

INSTALLATION AND MAINTENANCE

Compensators are designed to absorb movement according to predetermined design data. The calculated service life of a compensator will never be subjected to mechanical or thermal load exceeding the stated design data. In order to achieve the maximum service life, pressure resistance and reliability, caution should be taken during handling, storage and installation of the compensator. The necessary care should include taking the follow advice. Failure to comply with the installation instructions could reduce the service life and pressure capacity of the at worst breakdown of the compensator or the pipe system.

STORAGE AND TRANSPORT

We recommend that visual inspection is carried out immediately on receipt of delivery of the compensator to ensure that it has not been damaged during shipment.

- Transport fittings, tie rods, hinges or gimbals should not be used to sling and lift the compensator. The compensator should not be lifted by slings or chains around the bellows and must not be lifted in manner which causes the bellows loads.
- The compensator must not be subjected to torsion during handling and installation.
- The compensator should be stored on an even solid surface in a clean and dry environment under a roof or other rainproof cover.
- Compensators should not be stacked on top of each other or knocked against each other.
- Care should be taken to avoid mechanical damage as well as damage by water, moisture, sand, soil, building materials and chemicals.

Transport fittings/pre-tensioning fittings

Transport and pre-tensioning bars will be identified by yellow and black striped tape. These fittings must NOT be removed until the compensator is fully installed. If these devices are removed prematurely the compensator may move to an incorrect condition and could possibly endanger people working in the vicinity. Furthermore premature removal could cause the compensator not to function as intended, which could result in reduced service life or at worst breakdown of the compensator.

INSTALLATION

Installation should be carried out by suitably trained and competent staff working in compliance with relevant legislation and regulation for occupational safety.

Prior to installation

Unless clearly stated in the design data of the compensator, the compensator is not designed to compensate for installation inaccuracies in the piping and must not be used to connect them. Prior to installation the compensator should also be checked that it is undamaged and has no dents, damaged fittings and water marks on the steel (incipient rust) etc. It should also be checked that:

- The compensator is free from foreign objects such as insulation materials, dirt or debris.
- Sealing surfaces on flanges are even and clean.
- The gap in the pipeline where the compensator is to be installed matches the specified installation length of the compensator with design tolerances taken into account. The compensator must be fitted at length stated in the specification.
- The connecting ends of the pipeline are clean and correctly prepared for welding.
- The installation location of the compensator in the pipeline complies with that determined by the system designer.
- The expansion of the pipeline is in accordance with the design data of the compensator.
- The adjacent pipework is correctly installed with anchors, guides and support in place.
- Anchors must be adequate to accept reaction forces from the compensator and all other pipework loads.
- Only one compensator is fitted between two anchors.
- Tie rods on lateral compensators are correctly fitted and secure.

Anchors/guides

Anchors and guides on the pipeline must be placed as per the guidelines in EJMA so that:

- The compensator is not subjected to dead-weight loads from the pipeline.
- The pipeline does not sag, “hog” or “snake” between anchors or guides.
- Drops rods or hanger rods should be avoided, guides should be slide or roller type.
- When using compensators the distance must not exceed 4x the nominal diameter of the pipeline.

- The distance between the first and the second guide must not exceed 14x the nominal diameter of the pipeline.
- The distance between the remaining guides must not exceed 21x the nominal diameter of the pipeline. this distance must be reduced if this is necessary in order to stabilize the pipeline.

During installation

- When welding or grinding near the compensator it should be protected against weld spatter and debris, we recommend use of a chloride free welding blanket.
- Care must be taken to avoid accidental arcing on the thin-walled bellows in the compensator.
- The compensator should be protected from damage caused by adjacent construction work, splashes from mortar or plaster can damage the compensator and must be avoided.
- If the compensator is equipped with inner sleeve, make sure the flow arrow on the compensator points in the direction of the system flow.
- When fitting angular compensators it is important that the hinge pins are in the correct orientation.
- Do not apply torsion to the compensator to align the bolts on flanged units.
- Component such as tie rods, hinge links and gimbals must not be removed. They form part of the integrity and functionality of the compensator.
- Care should be taken with fitting tools, take care not to damage the bellows with spanners or wrenches when tightening bolts.
- When compensators are supplied without external covers and insulation is to be added a lagging cover should be fitted to prevent insulation material becoming trapped between the bellows convolution where it can prevent the bellows from functioning correctly.

On completion of installation

- Before the completed system is tested and commissioning it should be subjected to a visual inspection. Many years' experience has shown that careful checking of the installation before pressure testing and final commissioning will help to ensure successful installation and performance. Before pressure testing and as part of the inspection regime ensure that all temporary shipping and pretensioning devices (marked by yellow and black striped tape) are removed from the compensator.

PRESSURE TEST

Pressure test must be carried out according to stated test specifications on the drawing and/or the tag plates on the compensator.

Prior to pressure testing

CHECK THE FOLLOWING

- Has the compensator been damaged during installation?
- Is the entire pipe system, especially anchors, guides and compensators, installed as shown in the drawings in the installation instructions?
- Is the compensator correctly fitted into the system and not used correct fabrication inaccuracies?
- Is the flow direction of the compensator correct?
- Are the bellows and other moving parts on the compensator free from foreign objects such as insulating material?
- Have all shipping bars, pre-tensioning, devices protective parts and packaging materials been removed?
- Have all guides, supports and compensators been released to allow the expected movements in the pipe system?
- If the system is designed for a light flow medium such as air or gas and is to be tested with a heavier medium such as water have the necessary steps been taken to ensure that the extra dead-weight loads to the compensator and pipe system can be safely accommodated?

During pressure testing

CHECK THE FOLLOWING

- The pressure should be increased gradually until the specified test pressure is reached.
- Check the compensator for any sign of leakage at the connections and check the gauges for pressure drops.
- Examine the compensator for any signs of twisting, instability, squirming at the bellows or unexpected movement of any of its components.
- Any unexpected movement of the pipe system which could be pressure-related should be investigated and addressed.

After pressure testing

CHECK THE FOLLOWING

- The compensator and pipe system should remain as designed, in particular check that the anchors and their attachment to civil works or structure do not display any signs of distress.
- It should be noted that after testing some residual testing fluid may remain in the bellows, if this is likely to affect the functioning of the system arrangements to remove the fluid may necessary.

AVOID

- Dropping or knocking the bellows.
- Using cleaning agents containing chlorides.
- Using steel wool or steel brushes on the bellows.
- In case of any doubt the pressure test should not exceed more than 1½ x the design pressure without previous written confirmation from us.

MAINTENANCE

- A correctly dimensioned and correctly installed compensator does not require any special maintenance their than the inspection that carried out for the other parts of the pipe system in which the compensator installed.
- We recommend that you carry out ongoing inspection of the pipe system throughout its service life. The aim of these inspections is to check for the presence of rust, whether parts have come loose, etc. The frequency of these inspections is determined on an individual basis based on the function of the system, occurring lads and so on. The above does not guarantee that damage will not occur, but it does significantly reduce the risk.

- It may be useful to know the common causes for faults in compensators. However, it is difficult to list all general maintenance directions as compensators have a wide field of application and many compensators are constructed for a specific application.

We would like to draw your attention to the most common causes for failures below:

Shipping and handling damage

- Knock-damage, dents, scuffs and scratching of the bellows caused by incorrect handling or inflicted after installation.
- Unanticipated detrimental influences from the environment such as corrosion caused by salt chemicals or the like in the atmosphere.

Installation damage and installation errors

- Incorrect location – installing compensators at a position in the pipework not intended by the system designer.
- Using the compensator the correct fabrication errors without first confirming this is acceptable with the designer.
- Premature removal of shipping or pretensioning devices or failure to remove them after installation.
- Damage from weld spatter due to lack of protection during installation.
- Installation of units fitted with flow liners with the liner against the flow direction.

Operational damage

- Corrosion damage caused by the flow medium, in particular chloride presence.
- Fatigue failure owing to unforeseen vibration in the system.
- Fatigue failure caused by movements for which the compensator was not designed, especially lateral movements.
- Damage caused by accumulation and packing of foreign material between the bellows convolutions, this can affect the bellows internally or externally.
- Torsion
- Overpressure in the pipe system.