corner configurations.



# Petrochemical & high temperature processing



## Petrochemical process lines

require metal expansion joints to handle extreme pressure or temperature.

Typical applied hardware and accessories:

- Hinges, gimbals
- Tie rods, pantograph linkages
- Leak detectors
- Liners, shrouds
- Internal insulation
- Purging systems
- Reinforcing rings
- Expanded ducting

All designs are subject to thermal stress analysis and FEA in order to deliver 100% reliable products.

Industry sectors with high temperature applications:

- Refineries
- Chemical Plants
- Styrene plants
- Catofin plants
- MTBE plants



DN2000mm universal metal expansion joint for styrene processing.



DN2000mm double gimbal metal expansion joints for styrene processing.



3D model of metal expansion joint with pantographs.



# FCCU, CCR & Turbo Expander Units

Metal expansion joints are an integral component of complex refinery processes and their reliability can be significant to the refinery's productivity and performance. An unexpected joint failure can be costly.

## Expansion joints used in Fluid Catalytic Cracking Units (FCCU)

are some of the most critical and complex expansion joints manufactured. FCCUs operate at very high temperatures, consequently resulting in large thermal movements that must be absorbed by the expansion joints.

Introduction of abrasive media (catalyst) requires additional protection to avoid gradual deterioration and premature failure of the expansion joint. Refractory lining is made to protect the steel parts from the high service temperature and from any erosion particles in the media. The lining is added to the expansion joint by welding in special stainless anchors.

The bellows membrane is the most critical element of the expansion joint assembly. Its relatively thin wall construction is designed for maximum flexibility, but must be protected against erosive catalyst and other corrosive media. Expansion joints for FCC service fall into these major categories, cold wall, hot wall lined and hot wall unlined.

Types of expansion joints used in FCC applications, include:

- Gimbaled
- Hinged
- Pressure balanced
- Restrained universals

Features and accessories on FCCU type expansion joints:

- Pantographic linkage
- Redundant ply bellows design
- Equalizing rings
- Sealable covers

## Continuous Catalytic Reforming (CCR)

requires an unlined thin-wall, high alloy expansion joints to accommodate high temperatures and movements. With a great need to achieve higher performance and profitability, these expansion joints are critical to the overall success of the refinery.

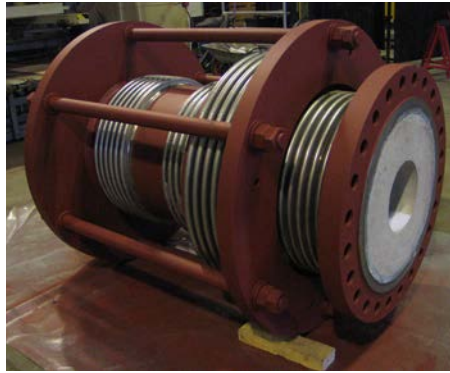
## The turbo expander

is another important system within a refinery with significant effect on production profits. The losses are extremely high to a refinery that must shutdown to repair for example the universal hinged or gimbaled expansion joints installed within the turbo expander piping system.

This system requires experienced professionals to provide expansion joint designs to ensure long term safety, reliability and maintainability.



DN1400mm cold wall universal expansion joint cartridge for FCCU.



In-line pressure balanced metal expansion joint.



DN2000mm hinged expansion joint for a turbo expander piping system.



DN2300mm tied universal catalyst with slotted gimbals.



Recirculation catalyst standpipe refractory lined expansion joint (800mm ID).



DN 1422mm refractory lined, pressure balanced expansion joint with two-ply testable bellows and test gages.

# Installation, Service & Preventive Maintenance



## Servicing our customers

is vital to us. 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 man-hours with proper and safe installation.

The key to long-term and reliable expansion joints is dependent on a professional installation team. EagleBurgmann KE's service team has extensive installation experience and supervision on projects worldwide and can be available 7 days a week, within 24 to 48 hours.

## 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 services include:

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



EagleBurgmann KE has a team of experienced welders.



Installation of a clamshell metal expansion joint.

## Emergency hotlines

South East Asia	+65 9630 3420
India	+91 93805 80508
Middle East	+971 55 531 946
Europe	+45 21 24 66 32
USA	+1 (859) 653 8364 (fabric) +1 (619) 562 6083 (metal)



# Expansion Joint Product Range

## Design and engineering capabilities

With more than 50 years of experience as a solution provider, EagleBurgmann KE has developed capabilities in solving challenges associated with controlling thermal expansion of piping and ducting systems.

EagleBurgmann KE has a proven track record of capabilities both in engineering and product reliability, with installations in all continents and various market sectors.

Through continuous innovation, we provide our customers with the latest technologies and solutions within the expansion joint industry.

As a solution provider, EagleBurgmann KE offers a wide range of services in connection with optimization of conditions for expansion joints. They include:

- Consulting, evaluations and troubleshooting
- Initial dimensional measurements
- Installation and refurbishment
- Supervision and training
- Plant surveys
- Emergency service
- Final inspections

## Fabric Expansion Joints

are able to compensate for movements in several directions simultaneously and have almost no reactive force. They require little space for installation and are easy to adapt to physical conditions.

Selection of the right fabric expansion joint depends on a variety of factors which vary from application to application.

By combining different materials and taking thermal, chemical and mechanical resistance into consideration, as well as the fatigue properties of the materials, our engineers develop optimal solutions that provide long-term reliability to customers in various industries.

### Fabric expansion joint operating limits\*

#### Dimensions:

According to customer specifications

**Temperature range:** -35 ... +1.000 °C

For higher temperature, please request

**Pressure range:** -0,35 ... 0,35 bar

## Metal Expansion Joints

are flexible connections installed in piping and ducting systems to accommodate expansion and vibration caused by changes in temperature, pressure and media.

EagleBurgmann offer a full range of metal expansion joints from rectangular and round ducting joints to highly engineered designs for critical applications.

The company has a long history of welding and forming of special materials including a wide range of nickel alloys. EagleBurgmann KE offer complete documentation packages in accordance to current industry standards such as ASME and EJMA.

### Metal expansion joint operating limits\*

#### Dimensions:

Circular: DN40 mm and up

Rectangular: According to customer specifications

**Temperature range:** -198 ... +1.371 °C

**Pressure range:** Full vacuum up to 172 bar

*\*Operating limits depends on design, material selection, type of expansion joint and duct insulation.*



EagleBurgmann KE offer a wide range of products.



Cross section of fabric expansion joint.



Cross section of metal expansion joint.

Argentina · Australia · Austria · Belarus · Belgium · Bulgaria · Brazil · Canada · Chile · China · Colombia · Cyprus · Czech Republic · Denmark · Ecuador · Egypt · Estonia  
Finland · France · Germany · Great Britain · Greece · Hungary · India · Indonesia · Iraq · Israel · Italy · Japan · Jordan · Kazakhstan · Korea · Kuwait · Latvia · Libya · Lithuania  
Malaysia · Mauritius · Mexico · Morocco · Myanmar · Netherlands · New Zealand · Nigeria · Norway · Oman · Pakistan · Paraguay · Peru · Philippines · Poland · Qatar  
Romania · Russia · Saudi Arabia · Singapore · Slovenia · Slovak Republic · South Africa · Spain · Sweden · Switzerland · Syria · Taiwan · Thailand · Trinidad and Tobago  
Tunisia · Turkey · Turkmenistan · Ukraine · United Arab Emirates · Uruguay · USA · Uzbekistan · Venezuela · Vietnam



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EagleBurgmann Expansion Joint Solutions is a leading global organization in the development of expansion joint technology; working to meet the challenges of today's ever-changing environmental, quality and productivity demands. Our flexible products are installed in thousands of plants, refineries and on equipment worldwide where reliability and safety are key factors for operating success. Everyday more than 6000 EagleBurgmann employees contribute their ideas, solutions and commitment to ensure our customers worldwide can rely on our products and services. **For more information – visit [www.eagleburgmann-ej.com](http://www.eagleburgmann-ej.com)**

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**EagleBurgmann®**  
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