

FABRIC COMPENSATORS

CERTIFICATE

VGB POWERTECH

The Quality Association for Fabric Expansion Joints
in cooperation with the
VGB PowerTech e.V.
confirms herewith

KEMPCHEN Dichtungstechnik GmbH
Im Waldteich 21
46147 Oberhausen

the authorization to use the

RAL
GÜTEZEICHEN
Expansion Joint

Quality Mark RAL-GZ 719

The Company fulfils the RAL quality requirements
since 1993. The Certificate is valid until
31 December 2019

Quality Association for Fabric Expansion Joints
Management

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RWTÜV

Gesch.-Nr.: 2.1.1-316/92
Auftr.-Nr.: 430566 01

Essen, 30.12.1992
G3/Dua

Bescheinigung
über eine Helium-Dichtheitsprüfung an Probekörpern eines
Gewebekompensators

Bestandort:
Kempchen & Co GmbH
4200 Oberhausen

Prüfung:
Ronden mit 220 mm Durchmesser
Gewebebau:
- Glasgewebe T 1000 mit 0,4 mm PTFE
- lose 0,2 mm dicke PTFE-Folie
- Glasgewebe T 1000 mit 0,2 mm PTFE
Dichtungsmaterial:
- APLAS-TEF mit 4 mm Dicke

TA Luft bzw. Genehmigungsbefehl des LOBA NRW
für den Neubau der Kokerei Kaiserstuhl III

Prüfstand der Kokerei Kaiserstuhl III

in der Zeit vom 13.03. bis 18.09.1992

VGB
VEREINIGUNG DER GROSSKRAFTWERKS BETREIBER E.V.

Untersuchungsbericht

Auftraggeber: Fa. Kempchen & Co, Oberhausen

Auftrags-Nr.: ...

Auftragsgegenstand: Prüfbericht (K...)

VGB-Institut: Labor Werkstoffte...

Bearbeitungs-Nr.: 2462/93

Datum der Bearbeitung: 28.01.92

VGB
VEREINIGUNG DER GROSSKRAFTWERKS BETREIBER E.V.

Prüfbericht

Dichtheitsprüfung eines U-Form Kompensators
G.L.1992
Kempchen & Co, Oberhausen
Kompensator Typ 110 gem. Anlage 1, Blatt 1
wegge. vgn

a) Dichtheitsprüfung mit schaumbildender
Flüssigkeit in Anlehnung an das Dechema
Informationsblatt ZFP 1, Beiblatt 2,
Ziff. 2.2

b) Druckverlustmessung über 6 h mit einem
Manometer nach DIN, Kl. 1.6.
Meßbereich 0 - 250 mbar (Skalenteilung
5 mbar).

Bau: Gemäß Anlage 1, Bilder 1, 2, 3.
Kompensator wird zwischen 2 Stahlplatten auf eine Prüfvorrichtung
aufgebaut mit zwei Klemmfanschen mittels je 36 Schrauben
die in den Klemmbereichen groß
und mit Trennmittel bestrichen. Der
für der Stahlplatte angebracht
teilt und über ein Manometer gemessen

150mm φ x 20 mm mit 36 Bohrung
φ, Anlage 1, Bild 3

50 mm φ, Profil 50 x 12 mm mit Vier-
schern, 17,5 mm KIL,
Schrauben M 16 x 70

Druckfeder, 55 mm φ
Druckfeder, 30 mm φ

Manometer nach DIN Kl. 1.6
Meßbereich 0 - 250 mbar
Skalenteilung: 5 mbar

Empfänger: Rivafluor T.

RAL
GÜTEZEICHEN

Weichstoff-Kompensator

Weichstoff-Kompensatoren

Gütesicherung
RAL-GZ 719

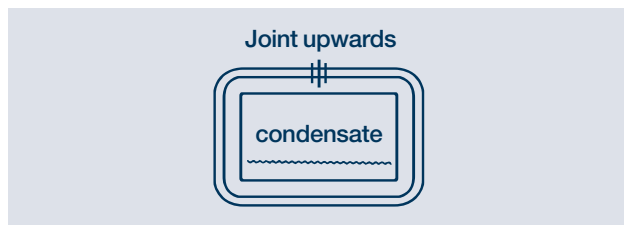
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7.0 Assembly and repair instructions

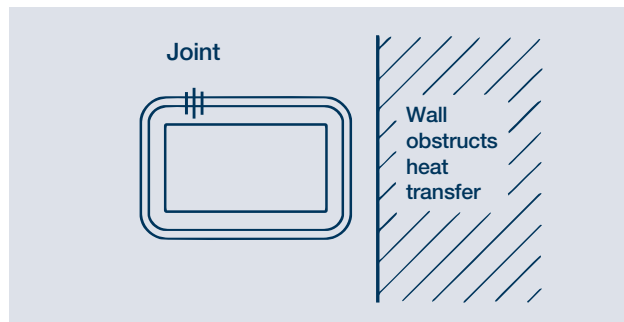
7.1 General instructions for closing a prepared site joint

- » Take out the compensator and check which side is the inside. The outside is marked as such.
- » Make sure the pass tube has no sharp edges. Any sharp edges must be refinished.
- » Because the joint is naturally the weakest spot on the compensator, it should be placed in an area that can be expected to be exposed to low mechanical and thermal stress.

In horizontal piping and ducting at risk for condensation formation, the joint should be placed upwards

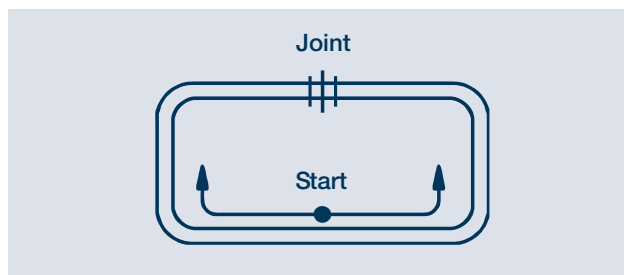


If you anticipate trapped heat because unfavourable arrangement of objects obstructs free convection, or a radiation exchange is taking place, the joint should be placed on the area of the compensator which can be expected to remain coolest.



Check to make sure that the counterflanges are properly rounded.

- » Begin assembly a compensator with a joint with screwed flanges in the middle of the compensator on the side across from area where the joint is to be placed, and continue to the open ends.

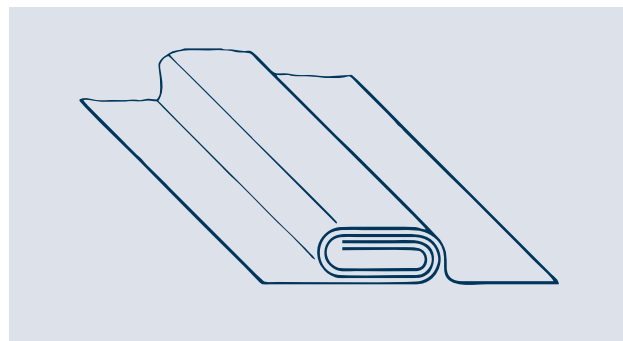


We recommend leaving approx. 1/2 m unscrewed to allow for proper freedom of movement.

- » Now overlap the fabrics alternatingly. Sew the fabrics together, beginning from the inside. Do the same for any wire weave or rock wool layers.

Be especially careful when sewing together the sealing layers.

- a) Glue the PTFE foil with Siemapren 1500 F(N) according to the illustration, fold, and interlock or weld in place

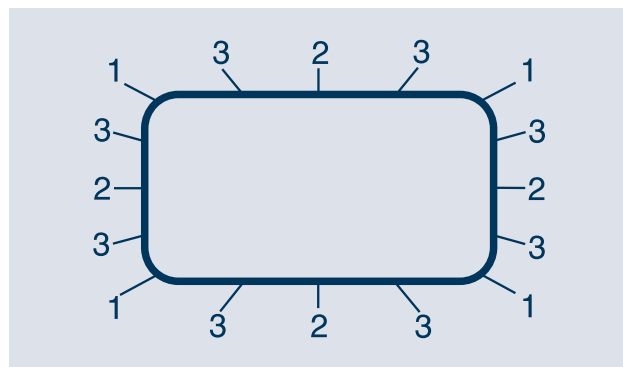


- b) Glass fibres with a sintered PTFE layer and polyester fibres with viton coating are painted with viton solution B and sewn together.

Silicon-coated glass or polyester fibres are painted with silicon paste and sewn together. Finally, all stitches are sealed with viton solution and the compensator is mounted.

When assembly is performed by a Kempchen technician, the PTFE foils are professionally welded, and the sealing layers are welded with sintered PTFE foils using special site joint preparations.

- » The continuous band compensator should be mounted according to this sketch:



Begin assembly on corners. 1. Tighten one screw in the middle of each corner 2. Then each in the same way 3 etc. This method eliminates small waves or folds.

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7.2 Special instructions for closing a prepared site joint and repairing the compensator of a type 110 or 120



Fibre construction:

- 1 Fibre glass layer with sintered PTFE foil
- 1 PTFE-foil layer, loose
- 1 Fibre glass layer with sintered PTFE foil

Inner and outer edge reinforcement, fibre glass strip

1. Loosen approx. 200 mm of the edge reinforcement. Cut the first inner layer to the proper length, leaving a 100 mm overlap. Apply adhesive to both sides and let dry approx. 4-5 minutes (1 + 2). Apply pressure with a hand roller if necessary (3).

2. Place a bent needle with thread approx. 20 mm from the edge. Make stitches 20 mm wide 10 mm apart across the entire width. Tie the ends of the thread into knots, create 2 seams (4 to 7).

3a. Stack the PTFE foils atop one another, staple the end and make multiple folds, approx. 20 mm wide, staple the final fold on both sides to prevent the foil from sliding (8 to 10).

3b. Weld the foil with a welding apparatus, if a foil welding apparatus is available on site, attach welding film to the ends of the foil (11).

Line up the other side without the welding foil precisely and staple. Set the welding tongs to 60 with the control device, press the button wait 20 seconds, release the tongs. Trim off any remaining welding film. Fold the welded foil once again (12+13).

4. Outer layer: with the outer layer turned away from the inner layer, paint both sides with adhesive and glue like the inner layer (14).

Important for the outer seam: A guard or thick PTFE foil or similar material must be inserted between the fabric layer and the PTFE foil to prevent the PTFE foil from being damaged by the needle (15).

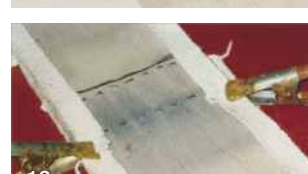
Press over the glued portions with a roller (16).

Create seams as in the inner layer. Paint the seams with multiple layers of viton preparation to close the stitch holes of the seam. Make multiple paints until a closed film accumulates (17).

Stretch the reinforced edge to its exact length, lay the parts flush against one another and glue approx. 20 mm offset from the fabric seam (18).

Attach the inner edge reinforcement in the same way. Finished seam connection (19).

Control device, welding tongs, required equipment (20).

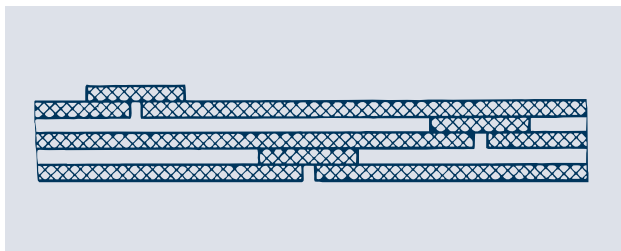


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7.3 Repairing a compensator by separation and reconnection, if assembly in continuous form is not possible

This is a difficult task, because unlike the prepared joint, the separation point does not allow for easy overlapping. This method should only be used if the pass tube cannot be dismantled or other operating conditions prohibit assembly in an continuous condition. For this reason, one must thoroughly consider whether detaching and switching the pass tube and re-welding after partial assembly of an continuous compensator, for instance, is preferable to separating the fabric compensator. If the decision has been made to separate the compensator, the separation must take place layer by layer. Additional strips of material of the same or higher quality must be placed under respective separation points. Then the separation points must be connected to overlapped joints. Section 7.1 applies to the individual steps of the process.



7.4 Repairing mechanical damage or burn holes

In order for a repair to be successful, the ripped or cutted material aside must have sufficient stability.

- » The damaged parts of the fabric are unfolded until the innermost layer is reached. In some circumstances it may be necessary to expand a small tear for this purpose.
- » The innermost layer - wire mesh or textile fabric - is sewn with wire or special thread.

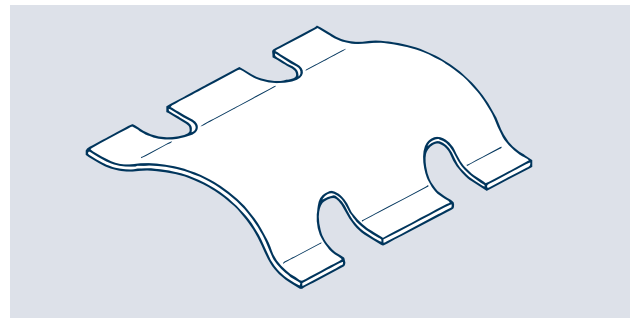
Any insulation is returned to its proper position and covered with a proportionate piece of fabric.

- » Next a piece of the fabric layer in equivalent size is placed in front of the sealing layer. The sealing layer is painted with viton adhesive and glued to the piece of fabric, and a proportionate piece of fabric is sewn onto the sealing layer as well. The seams are in turns sealed with Viton.
- » Any additional layers of damage are repaired as described above.

7.5 Emergency assistance

When damage occurs during operation and high temperatures prohibit the steps described in 7.3, it may be helpful to place a sheet metal strip over the site of the damage, particularly in band- or U-shaped compensators.

Loosen the counterflange and clamp a strip of sheet metal cut according to the illustration below in the screw hole area underneath. Attempt to recreate the shape taken on by the compensator. Seal the area between the metal strip and the compensator's outer skin with viton adhesive or silicon past



This type of repair presupposes that the position of both sections of piping or ducting have changed only slightly. However, this repair will generally allow for continued operation until the next shut-down.

8.0 Storage, installation and assembly instructions

8.1 Storage

Soft material compensators are sensitive to damage during transport and must therefore be transported properly. Be careful with sharp edges and pointed objects during transport!

Compensators must be properly stored until the time of installation. It is recommended that they be stored in climate-controlled metal trailers, from which they can be transported to the assembly site. The storage area must be heated at outside temperatures below 5 degrees Celsius.

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When immediate assembly is not possible and the compensators must be temporarily stored at the assembly site, it is important that the compensators be protected from wet conditions, e.g. covered with a plastic tarp. When on-site, the compensators must be carefully stored on wooden palettes and protected from damage from assembly work (mechanical protection) or general construction site traffic.

Compensators that have become stiff from storage at low temperatures may not be used in this condition. They must be brought to room temperature in order to regain flexibility.

8.2 Installation

After installation, the following factors must be taken into consideration, particularly in the areas above the compensator:

- » general protective measures during assembly work
- » temperature protection (welding work)
- » mechanical protection (welding and grinding work)

It is recommended that compensators remain protected if possible until initial operation.

Protective plates placed next to or above the compensator can obstruct heat radiation during operation. Normally, compensators may not be insulated. The same applies to the flanges, as a large portion of heat is transferred over the flanges. (Exceptions: Compensators with heat insulation or weather protective shields specially constructed for this purpose).

Fabric compensators may not be coated with paint or varnished. In certain types of compensators, the solvent can attack and destroy the compensator. Also, a varnish layer represents an unallowable insulation. There should be no sharp edges on the pass tube; any sharp edges must be repaired. The counterflanges must also be properly rounded.

8.3 Assembly

- » The steel flanges are to be inspected for smooth welding seams and rounded edges and any repairs carried out.
- » Bolt holes in the steel parts must be free of burrs
- » The flange misalignment/the distance between the flanges must lie within the allowable tolerance
- » Lay out the compensator and check which side is the inner site. The outside is marked as such!

O With elastomer compensators and fabric compensators, with elastomer edge reinforcement, use the separating agent provided. For directions for use, see the package.

The freedom of movement required for absorption of axial and/or radial movements is built in to the compensator. When installing, make sure that the compensator is pre-compressed so the installation length (LE dimension) is retained.

The joint/seam must be placed on the point of the compensator exposed to the least mechanical or thermal stress! In horizontal pipelines at risk for condensation formation, the inner seam must be placed at the top (12 o'clock) or on the side near the top - 2 or 10 o'clock. Stop assembly if the ambient temperature at the assembly site reaches values below 5 degrees Celsius.

It may be possible to partition off the ducting in the compensator area and heat the inside to temperatures > 5 degrees Celsius. Always check the outside temperature during assembly in the winter!

8.4 Notes on screw assembly of closed compensators

With screwed flanges, begin assembly of the compensator by placing one screw on each quarter of the circumference (C:4). The remaining sections are then halved again. The distance of 1 to 4 mm between the clamp frames is to be bridged by a shim of 0.5 mm in width. Then the screws may be tightened at half bolt force.

The full starting torque is to be applied to each screw in the second round of screwing. Important: make sure the intended surface pressures are attained! A precondition for this is that the ducting flange and clamping flange meet the aforementioned requirements.

When closing the ends of the band compensator, it is imperative to follow the instructions provided with the compensator.

The bolt screws are to be mounted with their head to the compensator so the remaining screw protrusion do not damage the compensator. After the initial heat phase, or if no initial heat phase is possible, re-tighten the screws to the required torque after 24 hours.