Handling and installation instructions for stainless steel expansion joints

According to the Pressure Equipment Directive 2014/68/EU / DIN EN 30681

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Expansion joints consist of a metal bellows and connecting parts attached on both sides in the form of pipe sockets, flanges or special connections in steel or stainless steel. The metal bellows of the expansion joints are made of several **thin-walled**, interlocking sleeves.
The material used for this is rust- and acid-resistant stainless steel or special material with high corrosion or temperature resistance (e.g. duplex stainless steels, nickel-based alloys, etc.).

Intended use

Expansion joints should only be used for their intended use. The necessary parameters as well as the required design can be determined from the following list.

https://www.flexomat.de/fileadmin/user_upload/Flexomat/PDF-Dokumente/flexomat_typschluessel.pdf

In addition, the technical documentation, the manufacturer's declaration, the declaration of conformity and the marking on the expansion joint apply.

Notes on transport and storage

For **transport**, the expansion joint, in particular the metal bellows, must be suitably protected against any damage. Upon acceptance of the goods, they must be immediately inspected for damage in transit and reported immediately (note on the forwarder's delivery note as well as damage patterns). Transport and assembly locks as well as the threaded rods used to clamp the expansion joint must not be used for lifting, aligning or fixing.

For the **storage** of the expansion joints, particular attention must be paid to the following:

- cool, dry and dust-free
- Effects of corrosive media must be avoided
- Do not stack expansion joints

The packaging materials used by Flexomat GmbH are intended for transport, i.e. for a short period of time. For long-term, permanent storage of the expansion joints/metal bellows, the transport packaging is notsuitable. Damage can occur, especially in the case of storage under the influence of the weather (see coatings above this paragraph). No warranty can be given for any damage caused by improper storage.

Installation instructions

When installing expansion joints, care must be taken to ensure that they can be installed stress-free without additional external influences.

Twisting and inadmissible misalignment of the expansion joints must be avoided during installation.

Prestressing of the expansion joints is only possible for the movements (axial, lateral, angular) for which they were designed and designed.

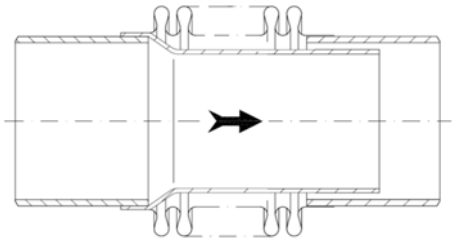
For installation, the protection of the shafts must be maintained in a suitable manner against any damage (e.g. welding spatter, slings or tools). Foreign bodies between the shafts, both inside and outside, are not permitted.

Transport and assembly locks must not be removed before installation. If there are no mounting locks, the expansion joint must be locked in place during installation. Before commissioning, it is essential to dismantle the safety components marked in yellow. When the expansion joint is disassembled, it must be locked in place again.

The transport and assemblysafeguards are **not** suitable for locking the expansion joint for a pressure test. For this purpose, separate structural measures must be agreed with the manufacturer.

Transport and assembly locks are **not** to be used as attachment points for mounting equipment. If not specified, suitable points must be inquired about at Flexomat GmbH.

When installing expansion joints with **an inner guide tube**, the **direction of flow must be taken into account**. In this case, the outlet opening of the guide scope depends on the direction of flow. The **flow direction arrow** is marked on the nameplate and indicates the direction of flow.



Planned **insulation** in the area of the expansion joint is to be discussed with Flexomat GmbH.

When **welding** , care must be taken to ensure that no electrical currents are passed through the metal bellows. The metal bellows must be adequately protected against weld spatter.

The expansion joint must not be used for a grounding pipeline.
In the case of a live line, a separate grounding connection must be provided at a suitable location (e.g. earthing tab on the flange).

Pressure and leak tests should only be carried out once fixed and plain bearings have been properly installed and checked. The test pressure is only **to be applied when cold without** lifting load. If necessary, the expansion joint must be locked in place to prevent elongation and buckling.
By means of suitable technical measures, stress **beyond the test pressure** must be avoided at all costs.

Pressure surges as a result of water hammer or switching operations that can lead to bursting (overpressure) or implosion (negative pressure) **are not permitted.**

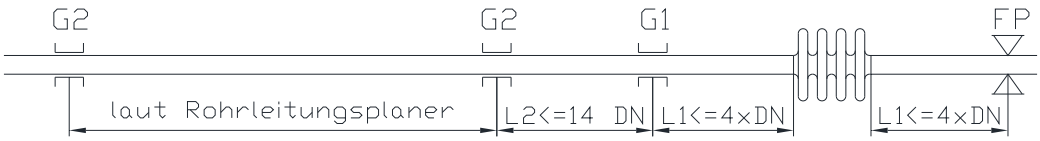
The fluid group **chosen for the classification of pressure equipment according to DGRL2014/68/EU** must be complied with **in the operating state of the expansion joint**. The performance data of the expansion joint must be compared with the operating and test conditions of the system.

In the case **of unknown** fluids or **fluids not named .dem by the manufacturer**, the suitability of the component and all materials for the actual operating conditions must be checked **before commissioning**. The responsibility for this inspection lies with the operator of the facility.

Pipe guide distances

Between 2 fixed bearings, only 1 expansion joint needs to be installed. The expansion of this distance must be smaller than the maximum possible strain capacity of the expansion joint.

The expansion joint must be mounted as **close as possible to a fixed bearing** (L1 <= 4xDN). In this case, only one plain bearing on the opposite side of the expansion joint is required.



G1 and G2 => Plain bearings FP => fixed bearings

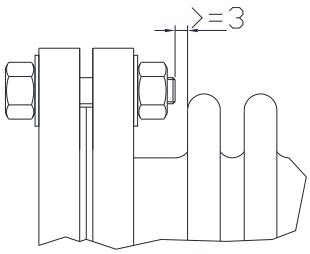
The cables must be **aligned** and well routed so that the expected movements can be optimally absorbed by the expansion joint.

Missing plain or fixed bearings of the systems cannot be replaced by external protection or internal guide pipes.

Installation of flange expansion joints

When mounting the expansion joints with flanges, care must be taken to ensure that the **shafts** of the metal bellows are supported by the tools and fasteners used (e.g. wrenches, screws, hexagonal nuts, etc.) **will not be damaged**.

When installing the expansion joint, a **minimum distance of 3mm** must be maintained between the end of the lanyard and the bellows flank. If this is not possible, the use of a **shorter screw** with a hexagonal nut, for example according to DIN 936 (low form) or the installation of an **additional washer** on the part of the screw head, should be checked.
Expansion joints with fixed flanges must be installed aligned with the connection flanges of the pipeline. Twisting **/ torsion** of the metal bellows during assembly and operation is **not permitted**.



Notes on flange design / flange mounting for flanges with reduced blade thickness or special flanges:

The flange design is carried out in accordance with the current editions AD2000 B7 and AD2000 B8 as well as the component and operating parameters specified by the operator / dealer at the time the order is placed.

If no technical parameters are known for the flange connection, the following values are assumed by the manufacturer for the calculation:

- Loose flange: flange type undivided, smooth
- Fixed flange: flange type selection + internal gasket
- Seal: Expanded graphite with metal inlay (Type 39 n. Dimy- Calculation program)
- Screws are not tightened
- no screw calculation
- without additional loads

When installing the expansion joint, care must be taken to ensure that assembly-relevant values are adhered to.
Should deviations from the agreed component and operating parameters as well as the values assumed by the manufacturer occur, it is the responsibility of the operator / dealer to carry out a new flange inspection and any corrections or to have them carried out

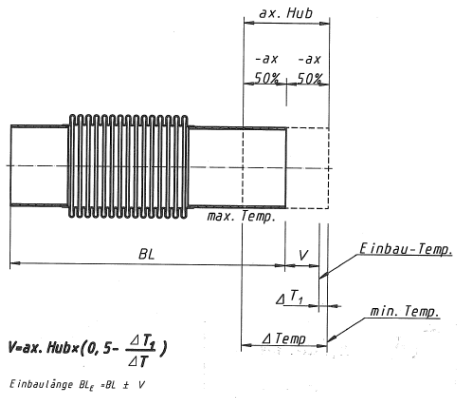
Note on the gasket to be used:

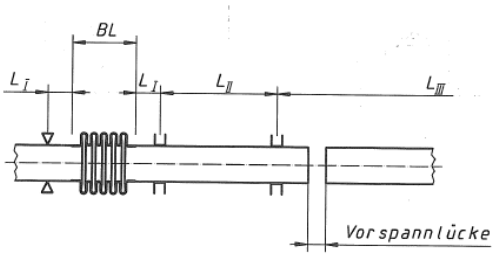
If no seal has been specified by the customer at the time the order is placed, the manufacturer will accept a seal from Table 1 (AD2000 B8 edition 2017) that matches the compression rating of the expansion joint in accordance with Section 8.2 AD2000 B8 (2017 edition). A separate flange calculation is therefore not necessary, even in the case of flammable or toxic media (AD 2000 B7 edition 2017). Deviating seals are indicated on the component drawing. When installing the expansion joint, it is important to ensure that if no specific seal is specified on the component drawing, a gasket suitable for the compression rating of the expansion joint is used in accordance with Table 1 (AD2000 B8 Edition 2017). If a different seal is used, it is the responsibility of the operator/dealer to carry out a flange inspection or to have it carried out.

Prestress, installation length and torsion

The installation length depends on the operating conditions (usually preload required; EBL > BL).
The expansion joint, **based on its nominal length, absorbs 50% of the stroke movement** in the pressure and pull directions. As a result, the expansion joint for installation in the cold line must normally be stretched by 50% of the stroke.

When used as **vibration** or silencers, the expansion joints must be installed **without preloading**, installation length [**EBL] = overall length [BL].** The maximum permissible vibration amplitude is **≤ 5%** of the nominal one-sided motion for 1000 load cycles. In order to avoid further movements, the damping element must be mounted as close as possible to the oscillating unit. In order to avoid the danger of oscillating mass and thus natural resonance, a self-sufficient fixed point or a self-sufficient guide bearing must be placed directly behind the vibration damper.





As a matter of principle, when installing all expansion joints, care must be taken to ensure that the expansion joints are not affected by unfavourable pipe movements, for example as torsion.

High Temperature Application

In operating conditions with high operating temperatures, specific measures must be taken to ensure the safety of the expansion joints during operation. Under operating conditions where the temperature range is within the creep strength range, it should be noted that the service life of the expansion joints is limited in time. The limit temperature from which creep strength values are designed must be taken from the respective material standard or Annex J in DIN EN 14917:2012. It is about 380°C for unalloyed steels, about 440°C for low-alloy steels and about 525°C for high-alloy steels (austenitic, ferritic-martensitic steels) (AD2000 S6:02.2013). If creep strength values have been used for the design of the expansion joint, this can be found in the component documentation. Under certain circumstances, the service life of the expansion joint may be limited in these temperature ranges (i.e. if the stress frequency is too low to achieve the specified number of cycles within the service life, failure may occur before then).
Austenitic and austenitic-ferritic materials may only be used at temperatures above the limit temperature specified in the standard for the respective material if no intergranular corrosion can occur and a suitability assessment for the intended application temperature has been made. Otherwise,

appropriate measures must be taken to rule out the occurrence of intergranular corrosion or to detect it at an early stage.

Maintenance

The operator must carry out inspections at regular intervals by qualified persons. Depending on the strain, checks are recommended 1 time a year, or at shorter intervals. The results of this monitoring must be documented in writing.
Heavily soiled expansion joints must be cleaned with suitable agents or, if necessary, replaced.
Expansion joints with articulated joints (pressure-relieved expansion joints, lateral expansionjoints, angular expansion joints) must be designed with bolt joints. These joints are treated with molybdenum upon delivery. If, during regular inspections or after improper cleaning, it is found that the lubricant (molybdenum) is no longer present in sufficient quantities, it must be relubricated. A sufficient amount of molybdenum is present if the cylindrical pin surface has been lubricated over the entire surface and a slight excess of lubricant is visible.
During the inspection, attention must be paid to any deformation of the shafts or damage to the connecting parts. If you have any questions about this, please contact the manufacturer. Damaged expansion joints must be replaced. Repairs or modifications to expansion joints must be discussed with Flexomat GmbH and carried out by appropriate qualified personnel.

Corrosion protection

The metal bellows manufactured by Flexomat GmbH are made exclusively of stainless steel and are therefore delivered without corrosion protection when delivered, unless further agreements have been made .
Expansion joints consist of a metal bellows, as well as attachment, connection and/or tension parts. These attachments, connections and/or bracing parts can be made of stainless steel or ferritic steel, depending on what has been contractually agreed. Stainless steel parts are delivered without corrosion protection. Components made of ferritic steel, depending on the agreement, are protected against corrosion. The components can be primed, galvanized or tectylated to protect them.
The primer on the components is basically only transport protection and must be replaced in any case by permanent corrosion protection. The primer does not provide sufficient and permanent protection against corrosion. Operation of the expansion joint without permanent protection can lead to premature failure of the expansion joint! Warranty claims due to defective surface treatment cannot be accepted.
Furthermore, the purchaser/operator of the expansion joints must ensure that the materials used are also suitable for the purpose/place of use. If necessary, protection against external influences is also necessary for stainless steel parts. During the regular inspection of the systems, the stainless steel parts (metal bellows, etc.) must also be checked for superficial abnormalities. On site, the general due diligence regulations to avoid corrosion must be observed.

Warranty

The warranty complies with the legal provisions, in compliance with the specified operating parameters.

Damage resulting from natural wear and tear, improper handling or overload is not covered by the warranty.

Environmental protection

The transport and packaging materials, as well as the product itself, must be disposed of in an environmentally friendly manner after use.

Expansion joints according to PED 2014/68/EU

The classification of stainless steel expansion joints is carried out according to PED. It may only be used for the medium or fluid group specified in the technical documents.

Failure to comply with these requirements will result in a violation of the Industrial Safety Ordinance. As a result, the declaration of conformity and the CE mark lose their validity and the expansion joint is not operated within the framework of the PED.

Hazard and risk analysis

Dangers	Measures
Strength failure due to internal or external pressure, including the attachments	- Exceeding the maximum permissible operating pressure is not permitted, taking into account the manufacturer's instructions in the technical document as well as on the type plate on the component
Influence of temperature	- No exceeding or falling below the maximum permissible operating temperature, taking into account the manufacturer's instructions in the technical documents as well as on the type plate on the component - Protective clothing (e.g. gloves) against the risk of injury due to the outside temperature on the component
External loads on the pressure device	- Flawless piping planning with all fixed, plain and floating bearings
Exceeding the permissible motion recording	- No exceeding of the maximum permissible movements, taking into account the manufacturer's instructions in the technical documents as well as on the type plate on the component
Prevent external damage to the metal bellows	- The expansion joint must be protected from external damage by means of appropriate measures - Ideally, the outer corrugated protection (e.g. corrugated cardboard + corrugated cardboard) should be used. sheet steel) must only be removed before commissioning - During maintenance and operation, it is necessary to prevent objects from falling - Provide appropriate warnings
Korrosion/Erosion/Abrasion	- Verification of the use of suitable materials for the attacking medium in cooperation with the manufacturer - Appropriate preservation of steel parts against external influences must be provided - Provision of internal and external attachments (e.g. inner protection tube) against internal and external abrasion or corrosive deposits/impacts

Dangers	Measures
Sharp edges and various attachments (e.g. bracing elements)	- Personal protective clothing must be worn - appropriate warnings must be used
Failure of the pressure device during operation	- a separate risk assessment must be carried out by the operator - Periodic inspections are to be determined by the operator in accordance with the Industrial Safety Ordinance - These tests must be carried out by qualified persons - The result must be documented.

Co-applicable standards

PED 2014/68/EU	Current Issue
DIN EN 14917	Current Issue
DIN EN 30681	Current Issue
Industrial Safety and Health Ordinance (BetrSichV)	Current Issue
Ordinance on Hazardous Substances (GefStoffV)	Current Issue

If you have any further questions, please do not hesitate to contact the Flexomat GmbH team !

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