

Operating manual for expansion joints (including expansion joints for pressure equipment according the Pressure Equipment Directive 2014/68/EU)

General

Type codes overview

Axial-expansion-joints: XXX / serial number

ANS	= Axial-expansion-joint equipped with welding ends on both ends
ALS	= Axial-expansion-joint equipped with welding ends and guiding sleeve on both ends
ANFH	= Axial-expansion-joint with welded firm flange on one end, and floating flange on the other end
ANL	= Axial-expansion-joint equipped with stainless steel weld-neck collars and floating flanges on both ends
AUA	= Axial-expansion-joint with male union thread and outer protection sleeve on both ends
ABS	= Axial-expansion-joint equipped with welding ends, outer and guiding sleeve on both ends
ABXI	= Axial-expansion-joint with female union thread, outer and guiding sleeve on both ends
ANB	= Axial-expansion-joint with floating flanges
ADS	= Axial-expansion-joint, externally pressurized, with welding ends (ADS) or male union threads (ADA) on both ends
AUS ONE	= One – off axial-expansion-joint with welding ends, with outer protection tube, for district heating
ADS MUF	= Axial-expansion-joint, externally pressurized, with welding ends on both ends, for district heating

Other type codes – at request.

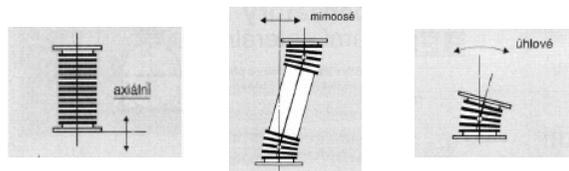
Type code = DN - PN – Movement in mm

Code designations / Markings

DN	- Nominal inside diameter in mm
PN	- Pressure class, i.e. design pressure, referring to the room temperature 20° C (RT)
PS	- Service pressure (min. and / or max. pressure at service temperature (TS))
TS	- Minimum (-) and maximum (+) service temperature
2020	- Example: Year of production or 08/20 = month/year of production
CE	- Pressure equipment acc. to Category I of PED 2014/68/EU
CEXXXX	- Example: product acc. to Category II, III and IV of PED 2014/68/EU
Without	- Product below Category I = According to good engineering practice, or beyond the scope of the PED 2014/68/EU

Modes of operation

axial / lateral / angular



Expansion joints compensate thermal expansion of piping, equipment and structures, mechanical expansion induced by wind, settlement of buildings, seismic activity, vibration of rotary machines, noise. They are used also to reduce the force transferred from the piping to the equipment as well as the tension of the path.

The following rules are to be observed upon design and prior to assembly:

1. Determination of the required movement $\Delta l = \alpha \times \Delta t \times L$

α = Coefficient of thermal expansion mm/°C/m, Δt = Temperature difference in °C, L = Distance between two anchor points of the piping in m

α Coefficient of thermal expansion 20 [°C] + T α [mm/ m°C]

Temperature [°C] >	100	200	300	400	500
Carbon steel	0,0111	0,0121	0,0129	0,0135	0,0139
Refractory 15	0,0131	0,0131	0,0135	0,0141	0,0143
Austenitic	0,0164	0,0171	0,0178	0,0180	0,0183

2. Determination of the required expansion joints, by observing the following:

- Always install only one expansion joint or hinged system between two anchor points.
- In case of expansions exceeding the movements provided by the expansion joint, divide the pipe length into sections.

3. Determination of anchor force and anchor construction.

Note: For each axial expansion joint, an anchor point must be present on both ends of a direct piping section!!

4. Determine pipe guides and pipe rests for pipe routes see page 5

5. Determine pre-stress of expansion joints see page 6

Intended use

The expansion joints have been designed, constructed and produced according to the customer's specifications including, among others, requirements for media, pressure, temperature and diameter. They are to be installed and operated in an appropriate manner. Operation and installation instructions contained in attached documents are to be observed.

It is necessary to observe especially the following:

- **Pressure** – (max. admissible working overpressure of the expansion joint must not be exceeded)
- **Temperature** – Stainless steel axial expansion joints are generally designed and classified according to pressure classes PN, and will be approved res. certified according to the relevant classification. This means in practice that a maximum service temperature of TS 20 °C must not be exceeded. In case the maximum service temperature TS is higher than +20 °C, the maximum service pressure and expansion must be reduced = multiplied by a temperature reducing factor Kp and Kd, see the table below:

PRESSURE Kp and expansion Kd TEMPERATURE reducing factor

Temperature [°C]>	100	200	300	400	500
Kp	0,9000	0,8000	0,6700	0,6100	0,5700
Kd	1,0000	0,9000	0,8500	0,8000	0,7500

Cycle KL reducing factor for higher number of cycles

Number of cycles	1000	2000	3000	5000	10000
KL	1,0	0,82	0,73	0,63	0,51

- **Resistance** – All bellows materials have to be resistant in operation against the transported media under the specified operating conditions. If necessary, this has to be checked against the resistance charts (the maximum allowable temperature depending on the media must not be exceeded).

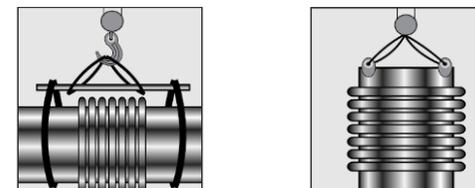
Note: If a material standard is specified in the order, the expansion joint must be

marked with the material numbers on all parts in touch with the medium. In all cases the manufacturer must carry out risk analysis for the medium specified in the order. In case of doubts about the specified material, the operator has to be informed for clarification. If the medium is not clearly indicated in the order specification, the manufacturer is not able to carry out a risk analysis for the chemical resistance of the materials. Basically, according to the labour protection laws, the operator is obliged, to verify (within the risk analysis) whether the material will be resistant against the given medium.

- In order to operate the expansion joints safely, technical, organizational and personal protective measures are to be carried out. Priority is always to be given to technical and organizational measures. If not all dangers can be avoided, effective personal protective equipment is to be provided and used.

Manipulation

- In the pictures below is indicated the only way of manipulation with expansion joints with pipe ends, i.e. lifting by pipe ends only. Connecting rods, tie rods and other equipment of expansion joint cannot be used for manipulation.
- It is needed to be careful during lifting, to prevent damage the bellows and any connecting elements (connecting rods, tie rods, etc.).
- Flanged expansion joints can be lifted by the flanges only.



Storage prior to installation

For the storage of expansion joints, especially the following must be observed:

- Store in a cool, dry and low-dust area; cover all adjacent and close heat sources.
- Cover the expansion joint ends (incl. the flared ends) with protection caps, in order to protect the inside from soiling and corrosion (after final evacuation res. cleaning).

Assembly

In order to ensure the serviceability of the expansion joints and not to shorten their service time by additional strains, the following is to be observed;

- The expansion joints have to be installed in a way that their natural position and movement are not constricted. During assembly and during the following time in operation, ensure that no torsion will strain the bellows
- Arrange all sealing of expansion joints equipped with flanges in a centric pattern, and ensure a crosswise bolting of the counter flanges. If necessary, use a torque wrench (this is necessary for certain sealing - see manufacturer indications)
- The expansion joints must not be stressed in operation by additional outside influences that were not mentioned in the design data and for which they are not designed.
- Tightening of all unlockable joints must be checked before operation.
- The bellows movement data indicated by the manufacturer must not be exceeded (see catalogue figures).
- The bellows must be protected against outside mechanical (see above), thermal, or chemical influences, also during installation, e.g. when welding the fittings.
- The bellows convolutions must be free of soiling and must not be constricted in their movement (any constriction would reduce the service time!)
- Check and adjust, if necessary, the piping and bearings close to the expansion joint.
- Do not start operation of the expansion joint in case outside damages of the bellows are visible
- In case of pre-stressed expansion joints secured by a transport lock – do not remove the pre-stress device/locking rods before the installation is finished. Locking rods are usually painted yellow.

