

**FLEXIBILITY  
IS OUR BUSINESS**



**GFG  
TEXTIL EXPANSION JOINTS**



5



Stainless-steel deflectors

2

**TECHNICAL QUESTIONNAIRE**  
- for Variable Expansion Joints

Name: \_\_\_\_\_  
Company: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_  
Country: \_\_\_\_\_

**Measurements for expansion joints**

Material and Conditions of use

Medium: \_\_\_\_\_  
Temperature: \_\_\_\_\_  
Pressure: \_\_\_\_\_  
Direction of movement: \_\_\_\_\_  
Type of movement: \_\_\_\_\_  
Type of connection: \_\_\_\_\_  
Type of fastener: \_\_\_\_\_  
Type of support: \_\_\_\_\_  
Type of installation: \_\_\_\_\_

**Estimate**

Quantity: \_\_\_\_\_  
Unit: \_\_\_\_\_  
Total value: \_\_\_\_\_  
Currency: \_\_\_\_\_

**MAIL OR FAX THIS QUESTIONNAIRE TO:**

**GFG-Kompensatoren mbH**  
Königsplatz 27  
D-30854 Paderborn  
Phone: +49 52 91 17 00  
Telex: 909201 3 54 45

Questionnaire (Page 13)

1



Trade show booth - Achema '94

4



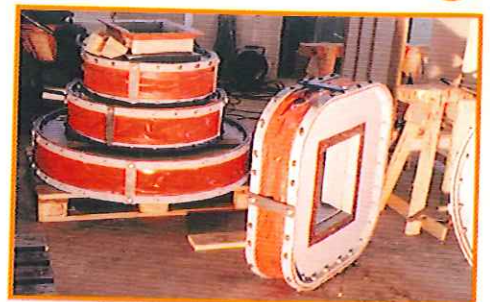
Installation in a DeNOx-plant

3



View into our manufacturing-plant

5



Complete units - ready for installation

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## **FLEXIBILITY IS OUR BUSINESS**

Under this motto we strive to more than satisfy our customers.

To our experienced staff, flexibility means:

Flexibility from our products

but also

- 1** Customer oriented, technical advice and consultation (for example at international trade shows etc.)
- 2** Design and construction based on your specific needs and plant conditions.
- 3** Manufacture of all necessary sizes, shapes and construction in large, modern manufacturing plants.
- 4** Installation, and repair-service of our products (and those of other manufactures) by our trained personnel.
- 5** Availability of parts and accessories, like steel-parts (flanges, deflectors etc.) as well as complete preassembled units for your installation.
- 6** Annual plant visits to determine the need for product modifications. Estimates provided.

**IS OUR BUSINESS**



**FLEXIBILITY**





*Incinerator plants – flue gas-recirculation/jet pipes.*

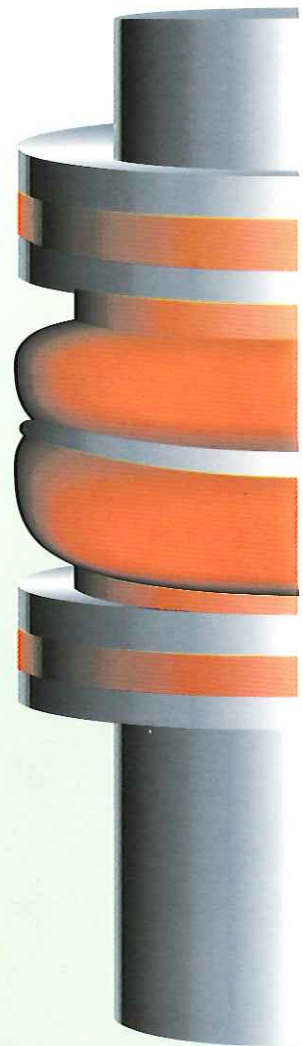
## DEFINITION

GFG-Expansion Joints are components for pipeline-, plants- und machine constructions. They are capable, because of their material and shape, of compensating for movements, in addition to their sealing function.

## THE ADVANTAGES

### OF USING GFG-Expansion Joints

- 1 Highest flexibility and therefore the most allowance for movement with minimal installation height (pipeline distance).
- 2 Reactive forces and adjusting forces are close to zero – for fixpoint calculations usually negligible.
- 3 By using a variety of materials we can provide optimal and individual adaption to your working conditions.
- 4 Cost effectively manufacture of large dimensions.
- 5 Noticeable lower delivery costs for large units because of the ability to fold the product.
- 6 Simple installation that can be often be carried out by the customer's own personnel.



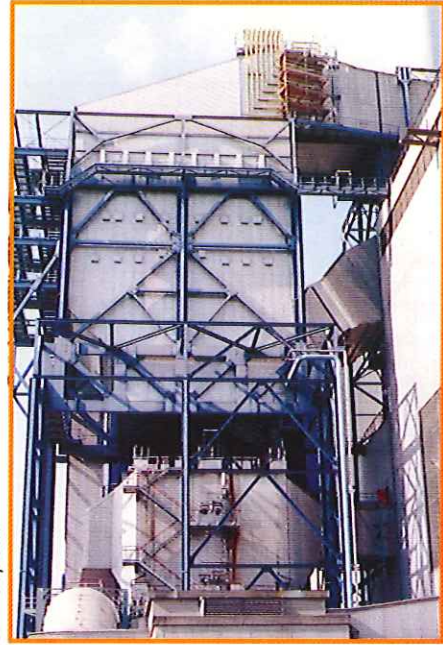
*Flue gas recirculation in a cement plant.*



# APPLICATIONS

GFG-Expansion Joints are used in

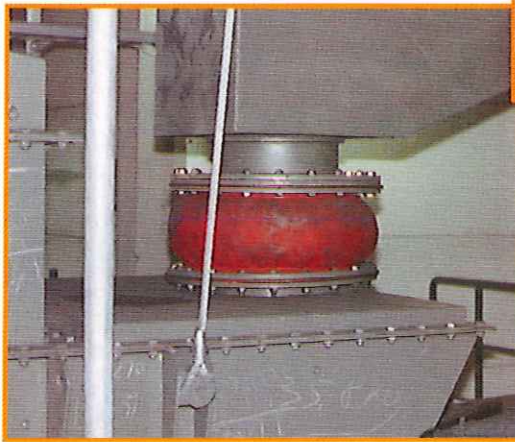
- Power plants
  - Boilers
  - DeNOx-plants
  - Flue gas desulpharization plants (FGDP)
  - Gas Turbine plants
  - Incinerator plants
- Dust removal and filtering plants
- Cement industry
- Steel industry
- Dehydration plants
- Chemical industry
- Conveying plants
- Fan construction / ventilation
- Ship building and marine technology and more



*DeNOx plant*



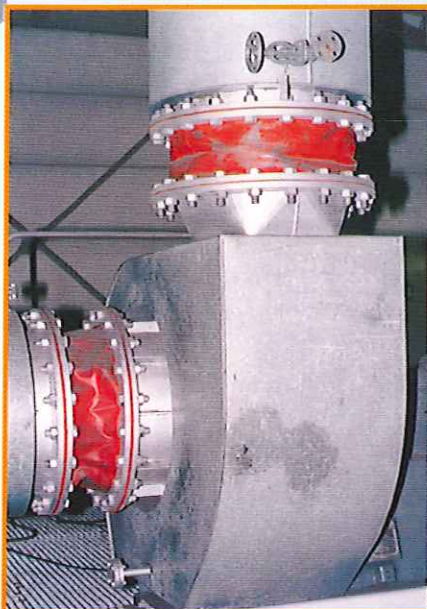
*Incinerator plants - flue gas-recirculation / jet pipes*



*Screening Machine for absorbent carbon*



*Extreme usage in a cement plant*



*Ventilator construction*



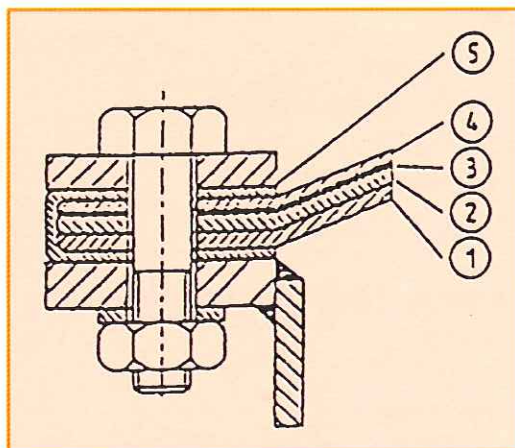
*Expansion joint for ship diesel motor, as a unit, with water-cooled flanges*





# MATERIAL CATEGORIES

Problems caused by mechanical, chemical and thermal influences are solved economically by using a variety of materials in different combinations.



- 1 + 2 Insulation material
- 3 Sealing foil
- 4 Structural fabric
- 5 Clamping reinforcement

Material categories (clamping area)

Joint construction itself is determined by its specific application and uses

## Insulation material

In the right thickness and quality this material prevents thermal and mechanical damage to the sealing foil. These fabrics are usually made out of:

- \*Glass
- \*Silicate
- \*Ceramics

## Sealing foil

The sealing foil is the actual sealing element and the heart of the expansion joint. Therefore, for protection, it is set between two textile layers. These foils are made of:

- \*Elastomers
- \*PTFE
- \*Stainless Steel

## Structural fabric

Used on the outside, this material creates the pressure resistance as well as the form stability. These fabrics are usually coated and made out of:

- \*Polyester
- \*Aramid
- \*Glass
- \*Silicate

## Coating

A coating of an elastomer protects the structural fabric, supports the shape, and is, in very simple executions, the actual sealing element of the expansion joint.

For this coating we use:

- \*Neoprene
- \*EPDM
- \*Hypalon
- \*Silicone
- \*Viton
- \*PTFE

THE SINGLE CATEGORIES:





# MAIN CATEGORIES

GFG-Expansion Joints are grouped (due to the variations in application and construction) as follows:

## 1. Single layer expansion joint

Depending on the fabric used, this type of expansion joint is made of one layer structural fabric, that is coated on one or both sides with an elastomer. Possible limits of use are:

- the temperature of 180°C and . - chemical resistance.

Because this is one of the simplest and least expensive type of movement compensation, it is used most in simple applications like:

- Ventilation - dust sealing element
- Separation of different duct-systems for proofing or because of vibration

You can also include the elastomer-expansion joint as a single layer expansion joint, however they are generally more expensive. These expansion joints are similar to rubber expansion joints and are generally used in wet areas with high chemical attack (for example FGDP-plant.)

The temperatur range is between 80-180°C, with the lower ranges using

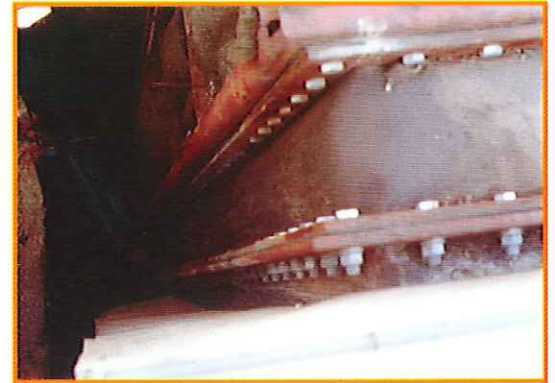
- Butyl, Hypalon or EPDM.
- Viton is used in the higher ranges.

## 2. Multi-layer expansion joints

Multi layer construction is generally used at temperatures over 200 °C, and is manufactured with different types of material.

## 3. Multi-layer expansion joints with insulation

Specific steps have to be taken in the duct and flange design to enable GFG Textile Expansion Joints to work in high temperature areas (500-600 °C)



Single layer expansion-joint in Viton for FGDP-Plant



Multi-layer expansion-joint at the suction side of a ventilator



Multi-layer expansion-joint with insulation in a DeNOx plant for a coal fired power plant

Through the use of a tubular expansion joint on extended mounting flanges, between the deflector and expansion-joint bellow, extra insulation materials can be put, that will supplement the thermal protection and work as a mechanical protection.

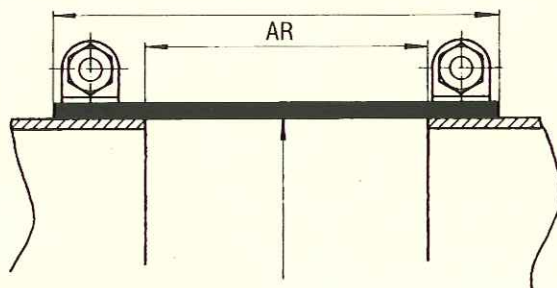




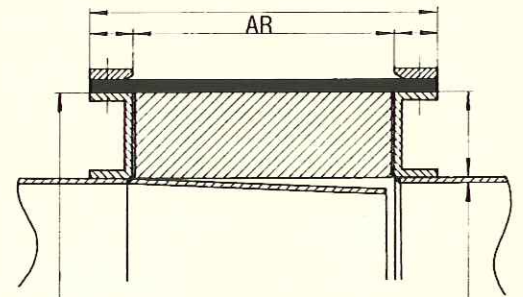
# COMMONLY USED TYPES OF G

## TUBULAR FASTENING

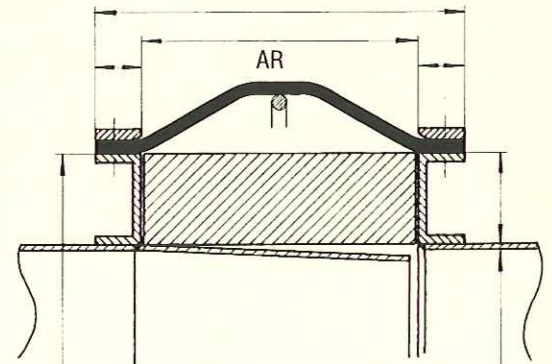
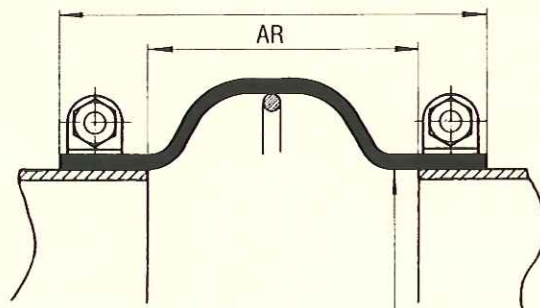
Directly to the pipeline



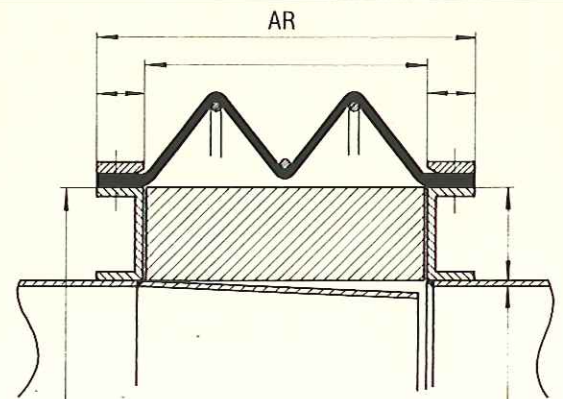
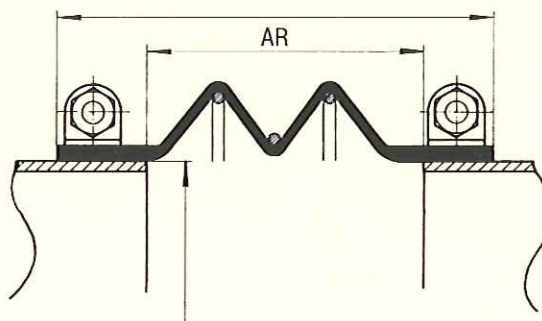
On extended mounting flanges



**MIDDLE SECTION STRAIGHT: MOVEMENT ABSORP**



**MIDDLE SECTION IN WAVE FORM: MOVEMENT ABSO**



**MIDDLE SECTION WITH FOLDS: MOVEMENT ABSORP**

AR: Pipeline distance – Flange distance

\*Note: The data given are recommendations and can be raised with  
 \*Give us your specification and we will send you information



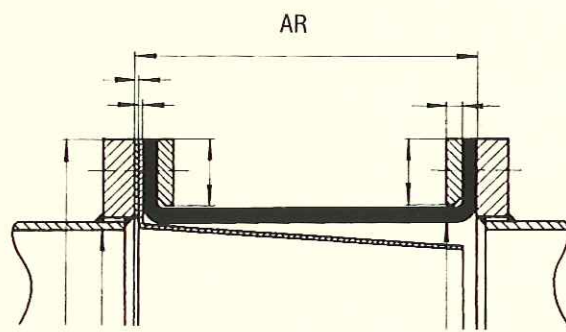
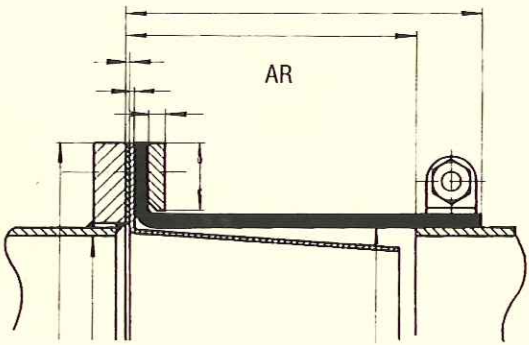




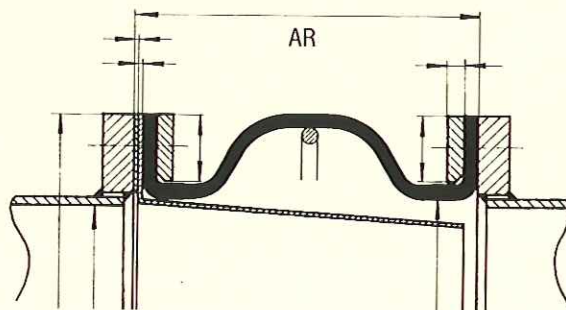
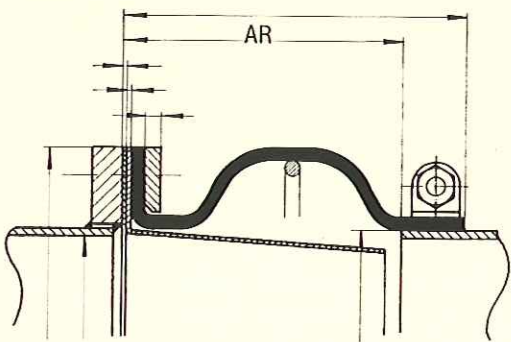
# GFG-TEXTILE EXPANSION JOINTS

## TUBULAR-FLANGED FASTENING

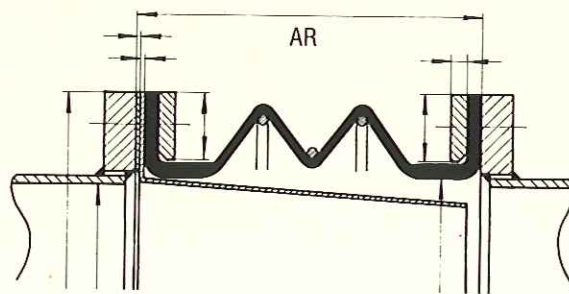
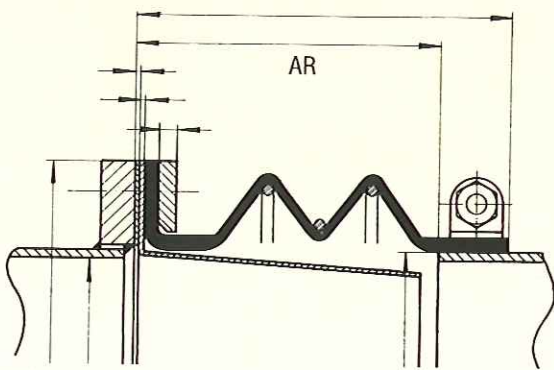
## FLANGED FASTENING



EXTENSION AXIAL  $-0.25 \times AR$  --- LATERAL  $\pm 0.1 \times AR$



EXTENSION AXIAL  $-0.3 \times AR$  --- LATERAL  $\pm 0.15 \times AR$



EXTENSION AXIAL  $-0.5 \times AR$  ---- LATERAL  $\pm 0,3 \times AR$

Contractor should select the GFG-Textil Expansion Joints most suited to your needs.







# OVERVIEW OF COMMONLY USED MATERIALS



Material	Thermal Resistance °C		Chemical Resistance			Note
	permanent	short term	Acid	Lyes	Solvents	
<b>Protection/Insulation and Structural fabrics</b>						
Polyester	150	180	X	X	X	high tear resistance, abrasion and vibration proof
Aramid	150	200	X	X	X	high tear resistance, abrasion and vibration proof
Glass	450	600	X	X	X	good insulation qualities, good chemical stability and tear resistance
Glass fibre mat	450	600	X	X	X	similar to glass fabric, but less tear resistance
HT-Glass	600	750	○	○	○	greater tear resistance with higher temperature
Silicate	1000	1300	○	○	○	good temperature and acid stability
Ceramic fibre felt	1100	1250	○	X	X	good insulation qualities and good chemical and thermal stability, but little tear resistance
Stainless steel W-Nr. 1.4401	800	-	X	○	○	only small chemical stability
Stainless steel W-Nr. 1.4539	800	-	○	○	○	very good acid stability (e.g. FGDP-plants)
Stainless steel W-Nr. 1.4816	1000	-	X	○	○	high temperature stability with high chemical stability
<b>Coatings</b>						
Neoprene	90	100	X	X	X	good age and weather stability
Hypalon	100	140	○	X	X	good acid stability
Silicone	180	220	-	X	-	easy to work with
Viton	200	280	○	X	X	very good acid stability as well as high temperature stability
PTFE	250	290	○	○	○	excellent chemical stability
<b>Sealing foils</b>						
Hypalon	100	140	○	X	X	good acid resistance
Silicone	180	220	-	X	-	easy to work with
Viton	200	280	○	X	X	good acid and high temperature resistance
PTFE	250	290	○	○	○	excellent chemical stability
Stainless steel W-Nr. 1.4435	500	600	X	○	○	only low chemical stability
Stainless steel W-Nr. 2.4816	800	100	X	○	○	high temperature and chemical stability
<b>Insulation material</b>						
Rockwool-felt	500	750	X	X	X	insulation and dust protection
Ceramic fibre felt	1100	1250	○	X	X	high temperature insulation

- non resistant   X conditional resistant   ○ resistant







## Tubular expansion joint

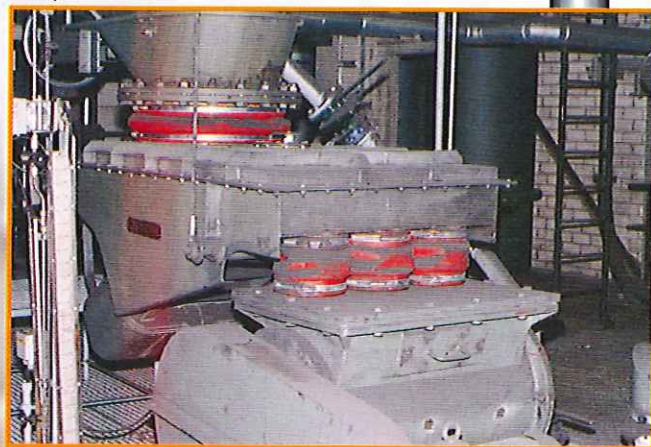
### Fastening directly to the pipeline

This is the simplest form of a textile expansion joint. It is only appropriate for a round or oval profile. With square profiles back up bars must be used, and the duct-walls must be drilled into.

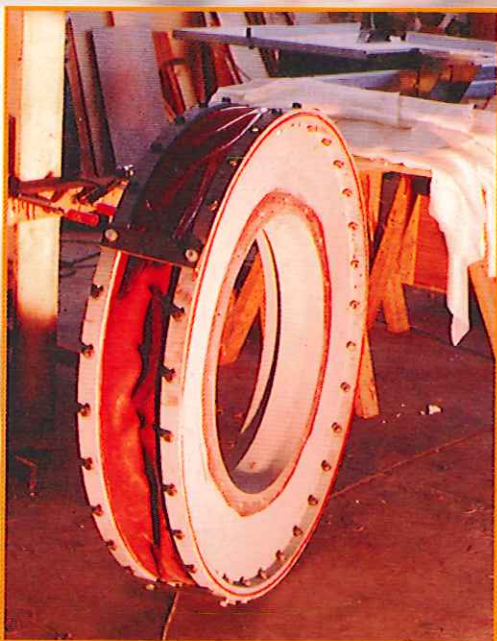
With low pressure, be aware, that the expansion joint bellow is sucked inside and therefore narrows the profile. This is where supporting rings should be used.

The maximum temperature is at about 350 °C because the clamping area takes on the medium temperature.

With diameters of 600–800 mm fastening is done with tube clamps (existing of several pieces.) Larger diameters require a flange fastening which insures a better seal.



Screeningmaschine for absorbent carbon.



Complete unit for use in a Calcinator plant - ready for installation.

## Tubular expansion joint

### Fastening on extended mounting flanges

(possible with pre insulation)

With this type of construction, all profile shapes and sizes can be handled, however, corners should be executed with a circular radius. No drilling of the duct-walls is necessary with square profiles. Because of good temperature reduction in the fastening areas, the following temperature-limits are possible:

- without insulation 400-500 °C, and
- with insulation up to about 600-700 °C.

With specialized construction, for example lining the interior with brick, GFG Expansion Joints can handle temperatures up to 1000 °C.

## Flanged expansion joint

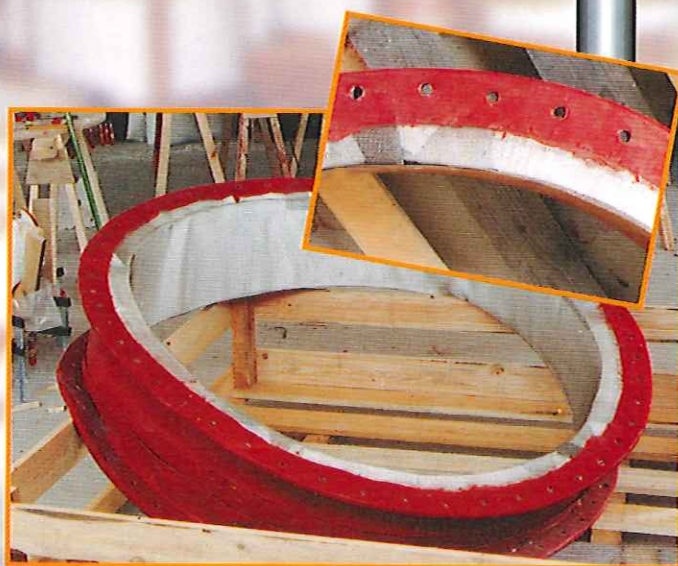
This construction is chosen for large units

- possible with existing pipeline flanges
- higher pressures
- maximum sealing function.

Because of the serious heat radiation in the fastening areas, temperatures should not exceed 450-500 °C.

With the use of larger flanges, the expansion joint can be moved further out (in distance to the medium flow) and, through additional insulation or worked on insulation, protected.

An increase in temperature to 600–650 °C is then possible.



Flanged expansion joint, with a worked on insulation, for use in a steel factory





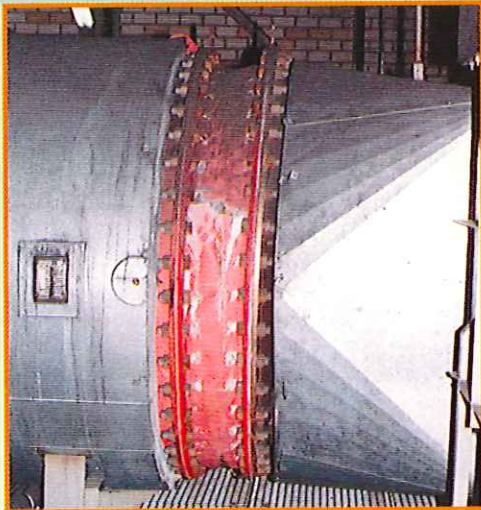
# INDIVIDUAL PROBLEM SOLVING AND RESULTING NEW DEVELOPMENTS



*Uninterrupted operating time is generally in the best interest of any plant operator, preventing unplanned shut downs, assuring smooth operation and therefore avoiding huge costs for*

*stoppage time. Following are two problems, which we were able to solve with the cooperation of our customers.*

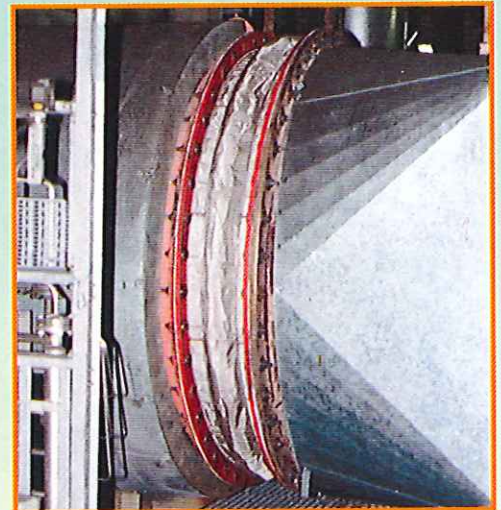
## The Problem



Traditional textile expansion joint shows after a short working period with high temperatures (about 650°C)

- Destruction of the temperature sensitive PTFE sealing foil and silicone layer
- Sudden breakdown of the expansion joint with unplanned shut down
- High fire danger

## The Proof



Even after several years of use, unlimited operation capability

## GFG-Special-Expansion joint

For use with extreme, medium and flange temperatures.

## The Problem



Expansion joint in a flue gas duct of a high dust DeNOx- plant, without dust protection

- Penetration of dust into the expansion joint area
- Loss of movement ability
- Additional bearing stress
- Deformation of the duct-walls

## Our Solution:

### GFG-Special-Expansion joint

Exclusive use of materials that are not sensitive to high temperatures, in conjunction with a metal supporting construction and a quality manufacturing.

## Our Solution

### GFG-Dust protection package

Built in dust protection, to avoid penetration of dust, and achieve lasting and effective insulation, (built in, without expansion joint disassembly, possibly from the inside).

## The Proof



A dust free expansion joint, even after several years of use.

## GFG-Dust protection package

For expansion joints used in high dust mediums.



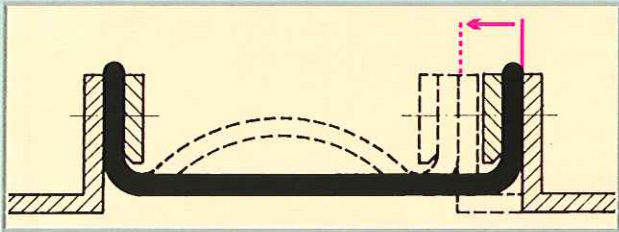


# POSSIBLE MOVEMENT TYPES

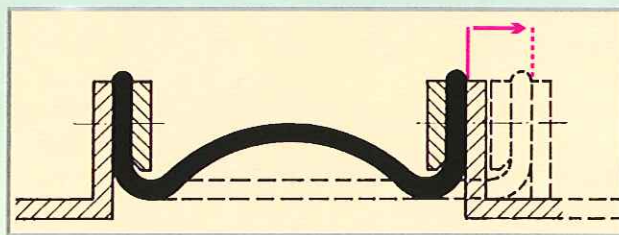


Since defined movement absorption is the actual job of a GFG-Expansion Joint, exact information about the possible movement is necessary. Below are the most common types of movement.

In contrast to a steel expansion joint a GFG-Textile Expansion Joint can compensate for a single movement, or a combination of different movements.

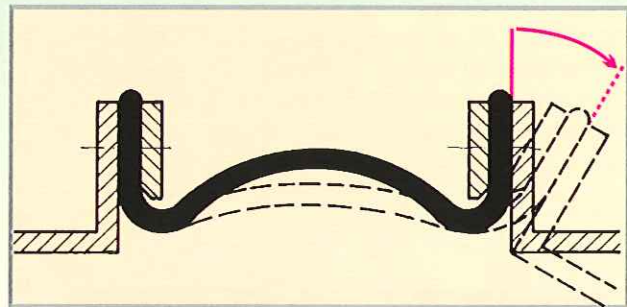


**Axial Minus**  
(compression)

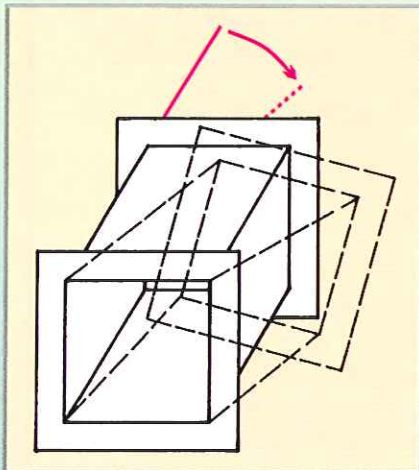
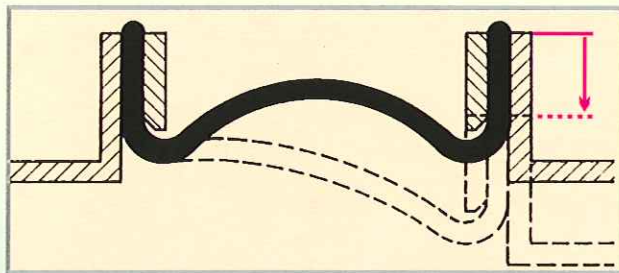


**Axial Plus**  
(expansion)

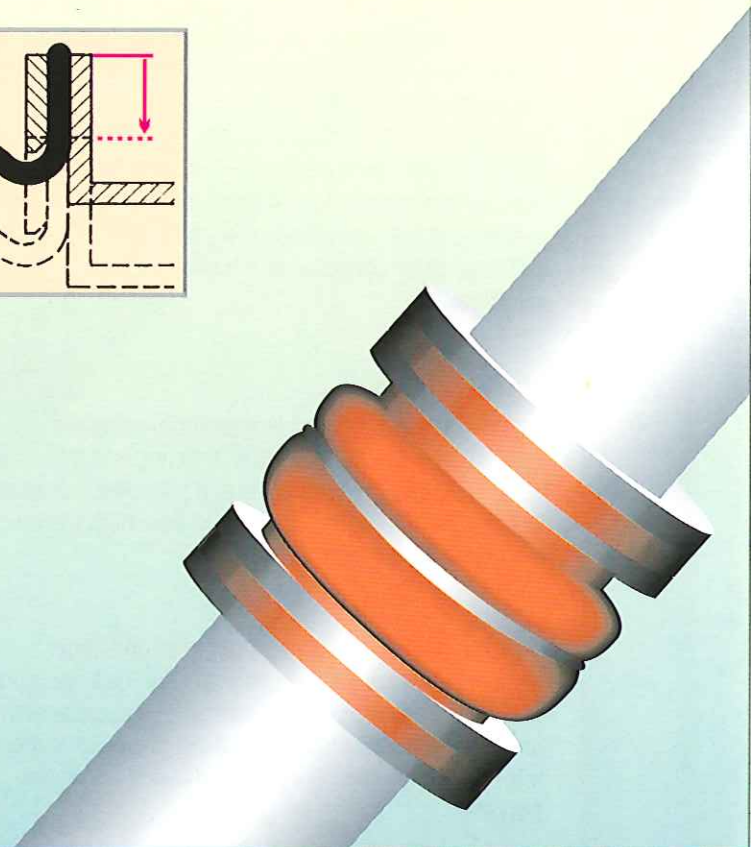
**Angular offset**



**Lateral offset**



**Torsion**





# INFORMATION FOR THE TECHNICAL QUESTIONNAIRE

All necessary specifications are listed in the questionnaire on the next page. The following are explanations to assist you in the gathering your data.

## 1. First time equipment - Replacement

*First Time Equipment* – Be sure, that the expansion joint installation site is accessible for maintenance work. If the installation height has still to be determined, let us know, so we can work out suggestions from the beginning.

*Replacement Equipment* – Check if the expansion joint can be installed endless, or if it should be delivered open, and then closed at the site. It is also necessary to know, what had been used prior, and if adequate time of use had been achieved with it.

## 2. Medium

The construction of the expansion joint is chosen according to the medium and the operating conditions. Specifications should be as detailed as possible. Price and performance ratio is determined by the conditions, such as how dry, wet, dusty. With flue / exhaust gas, if no analysis is available, the process in which the expansion joint will be used, should be described (for example incineration-plant, after flue gas scrubber, or thermal exhaust reheat plants etc.).

## 3. Medium temperature – environment temperature

With a medium over 200°C the temperature is the determining factor for the choice of material and unit shape (tube, flange, with insulation etc.) Always note the highest temperature possible during use of the expansion joint. Inside conditions such as brick lining, insulation etc. need also to be taken into consideration. An environmental temperature of 50°C will be assumed if not otherwise noted. Additional insulation will have to be considered, if higher temperatures are possible.

## 4. Pressure

Aside from medium and temperature, pressure is a relevant fact for interpretation. It is important to know if there is high or low pressure, if you expect pressure variations or pressure surges and how high the design or test pressure should be.

## 5. Start up frequency - operating conditions

Because start up, shut down or partial load operating of the plant, produces high stress for the expansion joint in relation to movement at chemical influences, information about these circumstances is very important.

## 6. Installation site

To assess the demands on the expansion joint, details about the installation site are necessary.

## 7. Deflector

Generally a deflector is recommended to regulate flow velocity. At a speed of 10-15 m/s (depending on installation site) a deflector will prevent pulsation or instability of the expansion joint bellow, and therefore prolong the units working life. If the medium contains abrasives, a satisfactory working life can only be achieved if the expansion joint is protected by deflectors.

## 8. Insulation

To assure the temperature reduction from the inside to the outside and therefore allow the textile expansion joint to function as intended, textile expansion joints should, not be figured in, as a part of the outside installation of the pipes if the medium temperature is above 200°C. Under 200°C, with planned insulation, the composition can be chosen accordingly. In the temperature range up to 200°C, insulation is an effective way to protect the unit from continuous condensation, from chemical reactions, and from the corresponding corrosion.

## 9. Fastening

- Tube clamps are needed for round and oval profiles up to about 800mm diameter with a material thickness of 12–15mm.
- Back up bars for round, oval and square profiles. Square ones need to be executed with rounded off corners (radius).
- Flanges and back up bars can be used with all profiles and sizes.

## 10. Flange dimensions

It is important to know both, inside and outside, dimensions for the loose flanges, as well as for the fixed flanges. If deflectors are in place, double checking of those dimensions is important since the expansion joint has to be integrated between the loose flange and the deflector.



# TECHNICAL QUESTIONNAIRE

for Textile Expansion Joints

Company \_\_\_\_\_

Street address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_ Country \_\_\_\_\_

Attention to \_\_\_\_\_

Telephon/Fax \_\_\_\_\_

Date \_\_\_\_\_

## Medium and Conditions of use

- First time equipment  
 Replacement

Area of use: \_\_\_\_\_

Medium (analysis)  
dusty/damp/dry \_\_\_\_\_

Temperature/medium \_\_\_\_\_ °C      Temperature / surroundings \_\_\_\_\_ °C

Pressure during use \_\_\_\_\_      Positive pressure \_\_\_\_\_ mbar

Pressure changes/surges    yes/no      Negative pressure \_\_\_\_\_ mbar

Flow-velocity \_\_\_\_\_ m/s

Start up frequency \_\_\_\_\_

## Movements for expansion-joints:

axial compression \_\_\_\_\_

axial expansion \_\_\_\_\_

lateral movement \_\_\_\_\_

angular movement \_\_\_\_\_

vibration \_\_\_\_\_ Hz/

movement frequency/time unit  
\_\_\_\_\_

## Dimensions:

(we request detailed drawings with measurements for assembly dimensions)

Inside dimensions Ø \_\_\_\_\_

\_\_\_\_\_ X \_\_\_\_\_

Outside dimensions Ø \_\_\_\_\_

\_\_\_\_\_ X \_\_\_\_\_

Breach opening \_\_\_\_\_

Face to face \_\_\_\_\_

Place of installation \_\_\_\_\_ outdoor/in a building

Installation style \_\_\_\_\_ horizontal duct  
vertical duct

Direction of flow \_\_\_\_\_ up/down/horizontal

Deflector planned?    yes/no      screwed       welded

Insulation      compensator insulated       flange insulated

## Mounting

- Tube clamps       Back-up bar       Flange

Flange measurement:    Ducting flange \_\_\_\_\_ mm

Back-up bar \_\_\_\_\_ mm

Bolt circle Ø \_\_\_\_\_ mm, Number of holes \_\_\_\_\_ Ø \_\_\_\_\_ mm

With square unit please include the relevant detailed flanges sketches.

MAIL OR FAX THIS  
QUESTIONNAIRE TO

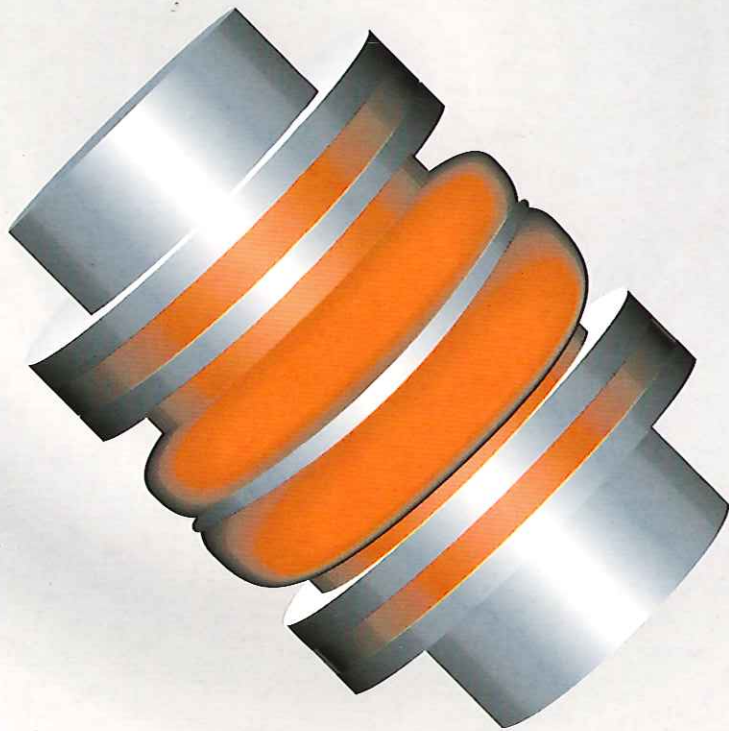


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