Installation Instructions Expansion Joints – Angular Expansion Joints

General safety recommendations

Prior to installation and start-up, installation and start-up instructions must be read and observed. Installation, start-up and maintenance work shall only be performed by **qualified and authorised staff.**

Maintenance

Expansion joints are maintenance free. Prior to disassembly and maintenance, the system must be depressurised, cooled down, emptied. Otherwise there is a risk of an accident!

Transport, packaging and storage

- The consignment must be checked for completeness upon receipt.
- Any transport damage must be reported to the carrier and the manufacturer.
- At an intermediate storage we recommend to use the original packaging.

Admissible ambient conditions for storage and transport are ambient temperature - 4°C to +70 °C
Expansion joints must be protected against wetness, humidity, dirt, shocks and damage.

Warranty

A warranty claim requires professional installation and start-up in accordance with installation and start-up instructions. The necessary installation, start-up and maintenance work must be performed by qualified and authorised staff.

Operating pressure

- The permissible operating pressure results in the nominal pressure considering the reduction factors.
- At higher temperatures, the expansion capacity has to be reduced according to the reduction factors.

Start-up and check

Before starting-up check if

- The pipeline is installed with sufficient inclination to avoid water pockets
- There is sufficient drainage
- Pipe anchors and pipe supports/ guides are firmly installed prior to filling and pressure testing the system
- The expansion joint is not stressed by torsion, especially not expansion joints with socket attachment
- The flow direction has been observed for expansion joints with inner sleeves
- The steel bellows is free of dirt, welding, plaster or mortar splatters or any other soiling; clean if necessary
- The general due diligence requirements to avoid corrosion damage are observed, such as water treatment, or prevention of galvanic corrosion in copper and galvanized pipes.

Insulation

Expansion joints may be insulated exactly as the pipeline.

- If no coating is provided, protect the bellows to avoid insulation material dropping into the convolutions.
- If the expansion joint is to be placed under plaster, a protective cover is essential. This ensures the bellows function, protects against soiling and avoids contact with structure materials.

Improper operation

- The limits given in the technical data of the standard range must not be exceeded.
- Swinging suspensions adjacent to expansion joints are not permitted.
- Do not clean the newly installed pipeline by blowing it with steam to avoid water hammers and unacceptable vibration stimulating of the bellows.

System start-up

- During pressure testing and operation, the allowable test or operating pressure for the expansion joint mustn’t be exceeded.
- Excessive pressure peaks as a consequence of valves closing too abruptly, water hammers etc. are not permitted.
- Avoid contact with aggressive media.
- The start-up of steam lines must be performed such that the condensate has time to drain off.

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Installation Instructions Angular Expansion Joints

Description and application fields of Angular Expansion Joints

Due to the angular movement of the steel bellows, **angular expansion joints** are suited to compensate for expansion movements occurring perpendicular to the longitudinal axis of the expansion joint. The technical data are decisive for use and are given on the type plate.
On installation site, the general duty to care must be observed to prevent corrosion damage, such as water treatment, or prevention of galvanic corrosion in copper and galvanized pipes.
Angular expansion joints are appropriate for the compensation of both long pipe sections of district heating systems as well as short boiler and turbine room pipelines in plane are three-dimensional pipe systems.

A minimum of two and a maximum of three angular expansion joints form a statically defined hinge system making a construction unit. Their effect is based on an angular movement of the steel bellows, which is specified as "Nominal expansion capacity at 1000 full load cycles" in the technical data sheets.

The longer the distance between two angular expansion joints, the bigger the movement that can be compensated by the expansion system, and the smaller become the displacement forces.
The axial reaction forces generated by the internal pressure are transmitted by hinge bearings. The hinges' centre of rotation is at half bellows length.
Gimbal expansion joints utilize a round or square Gimbal joint to take up the reaction forces. This enables three-dimensional rotation around the X- and Z-axis

Special characteristics:

- Very low anchor loads, since the joint anchor transfer the reaction forces generated by the internal pressure
- Lower requirements on pipe guides/ supports
- Even swing hangers may be acceptable.

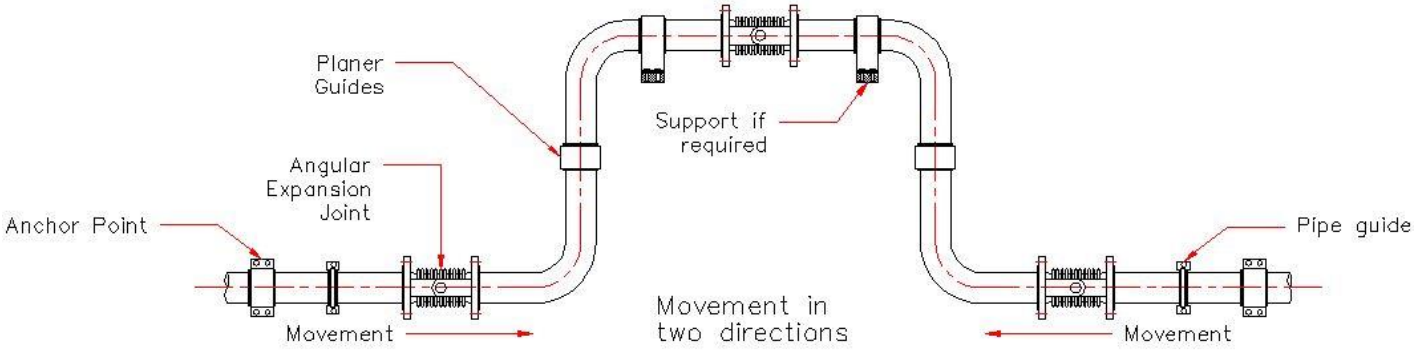
Installation advice

Assembly

- Anchor points and pipe guides must be firmly installed before filling and pressure testing the system.
- Expansion joints must be installed without being subject to torsion.
- The steel bellows must be protected against damage and dirt (e.g. welding, plaster or mortar splatter).
- Steam pipelines should be installed in such a way that water hammers are avoided. This can be achieved by adequate drainage, insulation, by preventing water pockets and by sufficient inclination of the line.
- Observe the flow direction while installing expansion joints with inner sleeves.
- Avoid the installation of expansion joints in the immediate vicinity of pressure reducers, hot steam coolers and shut-down valves, if high frequency oscillations are expected due to turbulence. Otherwise special measures must be installed (e.g. thick-walled sleeves, perforated disks, calming sections etc.).
- If high frequency vibrations or turbulence or high flow speed are expected, we recommend the installation of inner sleeves.
- Inner sleeves are also recommended for expansion joints with DN ≥ 150, if the flow speed of air, gas or steam media exceeds 8 m/s, or 3 m/s in case of liquid media.

Pipe guides, pipe supports

- When installing angular and Gimbal expansion joints which can take up lateral expansion only in one plane, pay attention to consistency between the direction of the pipe expansion and the movement capability of the expansion joints (perpendicular to the bolt axis). The nominal angular expansion capacity can be taken from the technical data sheets. Angular expansion joints have no special demands on guide supports. For short-leg boiler and turbine room pipelines guide bearing is not necessary.
- The weight of the pipeline (including medium and insulation) and all wind and additional loads must be absorbed by suitable pipe hangers or supports. Movements of the expansion joint must not be hindered!
- Long pipe sections before and after the hinge system need a guide support.

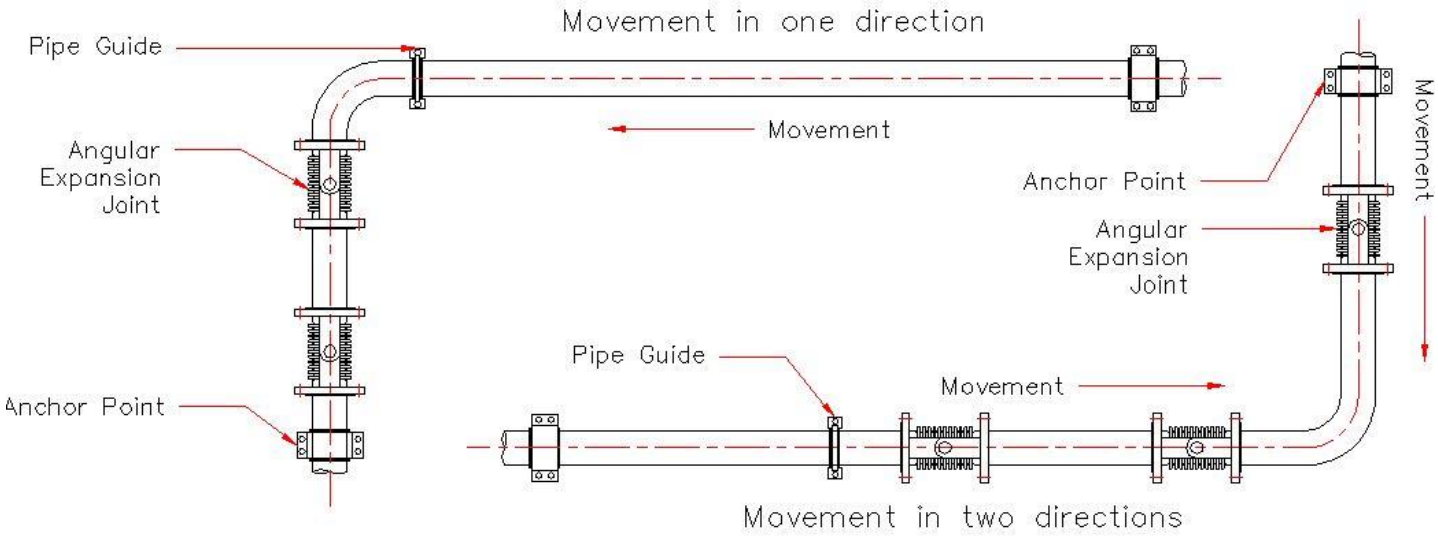


Anchor points

- Only one hinge system is allowed between two anchor points. The anchor points must absorb the inherent resistance of the expansion joint, resulting from the bending resistance of the bellows and the pin friction of the hinge supports as well as the frictional forces of the guides/supports.

NOTE

Pipe guides with excessive frictional resistance resulting from a too high surface pressure, dirt or corrosion deposits may block and cause considerable pressure peaks in the pipeline, its anchors and connections.



Pre-restraint

Angular and lateral expansion joints are usually installed with 50% pre-restraint of their expansion capacity. It is advisable to carry out pre-restraining on the completely installed system.

- While pre-restraining, consider the installation temperature of the pipeline, particularly for above ground level pipelines.
- If the installation temperature differs from the lowest design temperature, reduce the pre-restraint in accordance with the pre-restraint

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