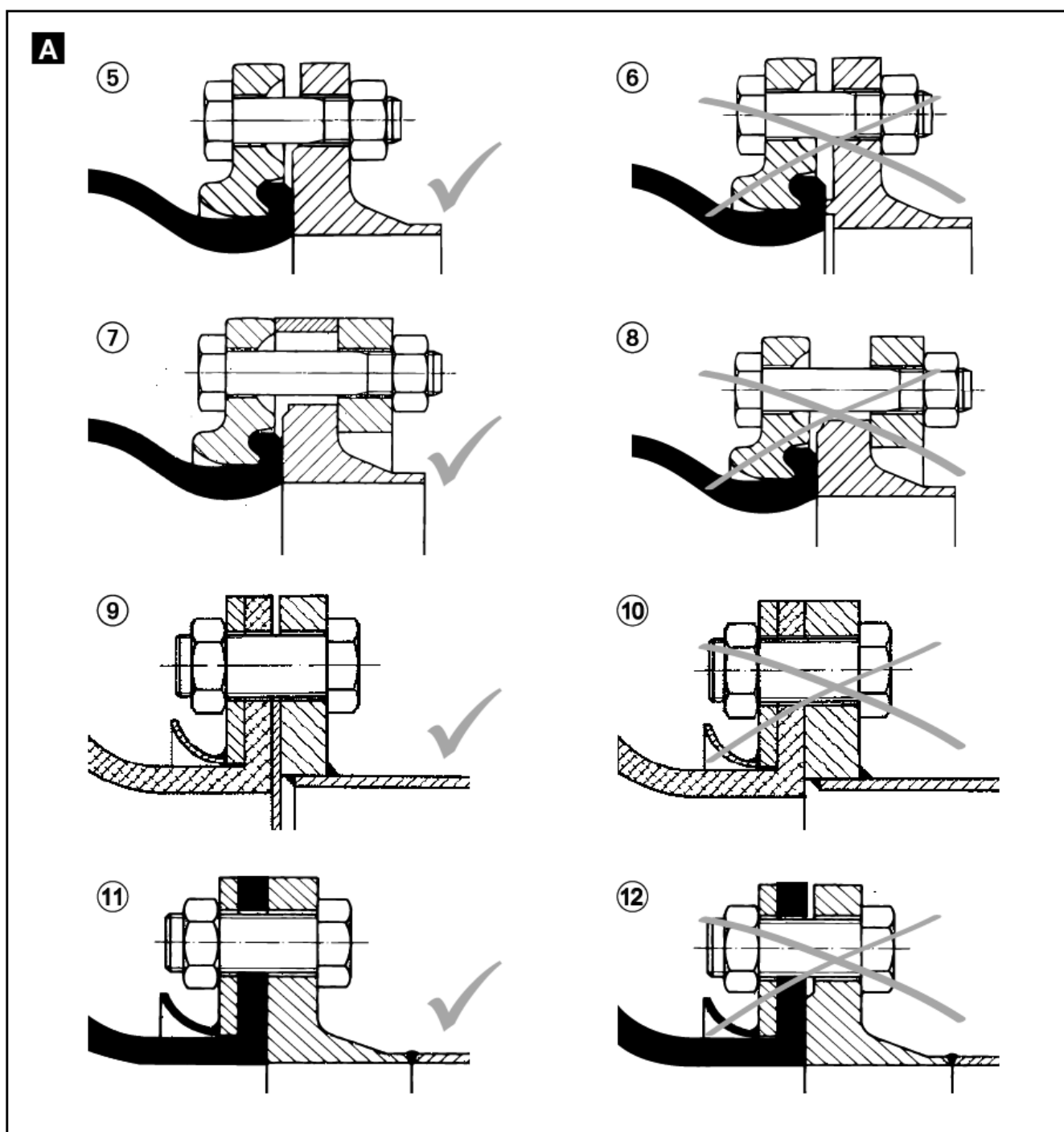
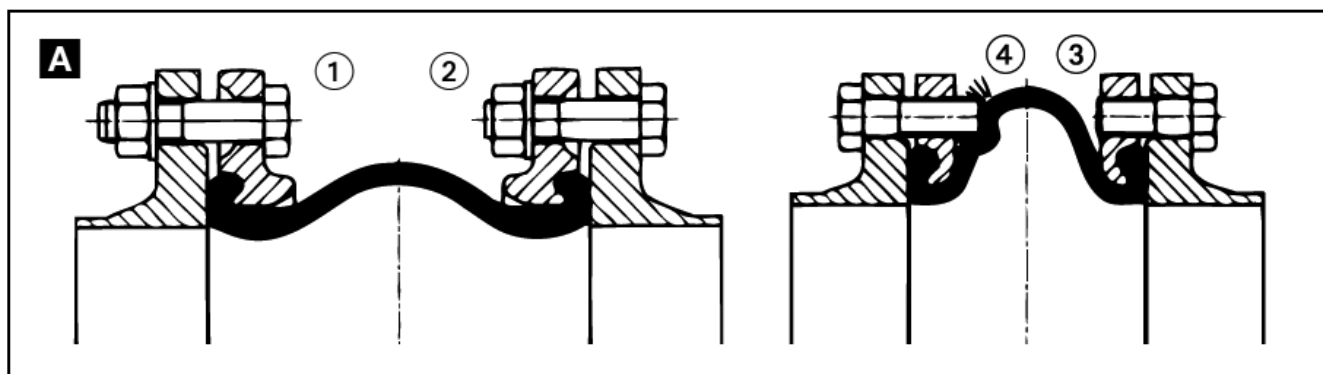


MANUAL

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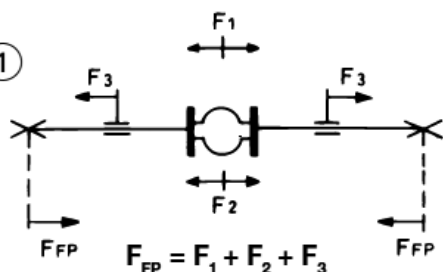


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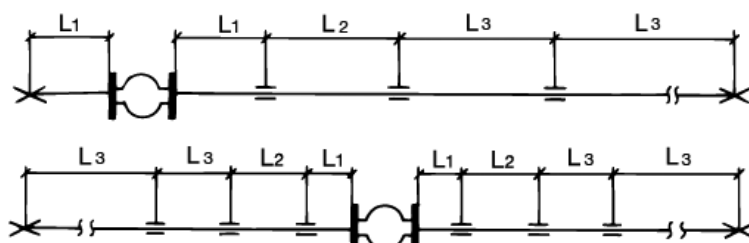
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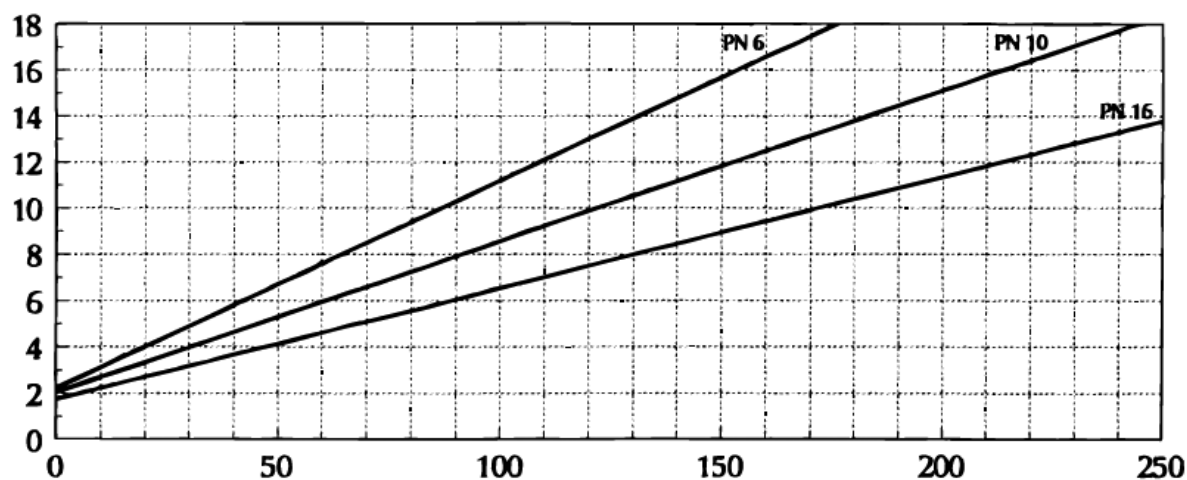
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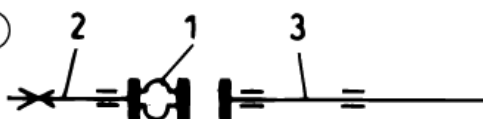
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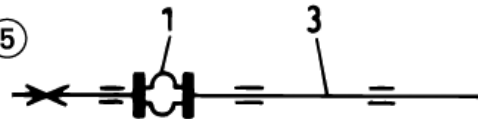
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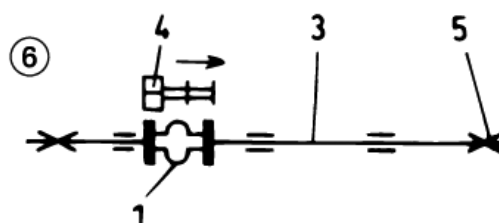
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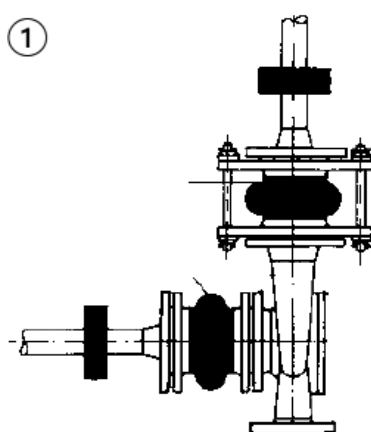
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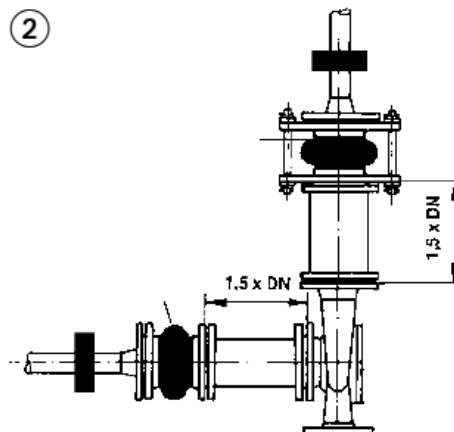
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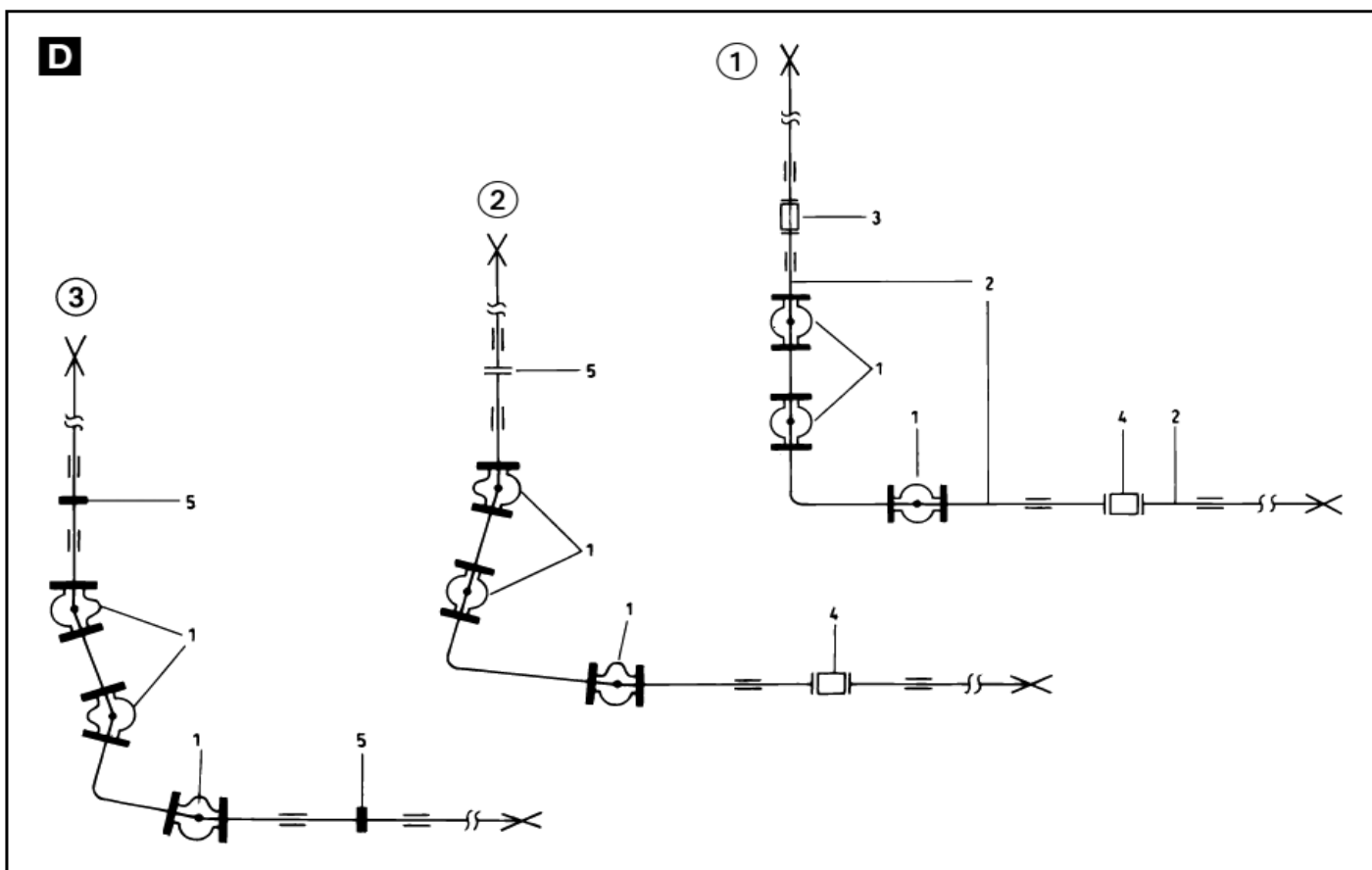
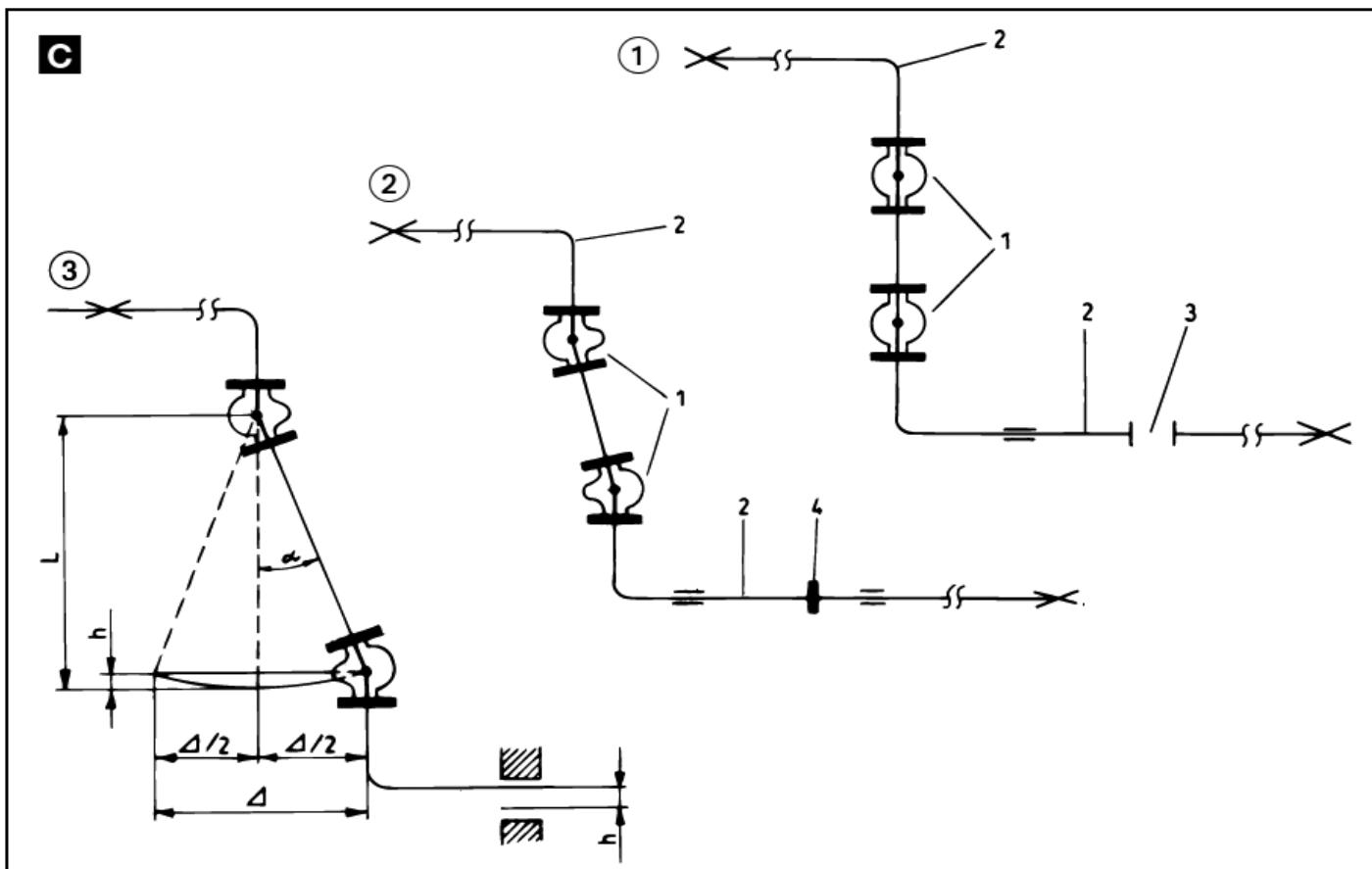


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MANUAL

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MANUAL

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E

Typ A, AR, AS, E, G, R, RS

① DN	② [Nm]	
	PN 10	PN 16
20/25	35	35
32	90	90
40	90	90
50	90	90
65	90	90
80	90	90
100	90	90
125	90	90
150	180	180
175	180	180
200	180	180
250	180	300
300	180	300
350	180	300
400	300	450

G

Typ GR-SAE

① DN	② [Nm] 3000 psi
40	10
50	10
65	15
80	20
100	30
125	35

I

Typ W-1

① DN	② [Nm] / [Nm]
80/250	20/65
100/250	30/65
150/300	115/210
200/400	90/180
250/450	115/160
250/500	115/205
300/500	125/205
400/600	110/170
500/700	130/195
600/800	155/215
700/900	115/155
800/1000	130/195
900/1100	145/175
1000/1200	160/190
1100/1300	175/205
1200/1400	195/220
1400/1600	280/325
1600/1800	215/235
1800/2000	210/225
2000/2200	210/220
2200/2400	225/235

N

Typ A

① DN	② [Nm]	
	PN 10	PN 16
450	85	95
500	90	115
600	120	150
700	135	165
800	170	200
900	180	210
1000	215	250

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K

Typ W-2

① DN	② [Nm] / [Nm]
200/450	40/50
400/800	85/130
500/900	70/120
800/1300	95/200

O

Typ B

① DN	② [Nm]	
	PN 10	PN 16
40	15	15
50	15	15
65	20	20
80	15	15
100	15	15
125	20	20
150	30	30
175	35	35
200	60	40
250	50	60
300	65	75
350	60	70
400	80	85

L

Typ C

① DN	② [Nm]		
	PN 6	PN 10	PN 16
300	70	70	100
350	85	75	100
400	70	105	130
450	80	95	130
500	70	110	180
600	110	150	260
650	95	150	230
700	100	150	210
750	130	190	280
800	140	200	260
900	150	200	240
1000	140	250	350
1100	180	260	450
1200	190	310	460
1300	285	425	480
1400	295	435	520
1500	315	580	710
1600	300	600	730
1700	355	565	690
1800	335	575	700
1900	400	565	830
2000	415	615	820
2100	445	770	–
2200	430	770	840
2300	460	800	–
2400	450	805	880
2500	565	835	850
2600	570	805	880
2800	595	865	–
3000	555	955	–
3200	590	–	–
3400	640	–	–
3600	785	–	–

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Rubber compensators AL 84

General instructions

STENFLEX® rubber-type expansion joints can only function accurately if the installation is performed to a skilled and professional standard. The life service duration not only depends on the operating conditions but particularly on correct installation as required. Expansion joints are not just simply plain piping elements. They are moving components which have to be subjected regularly to inspection. Expansion joints are special components of a piping system. STENFLEX® rejects all and any warranties for imitated products or for modifications on the original products. In order to avoid installation errors, it is very important that the following instructions are observed with due consideration of the technical dimensional data sheets in our catalogue.

ATTENTION: Failure to observe these instructions can lead to a destruction of the expansion joint, injury to persons as well as causing a hazard for the environment.

A - Installation

- Store the expansion joint in a clean and dry condition. For outdoor storage, ensure suitable protection against intensive sunshine and weather influence.
- Before installation, inspect the packing and the expansion joint for any damage. In the event of damage, irrespective of its nature, the product shall not be installed.
- Ensure that the expansion joint is free internally and externally from foreign matter such as dirt, insulating material and similar. Inspect the expansion joint before and after installation in this respect.
- Remove the transport securing elements and protection cover only immediately before installation work.
- The expansion joints shall be mounted by authorised and qualified personnel only. Applicable rules and regulations for accident prevention shall be observed as required.
- Do not throw or hit against the expansion joint; protect it against falling items. Do not attach chains, ropes or cables directly on the bellows.
- Special seals are not required as the expansion joints are self-sealing. The sealing surfaces of the mating flanges must be flat and clean. Additional seals are not necessary; a seal only has to be applied when installing guide sleeves.
- Install rubber expansion joints with a vacuum back-up ring for sub-atmospheric pressure operation.
- The length of the installation gap should be equal to the constructional length of the expansion joint.
- The expansion joint should be preferentially loaded with compression.
- Expansion joints are to be mounted according to installation mode, meaning, the screw head should always be placed on the bellows side, with the nut on the piping side. If this is not possible, the screw length is to be selected according to Installation mode in such a way that the bellows is not damaged in the process. When using flanges with threaded bolt holes, make sure that the screw lengths close off with the flange itself. The danger of damage increases with excessively long screws when the rubber bellows expands under pressure in the operating condition.
- During installation, ensure that the bores of the piping flanges are aligned. If necessary, re-adjust the revolving flanges at the expansion joint.

• When the system is used for aggressive media (e.g. sea water, acids, lyes etc.) the inner surfaces of the pipe system as well as the flange sealing surfaces must be coated with an efficient corrosion protection coating.

Fig. 5 The sealing surfaces of the mating flanges must be thoroughly flat and clean.

Fig. 6 Tongue-and-groove flanges are NOT acceptable.

Fig. 7 Recesses/shoulders must be balanced out with equalising elements.

Fig. 8 Revolving flanges with a welding neck are not suitable. No uniform pressing effect.

Fig. 9 An additionally installed gasket (65 + 5 Shore A) protects the rubber sealing surface against sharp-edged pipe ends.

Fig. 10 Sharp-edged pipe ends cut into the rubber sealing surface.

Fig. 11 With constructed rubber flanges, a full pressing effect is only possible with smooth mating flanges.

Fig. 12 Mating flanges with projection crush the rubber flange, the press-on flange located behind will tilt – pressing effect is inadequate.

• Tighten the flange screws evenly and crosswise. Use the spanner to hold the screw head on the inside, and turn the nuts on the outside in order to avoid damage to the bellows with the tools. After the first start-up, re-tighten the screws as required.

• A torsional strain (twist) of the expansion joint during installation/deinstallation and in the operating condition is not acceptable. This applies in particular for models with threaded connections, held by a spanner at the hex.

• When performing electro-welding on the pipework in the vicinity of the expansion joints, these must be bridged over with earthing strands. In principle, the expansion joints must be suitably protected against welding spatter and thermal negative effects during welding.

• With high flow velocities involving possible resonance or turbulence caused by re-routing of the flow direction (e.g., downstream of pumps, valves, T-pieces, pipe bends), a guide sleeve (LR) must be installed. When installing, observe the flow direction (arrow direction = flow direction).

• As far as possible, install expansion joints in such a way that they can be visually inspected at regular intervals for intact condition.

• Cover off the expansion joints to protect them against damage of all kinds.

• Do not apply paint or any insulation to the bellows.

• Wait until installation is completed before removing the pre-stress devices.

• The piping must be provided with adequately dimensioned fixed points to absorb the forces of the pipe system and piping guides. The user is responsible for professional execution in accordance with standard engineering practice.

• A pressure resistance test according to Annex 1, Section 3.22 of the Pressure Equipment Directive 97/23/EG is normally not carried out by the manufacturer. This is to be performed by the user after installation in the piping system ($PT = 1.43 \times PS$).

• The user is responsible for providing any necessary safety and monitoring facilities (such as the installation of temperature sensors, pressure-limiting valves, measures for avoiding pressure jolts and liquid hammers).

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Rubber compensators AL 84

Bolting torques for AL 84 rubber-type expansion joints.

The bolting torques refer to new expansion joints. If required in some cases, the values can be exceeded by 30%. Enquiries for Type D are to be sent to the manufacturer. Tighten the screws several times in a crosswise manner so that an evenly distributed seal-pressing effect is achieved. After approx. 24 hours of operation, the settling is to be balanced out by re-tightening the screws. In the unlikely event of a leak the manufacturer must be contacted. For torques which are not stated please contact the manufacturer.

Table E **Series A/AR/AS/E/G/R/RS** in the pressure ratings PN 10 and PN 16.

- 1 - Nominal width
- 2 - Bolting torque

Table G **Series GR-SAE, use only screws according to DIN 6912.**

- 1 - Nominal width
- 2 - Bolting torque/Bolting torque

Table I **Series W-1** in the pressure ratings PN 1/2,5.

- 1 - Nominal width,
- 2 - Bolting torque/Bolting torque

Table K **Series W-2** in the pressure ratings PN 2,5.

- 1 - Nominal width
- 2 - Bolting torque/Bolting torque

Table L **Series C** in the pressure ratings PN 6/10/16.

- 1 - Nominal width
- 2 - Bolting torque

Table N **Series A** in the pressure ratings PN 10 and PN 16.

- 1 - Nominal width
- 2 - Bolting torque

Table O **Series B** in the pressure ratings PN 10 and PN 16

- 1 - Nominal width
- 2 - Bolting torque

B - Installation instructions for axial and universal expansion joints for equalising length changes without pre-tensioning

- Non-tensioned rubber-type expansion joints can be applied for the combination (superimposition) of axial, lateral and angular movements. Observe the reduction of the individual movements! If in doubt, consult the manufacturer.
- Fixed points must definitely be adequately dimensioned. Fixed points must be capable of coping with the force FFP from the sum of the axial thrust force (F1), the expansion joint adjusting force (F2) and the frictional forces from the guide bearings (F3) (Fig.).
- In principle, only one expansion joint shall be installed between two fixed points.
- With several axial expansion joints, the pipe pattern must be subdivided by interim fixed points.
- The piping with axial expansion joints must be exactly guided with bearings. Guide bearings are to be arranged on both sides of the expansion joint. A fixed point replaces a guide bearing. Fig. 2.

Internal guide sleeves are not suitable for pipe guiding.

Fig. 2 Fixed point and guide bearing arrangement -

$L_1 \leq 3 \times DN$, $L_2 = 0,5 \cdot L_3$, L_3 refer to Fig. 3.

Fig 3. Diagram – guide bearing spacing (L3) PN 6, PN 10, PN 16 -
0-18 guide bearing spacing L_3 [m] (guide values), 0-250 nominal width.

B - Installation instructions for axial and universal expansion joints for equalising length changes with pre-tensioning

As a rule, a rubber-type expansion joint is NOT pre-tensioned because the pipe expansion in the line caused by relatively low temperatures is small and the expansion joint with its high flexibility (compression greater than elongation) balances out the expansions. If the expansion joint is nevertheless pre-tensioned, details on the corresponding installation length must be obtained from the manufacturer. Expansion joints shall only be pre-tensioned by the size of the max. allowable elongation.

Installation sequence for the pre-tensioning of axial expansion joints on site

ATTENTION: this does not apply for expansion joints already pre-tensioned in the factory!

Fig. 4 Join the expansion joint (1) to the already solid piping (2) so that a displacement is no longer possible. The other pipe part (3) lies loosely in the guides.

Fig. 5 The loose pipe part (3) is brought to point of contact and also joined to the expansion joint (1).

Fig. 6 This loose pipe part (3) is then shifted with a suitable device (4) until the calculated installation length is achieved. Do NOT over-stretch the expansion joint! The expansion joint is ready for operation after completed securement (5) and after removal of the pre-tensioning device.

Important

The expansion joint shall only then be pre-tensioned by the max. allowable elongation if the commencing minimum temperature is not lower than the installation temperature.

Installation instructions for lateral expansion joints for equalising lateral movements

- Lateral expansion joints require light fixed points on both sides. These must absorb the adjusting forces of the expansion joints as well as the friction on joints and pipe guides.
- Fix-position the piping fixed points after Installation of the expansion joint (after tightening the flange screws). Failure to observe these instructions can lead to a destruction of the expansion joint.
- In principle, only one equalising system shall be positioned between two fixed points.
- Suitable piping guides shall be installed on equalising systems for absorbing the weight forces.
- Lateral expansion joints are set to construction length BL in the factory. After installation, the tie rods must be frictionally connected to the flange. Any possible re-adjustment of the tie rods shall only be done in coordination and consultation with our Technical Consultation Service.
- Lateral expansion joints can be pre-tensioned. As a rule, pre-tensioning is performed by half of the movement listed in the dimension sheets.

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Installation instructions for angular expansion joints for equalising angular movements

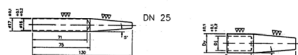
- Angular expansion joints require light fixed points on both sides. These must absorb the adjusting forces of the expansion joints as well as the friction on joints and pipe guides.
- Fix-position the piping fixed points after installation of the expansion joint (after tightening the flange screws). Failure to observe these instructions can lead to a destruction of the expansion joint.
- In principle, only one equalising system shall be positioned between two fixed points.
- Suitable piping guides shall be installed on equalising systems for absorbing the weight forces.
- Angular expansion joints have a certain defined turning axis around which they can be swivelled. Ensure for correct position of the turning axis when performing installation.
- Angular expansion joints can be pre-tensioned. As a rule, pre-tensioning is performed by half of the movement listed in the dimension sheets.

C - Installation of a pre-tensioned equalising system with 2 angular expansion joints

- Fig 1** Connect piping (2) with the fixed points. Install expansion joints (1) in neutral position. The piping leading further is lying on the guide bearing.
- Fig 2** Take out the removal piece (3). With the use of a suitable device, shift the expansion joints (1) from the neutral position to such an extent until the construction gap (4) is closed. Screw-connect or weld the construction gap (4) as required.
- Fig 4** The movement intake depends on the expansion joint middle spacing and the max. allowable deflection angle. Calculation is performed according to the following equation:



The expanding piping must have adequate freedom of movement in the guide bearing.



L = Expansion joint middle spacing (mm)

Δ = Movement intake (mm)

h = Movement freedom in the guide bearing (mm)

α = Angle of deflection

D - Installation of a pre-tensioned equalising system with 3 angular expansion joints

- Fig 1** Connect piping (2) with the fixed points. Install expansion joints (1) in neutral position. The piping leading further is lying on the guide bearing.
- Fig 2** Take out the removal piece (3). With the use of a suitable device, shift the expansion joints (1) from the neutral position to such an extent until the construction gap (5) is closed. Screw-connect the construction gap (5) as required.
- Fig 3** Repeat procedure for removal piece (4) – as described under 2.

M - Instructions for rubber-type expansion joints at pumps

- Connect the expansion joints as close as possible to the pump flange (Fig.).
- When using centrifugal pumps for the delivery of abrasive media, the expansion joints shall not be arranged directly at the pump nozzle (suction-/discharge side). There is otherwise the danger that the expansion joints will be damaged as a result of the high relative velocities from vortex and turbulence formation at the pump nozzles.
- The installation clearance from pump nozzle to expansion joint shall be $1 \times 1.5 \text{ DN}$ (Fig. 2).
- With sub-atmospheric pressure on the suction side, a rubber-type expansion joint with vacuum back-up ring must be applied.
- The operation of pumps against fully or partially closed gate/slide valves or dampers must be avoided. Cavitation should also be avoided because this can lead on a shortterm basis to a destruction of the expansion joint.

Installation of split back-up flanges / Type C-I, DN 2400

- Both flange halves must be pre-mounted in such a way that there is no misalignment or gap at the separation line.
- Use suitable and stable washers underneath the nuts/screw heads in the flange separating area.
- Ensure for correct bolting torques. **L**

Installation of tie rods / on the builder's part

- Only the tie rods, spherical disks, conical seats and nuts in the required material qualities and dimensions as specified and prescribed by STENFLEX® shall be installed. These structural elements have been designed to comply with the pre-specified operating conditions.
 - The tie rods must be installed before pressure is applied to the line.
 - Perform the installation of the tie rods according to the STENFLEX® product drawing.
 - Set the tensioning exactly to the constructional length (pre-Installation).
 - During pre-installation, make sure that there is the same projection of the threaded rods right and left.
 - The tie rod joints (spherical disks/conical seats) must be installed frictionally-locked, however with a suitable clearance (0.2 mm), so that slight movement is possible.
 - Lock the nut couples (securement against independent loosening of the threaded union).
- M 24 - 250 Nm
M 30 - 500 Nm
M 36 - 700 Nm
M 42 - 1000 Nm
M 48 - 1300 Nm
- The values can be exceeded, as necessary, by 50%.

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Start-up

- Expansion joints with tensioning are set in the factory to constructional length BL. After installation, the tie rods must be frictionally connected to the flanges.
- Pressure and sealing integrity tests are only then to be carried out when fixed points and guide bearings have been installed in an orderly and proper manner. Otherwise, the expansion joint will elongate and is then non-usable.
- When high operating temperatures are involved, appropriate protection measures are to be made on the customer's end in order to avoid personal injury caused by contacts with the hot surfaces.
- In order to ensure safe and reliable operation, expansion joints shall only be used within the allowable pressure, temperature and movement limits.
- The maximal permissible operating pressure of rubber expansion joints stated in the data sheets refers to a temperature of 20 °C. For higher temperatures the pressure must be reduced (see table) as the strength of the bellows' materials diminishes with rising temperature.

Maximal permissible operating pressure (bar)

Temp. °C	Type series (bar)							
	A, AG, B, R	AS, RS	AR	GR-SAE	E, G	C		W
20	16	16	25	16	10	4	10	2,5
30	16	16	25	16	10	4	10	2,5
40	16	16	25	16	10	4	10	2,5
50	16	16	25	16	10	4	10	2,5
60	15	16	24	16	9,5	3,8	9,5	2,5
70	14	15	22	15	9	3,5	9	2
80	11	14	20	14	7	2,8	7	1,7
90	6	12	16	12	4	1,5	4	1
100	6*	10	11	10	4*	1,5*	4*	1*
110	-	6	6	6	-	-	-	-
120	-	6*	6*	6*	-	-	-	-
130	-	6*	6*	6*	-	-	-	-

* short period (max. 100 hours)

- It is the responsibility of the user to provide for measures against incorrect and nonpurposeful use of expansion joints by means of corresponding instructional training and supervision of the operating personnel as well as with operating instructions.

Usage

- Be particularly attentive to durability against flow media before using the expansion joints (observe the durability list in cases of doubt in the catalogue).

Expansion joint colour coding	Rubber grade	Applications
Orange	EPDM	Hot water, acids, lyes
Red	NBR	Oil
White	CIIR	Drinking water

Typ AR: additional yellow stripe

Typ AS: additional blue stripe

- Guide sleeves must be installed in the expansion joints for a flow

containing aggressive media and in the event of high flow velocities or turbulent flows.

- Expansion joints can be equipped with additional flame protection coverings in order to avoid damage caused by fire.
- For usage, the operating data as stated in the dimensional sheets, design drawings and/or on the nameplate shall apply as application limits. STENFLEX® accepts no liability for all and any damage caused by operation outside of these limits. The user is entirely responsible for adherence to these specified data (e.g., with the use of safety-technical facilities).

Each expansion joint is provided with comprehensive installation and operating instructions which contain details of the required bolting torques.cc

Inspection and maintenance

- The user must ensure that the expansion joints are accessible at all times and that a visual inspection is possible at regular intervals.
- Inspect the expansion joints and ensure that they are intact according to the applicable standards. Contact our Technical Consultation Service in the event of faults such as bubble formation, surface cracking or irregular deformation. Repairs are not allowed.
- The Shore hardness of the flexible rubber elements of expansion joints is to be inspected at regular intervals. If the hardness level of 83 Shore A is exceeded, the element must be replaced for safety reasons.
- Avoid cleaning the piping system with chemically aggressive agents.
- Use suitable soap and warm water for cleaning the expansion joints. Sharp-edged objects, wire brushes or sandpaper are not allowed for cleaning purposes.

Declaration of conformity

STENFLEX® rubber-type expansion joints of the series A, AR, AS, AG, B, C, E, F, G, GRSAE, H, R, RS and W have been subjected to the conformity assessment procedure and comply with the Pressure Equipment Directive 97/23/EG. Rubber expansion joints subject to the Pressure Equipment Directive are marked with the CE-sign and the tag-number of the designated location.

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