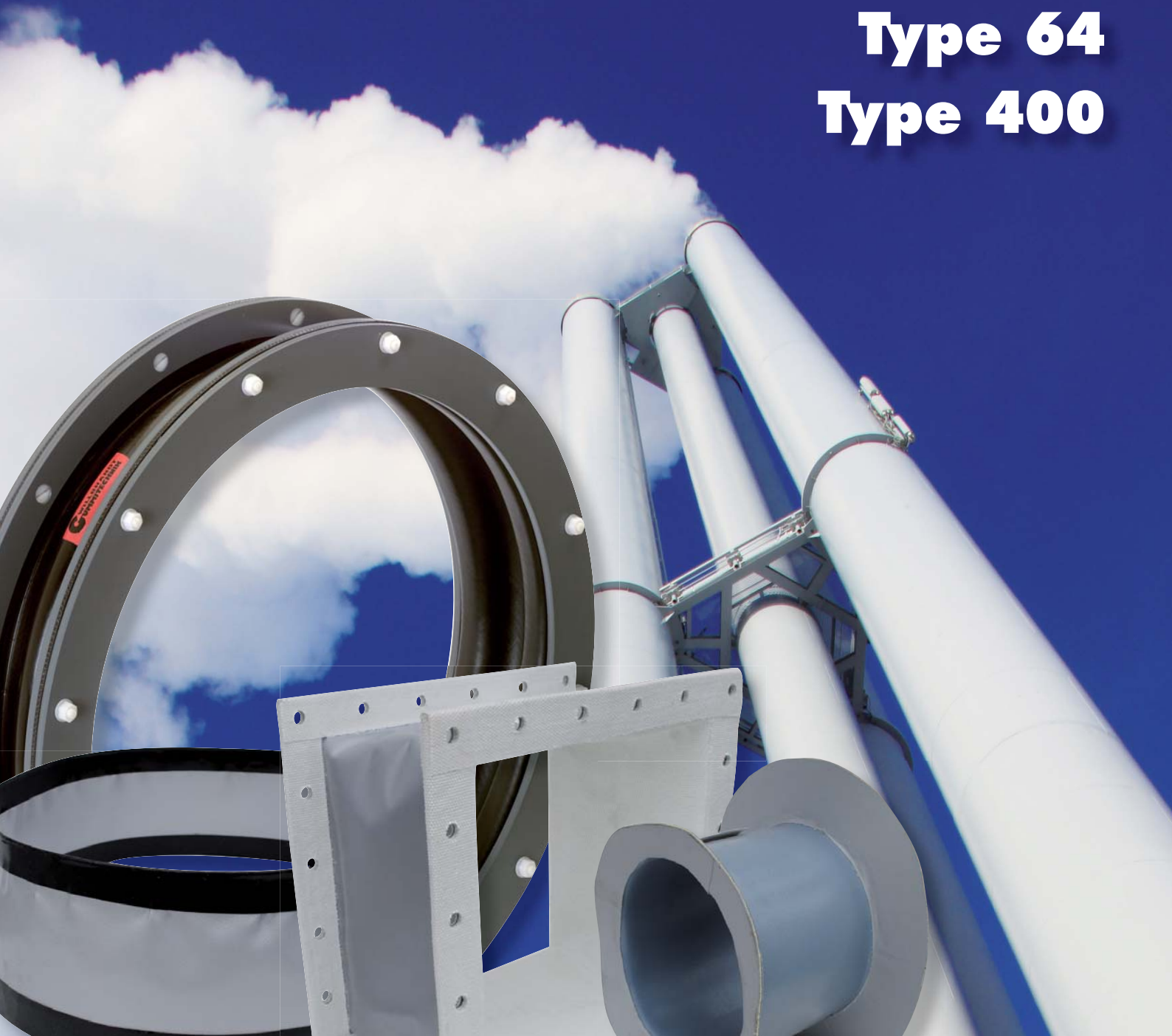


Non-metallic compensators

**Type 64
Type 400**

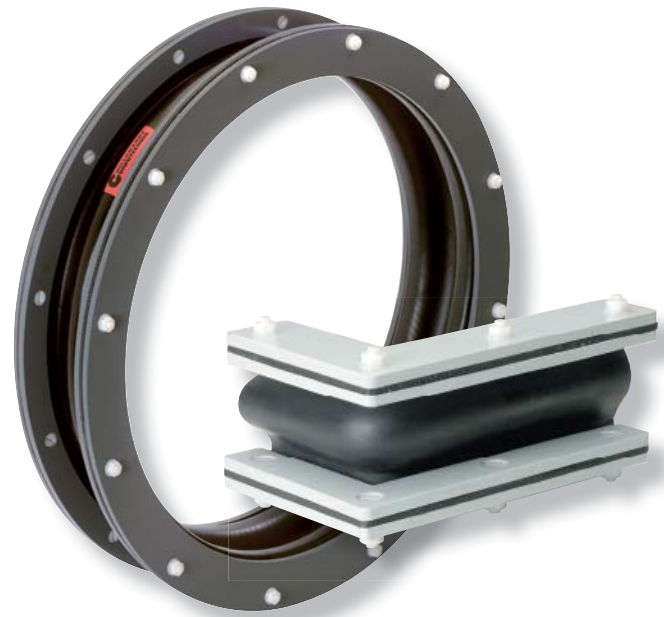


WILLBRANDT Type 64 Compensator

The type 64 compensator is a flexible expansion joint made from pre-formed sheets and vulcanised or heated into its final form, depending on the material.

The dimensions of the compensator are based on the construction dimensions and the required movement absorption. There are no standard dimensions for this particular type.

Application areas include zero-potential installation of fans and blowers, the cement industry and materials handling.



Description

Construction	<p>The compensator bellows comprise a layer of rubber sheeting with a fabric section that overlaps in the area of impact and is vulcanised or heated.</p> <p>There are corrugated and uncorrugated versions in order to absorb the prescribed movements.</p>
Connections	<p>Type 64 can be supplied with a flange connection or with cylindrical ends for clamp fixing. In this case it is not bound by any standard sizes and can be individually adapted to your connection dimensions.</p> <p>The pre-formed rubber flanges are made up to a nominal width of 1200. Larger dimensions come as a flat profile, so that the flange can be raised during installation.</p>
Pressure resistance	<p>Type 64 is made with nylon or polyester cord reinforcement and is designed for a max. pressure of +/-0.5 bar (depending on free installation length). For higher pressure requirements, please refer to our type 63.</p>
Movement absorption	<p>Type 64 is characterised by its high flexibility and low inherent resistance. It is able to absorb axial, lateral, angular and combined movements.</p> <p>The extent of the movement absorption is depending on many factors, e.g. the relationship between the installation length (BL) and the nominal width, the material used and the design of the bellows (corrugated or uncorrugated).</p>
Special accessories	<p>Backing flanges made from steel, stainless steel or plastic; clamps and guide sleeves made from steel or stainless steel; potential equalisation; ember and dust protection; acid protection hood; and sun protection cap.</p>

WILLBRANDT Type 64 Compensator

Materials

Inner	Reinforcement	Outer	Thickness mm	max. temperature		max. pressure		Design
				°C		kPa	kPa	
EPDM	Polyester	EPDM	3	120		-40	+50	Non-metallic
EPDM	Polyester	EPDM	4	120		-40	+50	Standard
EPDM	none	EPDM	8	120		-40	+50	Wear-resistant
FPM	Aramid	FPM	3	200		-40	+50	Standard
NBR	Polyester	NBR	4	90		-40	+50	Standard
CR	Polyester	CR	4	90		-40	+50	Standard

Important information

Corrugated designs prevent creasing and guarantee longer service life even if loading changes frequently.

Vacuum support rings should be used if vacuums occur on a regular basis!

Please refer to our resistance chart for media resistance, especially in the case of aggressive media.
The bellows should not be painted or insulated. Please refer to the installation instructions.

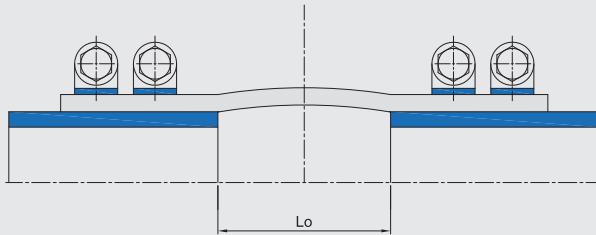


WILLBRANDT Type 64 Compensator

Bellows profiles

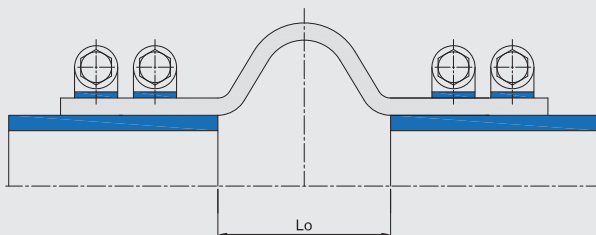
Type 64-1

Uncorrugated with straight ends for round or square design with flanging radius



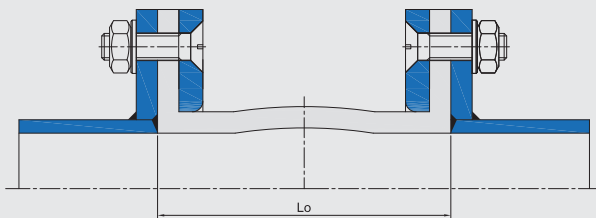
Type 64-2

Corrugated with straight ends for round or square design with flanging radius



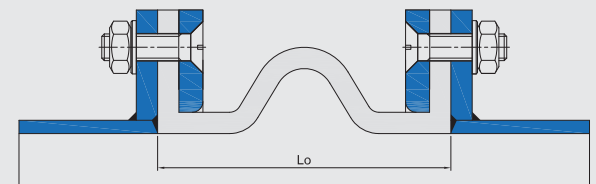
Type 64-3

Uncorrugated with flange connection for round or square design with flanging radius



Type 64-4

Corrugated with flange connection for round or square design with corrugated profile and flanging radius

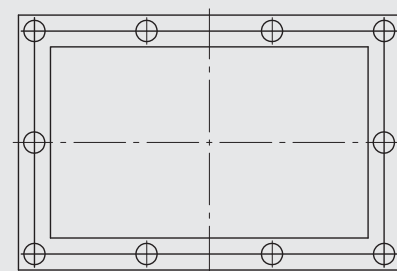
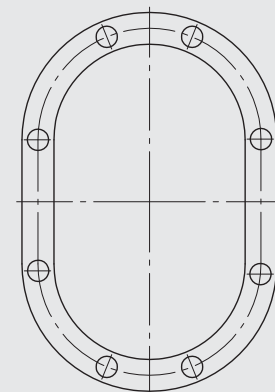
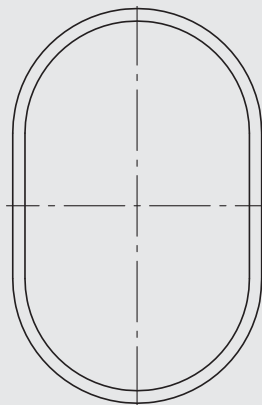
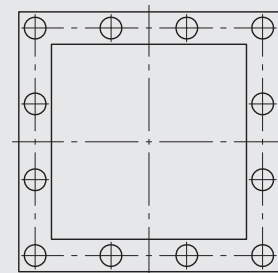
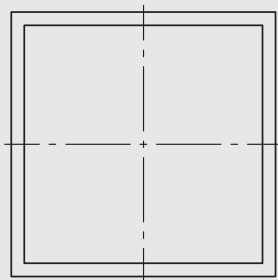
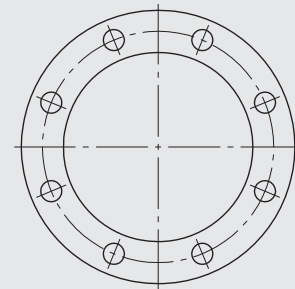
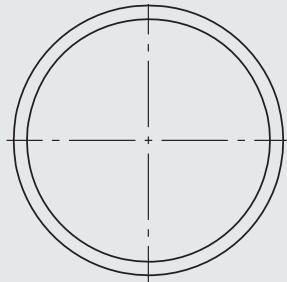


WILLBRANDT Type 64 Compensator

Cross-sections

Cross-sections with straight ends for clamp fixing and mounting bars

Cross-sections for flange mounting



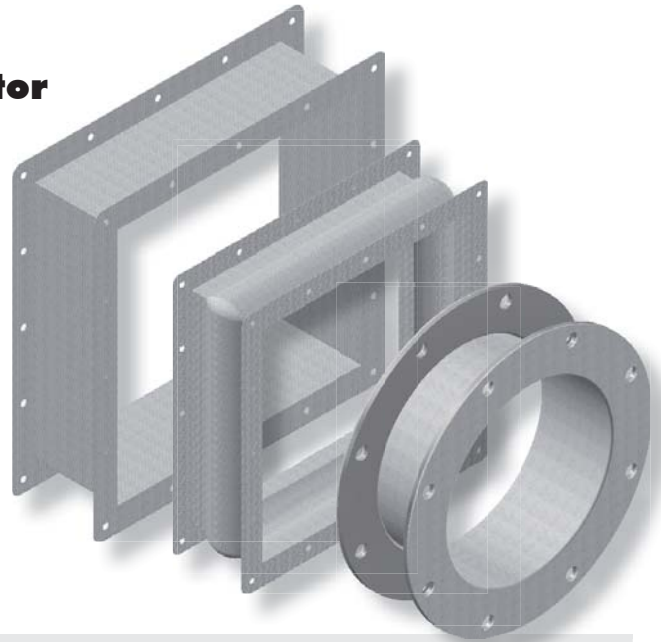
WILLBRANDT Type 400 Fabric Compensator

Type 400 series compensators are highly flexible expansion joints that can be composed of different layers in the layering process.

The layers are chosen so that when the internal temperature is high, the external emission temperature remains low.

The compensator profile is determined by the required movement absorption and the installation situation. The compensator is glued or stitched, depending on the application.

Application areas include coal, oil and nuclear power plants, blast furnaces and sinter plants, the cement industry, air-conditioning and goods-handling technology, zero-potential connection of fans, blowers and vibrating conveyors, as well as the construction of ships, apparatus and engines.



Description

Construction	<p>Depending on the internal temperature, various layers of fabric and elastomer are combined to achieve the necessary temperature reduction for the exterior. The various layers are then glued (usually with silicone adhesive) or stitched (e.g. in the case of silicone-free versions) together with a layer of reinforcement in the cuff or flange area.</p> <p>There are corrugated, uncorrugated and pleated versions in order to absorb the prescribed movements.</p>
Connections	<p>There are various mounting options to choose from in order to connect the compensators to the piping. One option is to connect to the compensator bellow flange, which is made to your individual specifications. This is the preferred option when leak-tightness is important.</p> <p>Furthermore, the compensators can be directly connected to the piping or, in the case of welded angle profiles (in high temperature applications), using clamps. For this type of mounting, the edge of the compensator is reinforced with a cuff.</p>
Movement absorption	<p>Fabric compensators can absorb axial, lateral, angular and combined movements. These can also be caused by vibration (e.g. acoustically), thermal expansion or offsetting.</p>
Pressure resistance	<p>The type 400 series is typically suitable for an operating pressure of 0.5 bar. Higher pressure requirements have to be subject to a check.</p>
Temperature range	<p>The type series can withstand temperatures of up to 1200°C, depending on the construction and layering.</p>
Special accessories	<p>Ducting and steel structures, guide sleeves, protective hoods and potential compensation can also be offered upon request.</p>
Design	<p>The design of the compensators is based on the application criteria, medium, temperature and pressure. A number of different constructions are available for this purpose.</p>

WILLBRANDT Type 400 Fabric Compensator

Medium

The combination of the medium, the operating temperature and the operating pressure determines the choice of material for the construction of the compensator. The following media characteristics should be taken into account:

- Raw or pure gases
- Proportion of solids (loading and particle size)
- Chemical composition (acid, alkali, solvents, radiation exposure)
- Flue gases from coal, oil and gas firing
- Dry or moist media
- Canal irrigation or cleaning

For flow rates greater than 30 m/s, we recommend using baffles to prevent turbulence in the area around the compensator.

Note

Depending on the place of installation on the duct (e.g. after an elbow, or if it is installed horizontally, vertically or at an angle), the compensator may be subject to wear by solids in the medium. The amount and particle size of the solids have an influence on the choice of material.

The use of baffles is also recommended if there is a high concentration of dust, soot, flue ash or similar solids.

Temperature

With regard to the design of the compensator, essential criteria for the selection of the bellows material other than the operating temperature include the maximum failure temperature and the design temperature.

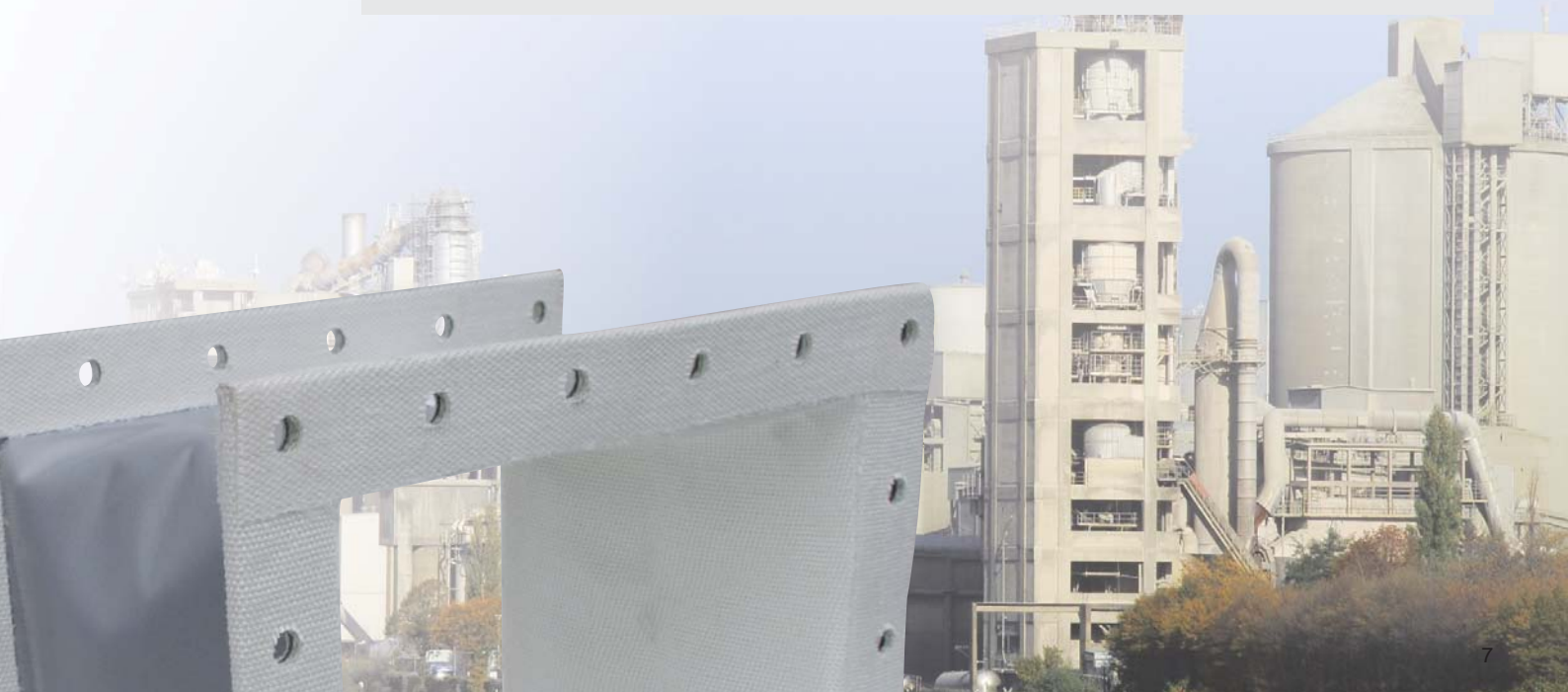
The media temperature determines whether the compensator can be installed on the duct level, or whether a gap must be created between it and the hot medium via a duct angle.

High ambient temperatures (e.g. near a boiler or housed compensators) are also a criterion for the design.

Note

External insulation of the compensators is recommended if there is a danger of the temperature falling below dewpoint or if media temperatures reach 220 °C. Otherwise condensation may lead to corrosion damage on the duct or leakage in the compensator connection area.

As condensate represents additional chemical loading, temperatures below dewpoint must be specified, particularly during process-related starting up and shutting down or during partial-load operation of the system. Temperatures below dewpoint influence both the material and design of the compensator.



WILLBRANDT Type 400 Fabric Compensator

Pressure

It is not only the temperature, but the pressure that determines the material and design of the compensator.

At higher pressures we recommend using flange compensators, as their clamping tightness makes them suitable for higher leak-tightness.

It is also necessary to check whether additional construction measures (e.g. the use of overpressure or vacuum support rings) are required.

If pressure fluctuations or pressure surges are expected, they should be specified.

Layered construction

Insulating layers

The purpose of the insulating layers on the inside is to reduce the media temperature before it reaches the sealing layers.

Insulating layers consist of glass fibre fabric or glass felt, ceramic fabrics or ceramic fibre mats, or a combination of these materials.

Sealing films

For almost all applications, sealing films consist of PTFE film and assume the actual sealing function of the compensator. The PTFE film may also be laminated onto glass fibre fabric on one or both sides, and ensures the necessary leak-tightness of the compensator for this material design.

PTFE is chemically resistant to almost all media.

In rare cases with extreme temperature requirements or high ambient temperatures, stainless-steel foils are used. In contrast to PTFE film, which is welded to be gas-tight, stainless-steel foils are simply clinched and are therefore only suitable for low-level leak-tightness.

External layer

The external layer is usually a silicon-coated glass fibre fabric or, in the event of harsh environmental conditions, a PTFE-coated glass fibre fabric. This layer is the pressure carrier and provides mechanical protection against external damage and weather effects.

The choice of the external layer also depends on whether the compensator can be delivered in a closed state, or if it needs to be designed with a site connection.

Materials (selection)

Insulating layers

Glass fibre fabric	up to approx. 550 °C
Thermo fabric	up to approx. 700 °C
Ceramic fibre fabric	up to approx. 1250 °C

Sealing films

PTFE film	up to approx. 260 °C
Silicone film	up to approx. 180 °C
Stainless-steel foil	up to approx. 600 °C

Outer layers

Glass fibre fabric with silicone coating	up to approx. 180 °C
Glass fibre fabric with PTFE coating	up to approx. 280 °C
aramid fabric with silicone coating	up to approx. 150 °C
Polyester fabric with hypalon coating	up to approx. 120 °C



WILLBRANDT Type 400 Fabric Compensator

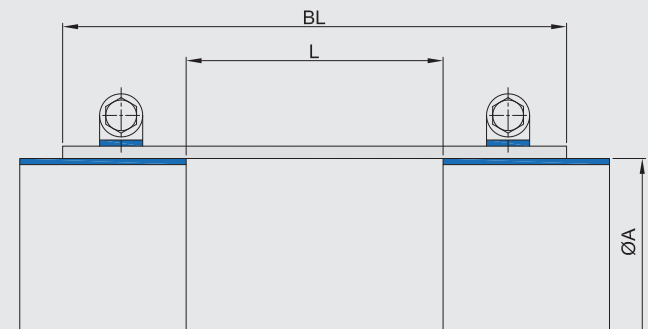
Examples of cross-sections for type 400 fabric compensators and field data. Duct dimensions can be freely selected.

The field data represents typical values and may fluctuate due to medium load or pressure.

Type 401 Uncorrugated hose compensator with straight ends for clamp fixing

Approx. movement absorption:

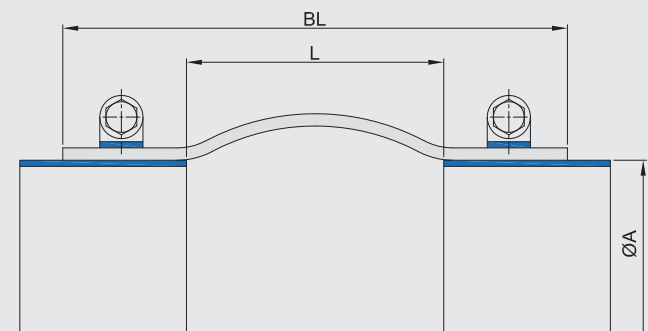
axial: 0.10 - 0.30 x gap
lateral: 0.05 - 0.20 x gap



Type 402 Corrugated hose compensator with straight ends for clamp fixing

Approx. movement absorption:

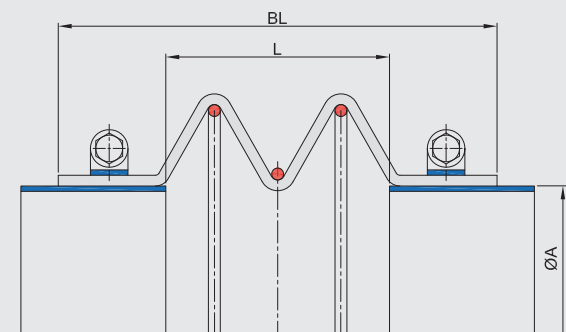
axial: 0.20 - 0.50 x gap
lateral: 0.10 - 0.20 x gap



Type 403 Pleated hose compensator with straight ends for clamp fixing

Approx. movement absorption:

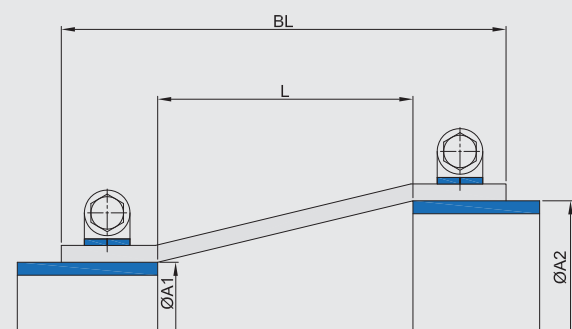
axial: 0.30 - 0.50 x gap
lateral: 0.15 - 0.25 x gap



Type 404 Conical uncorrugated compensator with straight ends for clamp fixing

Approx. movement absorption:

axial: 0.30 - 0.50 x gap
lateral: 0.10 - 0.15 x gap

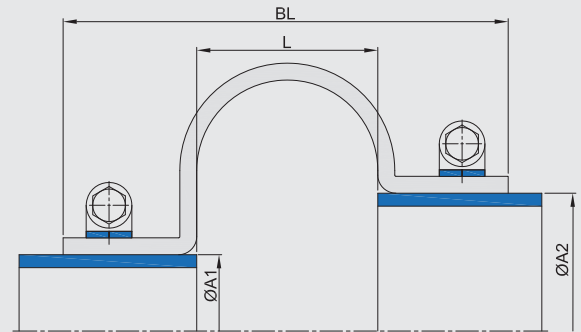


WILLBRANDT Type 400 Fabric Compensator

Type 405 Conical corrugated compensator with straight ends for clamp fixing

Approx. movement absorption:

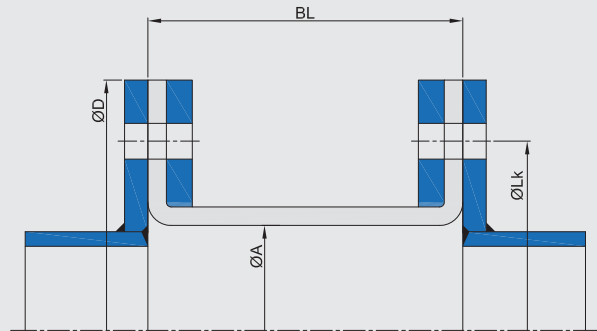
axial: 0.30 - 0.60 x gap
 lateral: 0.15 - 0.30 x gap



Type 410 Uncorrugated flange compensator

Approx. movement absorption:

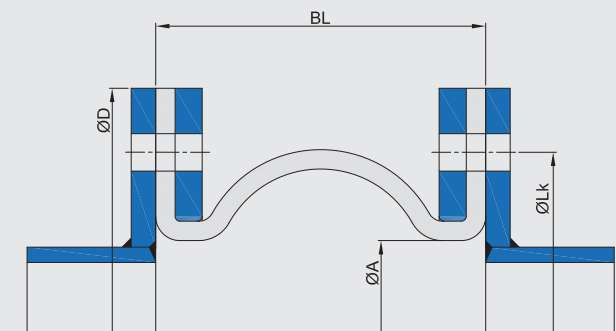
axial: 0.10 - 0.30 x gap
 lateral: 0.05 - 0.20 x gap



Type 411 Corrugated flange compensator

Approx. movement absorption:

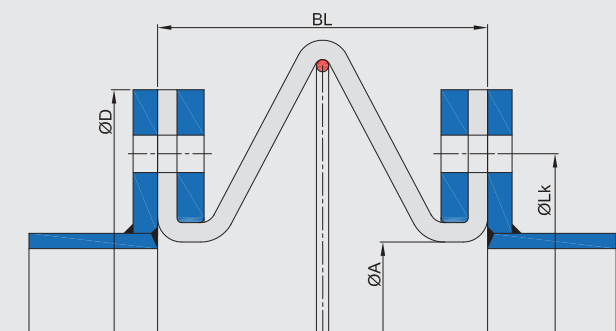
axial: 0.20 - 0.50 x gap
 lateral: 0.10 - 0.20 x gap



Type 412 Pleated flange compensator

Approx. movement absorption:

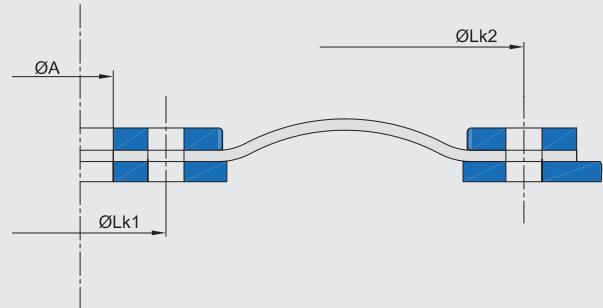
axial: 0.40 - 0.70 x gap
 lateral: 0.15 - 0.25 x gap



WILLBRANDT Type 400 Fabric Compensator

Type 413 Membrane compensator

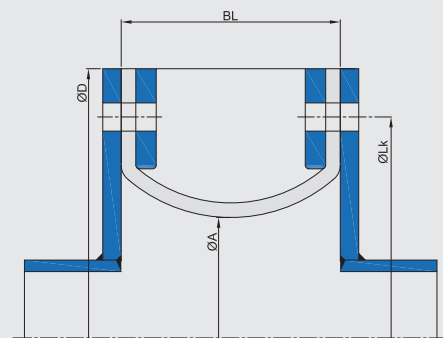
Movement absorption:
design-dependent



Type 414 Flange compensator with small internal corrugation

Approx. movement absorption:

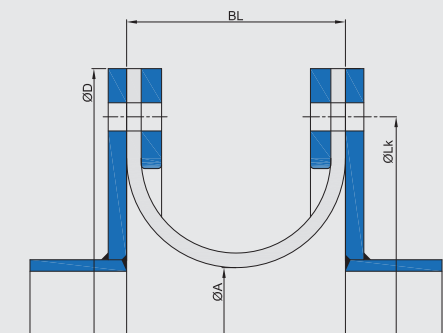
axial: 0.20 - 0.50 x gap
lateral: 0.10 - 0.20 x gap



Type 415 Flange compensator with large internal corrugation

Approx. movement absorption:

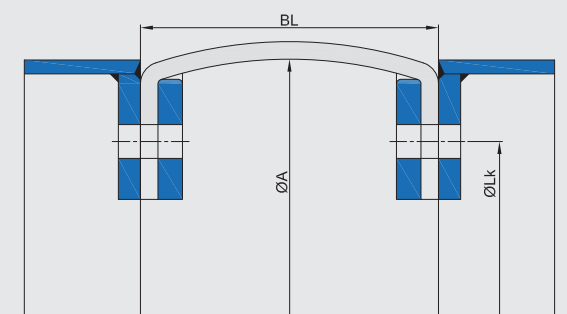
axial: 0.30 - 0.80 x gap
lateral: 0.15 - 0.30 x gap



Type 416 Flange compensator with internal flanges

Approx. movement absorption:

axial: 0.10 - 0.30 x gap
lateral: 0.05 - 0.20 x gap

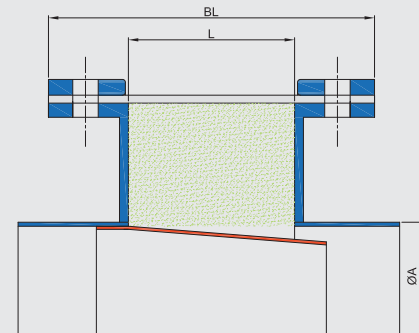


WILLBRANDT Type 400 Fabric Compensator

Type 420 **Uncorrugated hose compensator with straight ends for connecting to angled flanges using mounting bars, available with or without insulation package**

Approx. movement absorption:

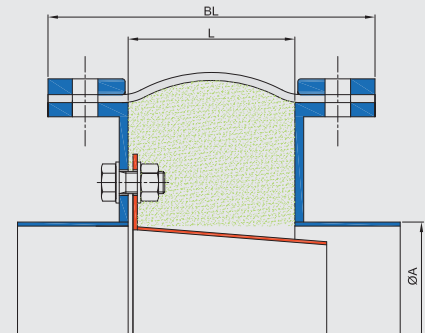
axial: 0.10 - 0.30 x gap
lateral: 0.05 - 0.20 x gap



Type 421 **Corrugated hose compensator with straight ends for connecting to angled flanges using mounting bars, available with or without insulation package**

Approx. movement absorption:

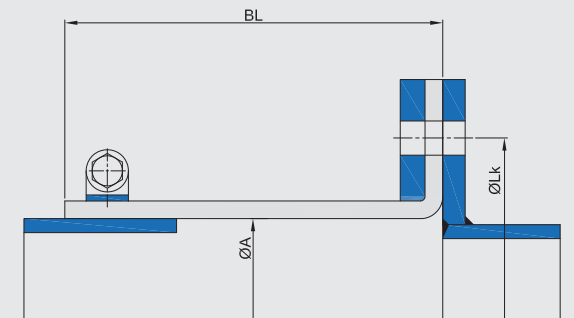
axial: 0.20 - 0.50 x gap
lateral: 0.10 - 0.20 x gap



Type 429 **Uncorrugated flange/hose compensator**

Approx. movement absorption:

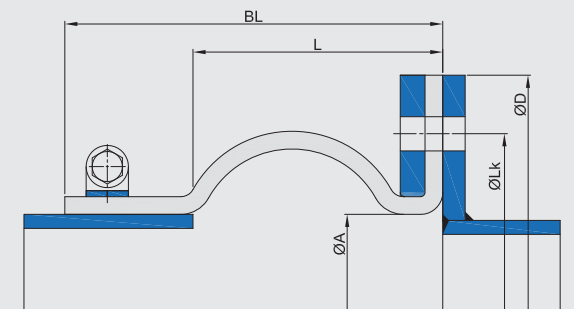
axial: 0.10 - 0.30 x gap
lateral: 0.05 - 0.20 x gap



Type 430 **Corrugated flange/hose compensator**

Approx. movement absorption:

axial: 0.30 - 0.60 x gap
lateral: 0.15 - 0.25 x gap

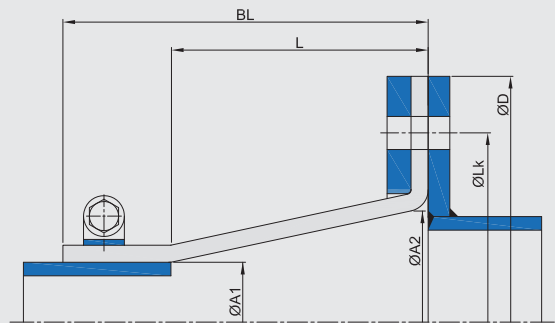


WILLBRANDT Type 400 Fabric Compensator

Type 431 Conical uncorrugated flange/hose compensator

Approx. movement absorption:

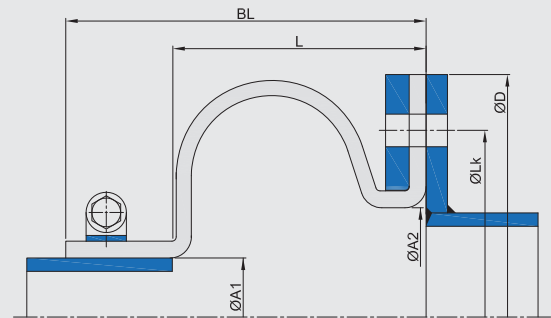
axial: 0.30 - 0.50 x gap
 lateral: 0.10 - 0.15 x gap



Type 432 Conical corrugated flange/hose compensator

Approx. movement absorption:

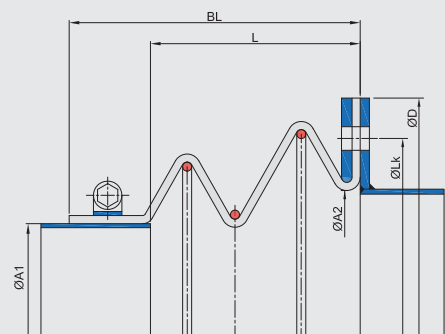
axial: 0.30 - 0.60 x gap
 lateral: 0.15 - 0.25 x gap



Type 433 Pleated flange/hose compensator, conical or for equal cross-sections

Approx. movement absorption:

axial: 0.40 - 0.70 x gap
 lateral: 0.15 - 0.25 x gap



WILLBRANDT Type 400 Fabric Compensator Operation and Installation Instructions

Storage

WILLBRANDT fabric compensators are delivered well-protected and in appropriate packaging. Until the time of installation they must be stored in a dry, clean place, out of direct sunlight.

Preparations for installation

The following steps should be taken before installation:

- Packing materials should only be removed immediately before installation.
- Transportation frames should only be removed after installation, but before commissioning.
- Dimensions and bolt holes for floating and ducting flanges should be checked to ensure they correspond.
- All edges and surfaces should be checked for burrs and contamination.
- Installation dimensions should be checked. Installation should be in compliance with the construction specifications, particularly with regard to zero-potential installation with no lateral deflection and the correct installation length.
- Components not supplied by WILLBRANDT (e.g. baffles, floating flanges) should have no sharp edges.

Edges that may come into contact with the compensator must have a round-off radius of at least 3 mm or a radius chamfer.

Installation

WILLBRANDT fabric compensators should be installed at the end of the piping to prevent damages resulting from work such as welding, etc.

The compensator must also be protected from sharp edges and tools during installation.

Due to the wide variety of design options (shape and material), we advise that you refer to our Operation and Installation Instructions and our Instructions for Connecting Fabric Compensators before installing and especially before connecting fabric compensators.

If necessary, please contact us!

Service and maintenance

Unlike rigid piping systems, compensators are subject to wear and tear, and have a limited service life. Routine inspections (e.g. visual inspection of screws) should be performed depending on load and operating conditions or every 3 months at the minimum.

Fabric compensators must not be painted because paint solvents may damage the surface coating of the compensator. Caustic cleaning agents and cleaning agents containing solvents should therefore also be avoided.

Important information

Fabric compensators are not load-bearing elements of the piping. The correct positioning of guides and fixed points should therefore be strictly observed.

If there is a danger of confusion, the inside and outside of the fabric compensators are labelled in the factory. This labelling must be observed.

- Be sure to provide adequate protection against welding sparks and sharp objects when working on nearby ducts.
- Pre-assembled installation kits should be lifted only using the designated lifting straps.
- Compensators should be lifted only using several suspension brackets or plates for support.
- If the stipulated installation dimensions are not adhered to, any warranty claim becomes invalid.
- PTFE foils become brittle at low temperatures. Please handle fabric compensators with PTFE foil carefully at temperatures below 10°C. Installation at such low temperatures should be avoided.
- Any glues used for installation must be suitable for both the compensator materials and the working temperatures, otherwise there is a danger of fire!

Note

The installation height (BH) is determined so that the compensator can be installed with zero potential and can absorb any movement.

WILLBRANDT Type 64 Compensator Operation and Installation Instructions

Compensator installation should not begin until all work on the pipes and flanges is complete and all anchor points and supports have been mounted. This is to prevent damage to the compensator from welding sparks, objects with sharp edges, etc.

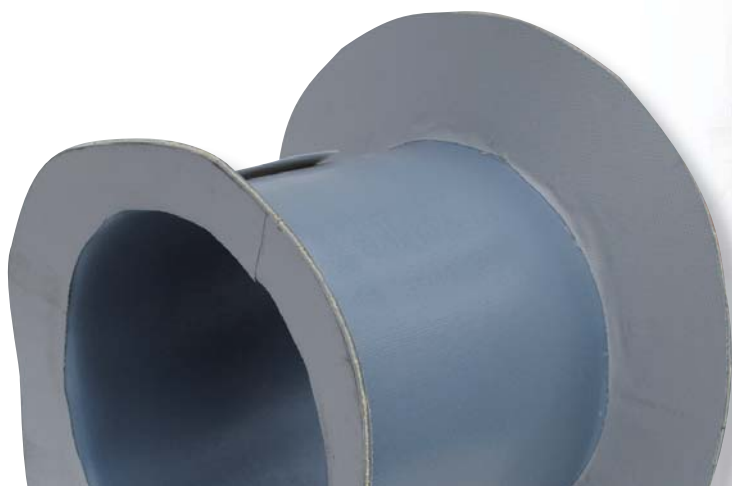
As type 64 compensators are made from extremely flexible material, their durability is dependent on careful and correct installation.

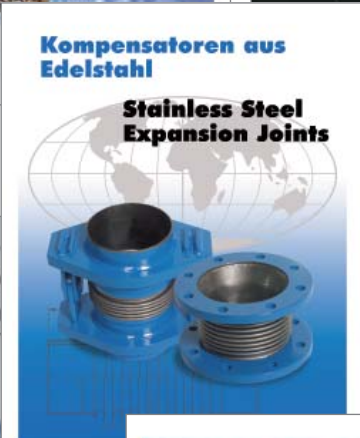
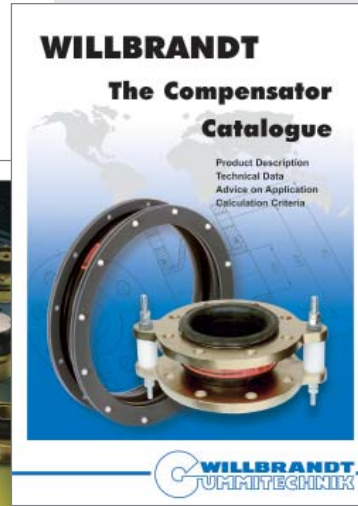
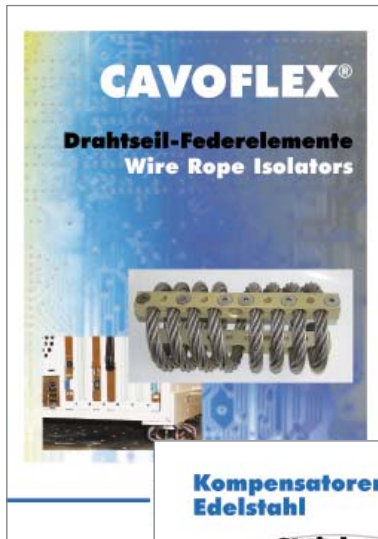
- Avoid sharp edges and folds.
- Ducting/backing flanges and other steel parts included in the scope of delivery should be inspected and checked against the drawings. The bolt holes in each flange should be symmetrical.
- It is advisable to use a support plate or an inner frame when lifting the compensator. It is preferable if the compensator is pre-assembled on the ground before being lifted with floating flanges and baffle (if included in the scope of delivery).

All other aspects of installation should be accordance with our general installation instructions.

Warning

Appropriate safety measures should be taken if a compensator defect presents a risk of personal injury!





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 Noise Protection Systems
 Profiles and Moulded Parts
 Power Transmission Elements
 Special Sealings
 Rubber for Ship and Harbour

