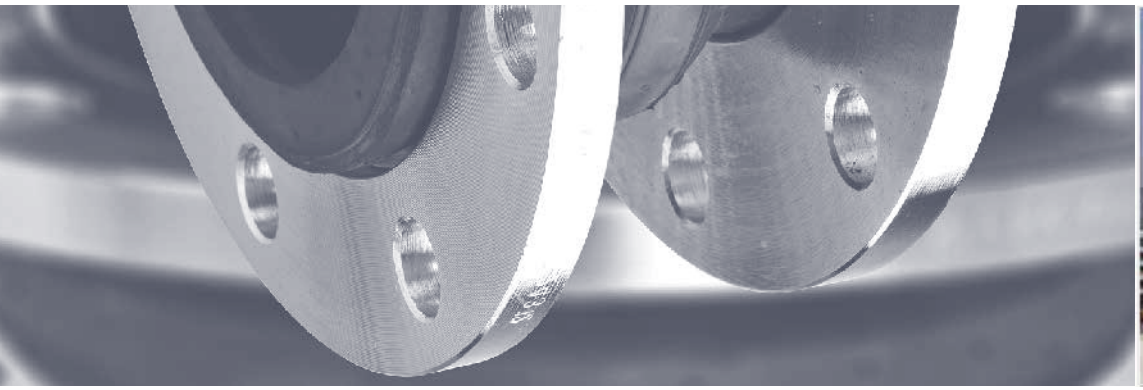


INSTALLATION INSTRUCTION
ALL FLANGED RUBBER EXPANSION JOINTS

Rubber expansion joints are available in two ready to fit versions with standard connections according to DIN, ASA, BS, etc.

- **Rotatable steel flanges**
  These should fit precisely and burr-free in the fitting area of the rubber bellow, whereby the sealing surface can protrude about 1 – 10 mm depending on the nominal diameter. The mating flange sealing surfaces can be smooth (Form A) or with seal (Form B) according to EN 1092 - 1: 2001.
- **Pressure-resistant solid rubber flanges**
  These flanges are delivered includ ing single-piece steel backing flanges. The mating flanges should have a smooth sealing surface according to EN 1092 - 1: 2001 (Form A).

Both types of expansion joints are self-sealing; additional seals are unnecessary.

1. PLANNING INSTRUCTIONS

Expansion joints must be arranged in pipes in such a way that regular maintenance and any necessary replacement can take place easily.

It must be ensured that the expansion joints do not rub against adjacent components also when expanded to the maximum permissible limits.
The expansion joints must also not be exposed to high externally radiated or accumulated heat.

Universal expansion joints (without tie rods) for absorbing axial, lateral and angular movements.

For an expansion joint to absorb the axial or lateral movements (expansion or compression) of a pipe, it must be arranged between two fixed points. In addition, plain bearings must be included for pipe routing/support.
The reaction forces, adjusting forces and friction forces must be taken into account in the dimensioning of the fixed points and plain bearings.

Reaction force (N) = Effective area (mm^2) x working pressure (N/mm^2).
F = A x P

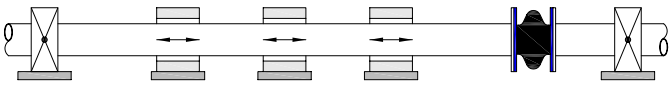
(Adjusting forces according to type data sheet)

Fitting example 1 (EB 1)

Compensation of axial expansion with expansion joints without tie rods.

The reaction forces of the expansion joint are absorbed by the fixed bearing.

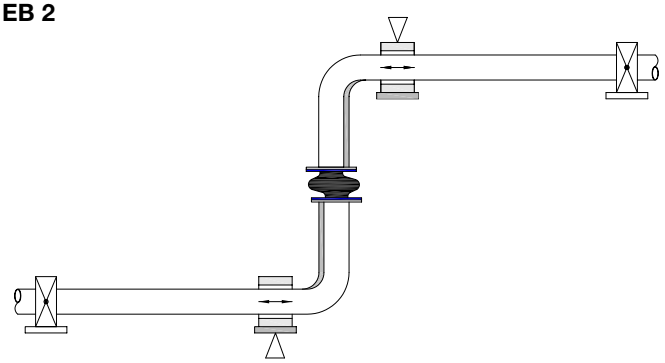
EB 1



Fitting example 2 (EB2)

Compensation of lateral and axial expansion with an expansion joint without tie rods. The reaction forces of the expansion joint are absorbed by the fixed bearings and plain bearings. The plain bearings must be appropriately supported! Adjusting forces must be absorbed by the fixed points.

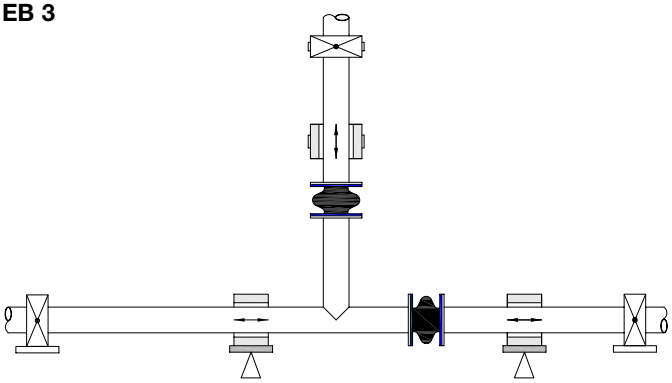
EB 2



Fitting example 3 (EB 3)

Compensation of lateral and axial expansion with expansion joints without tie rods arranged in a pipe outlet.The reaction forces of the expansion joint are absorbed by the fixed bearings and plain bearings. The plain bearings must be appropriately supported!

EB 3



Lateral expansion joints (with tie rods) for absorbing lateral movements.

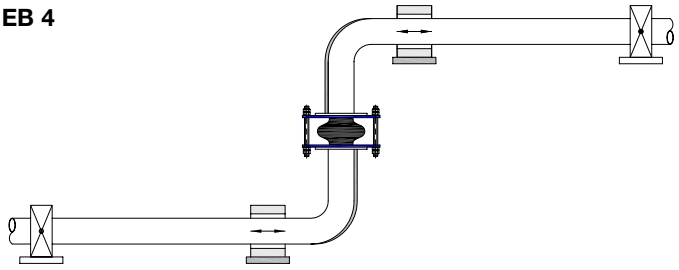
If an expansion joint for absorbing axial movements cannot be fitted between two fixed points, the axial movement must be converted into a lateral movement. This makes it possible to use an expansion joint with tie rods, which neutralises the occurring reaction forces (inside area of the expansion joint x working pressure). With this arrangement, only appropriate plain bearings may be used for correct initiation of expansion.A large selection of rubber expansion joint tie rods can be found in our catalogue.

Fitting example (EB 4)

Compensation of axial expansion by deflection into a lateral movement with expansion joints with tie rods.

Compensation of axial expansion by deflection into a lateral movement with expansion joints with tie rods. The adjusting forces of the expansion joint are absorbed by the fixed bearings. The plain bearings serve only for correct initiation of movement in the expansion joint! In contrast to fitting example 2, axial movement of the vertical pipe arm is disregarded.

EB 4



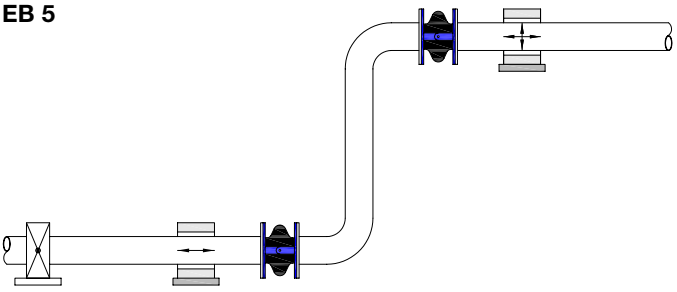
Angular expansion joints (with joint tie rods) for absorbing angular movements.

In order to absorb significant axial movements with low adjusting forces, a combination of angular expansion joints with tie rods can be used.

Fitting example 5 (EB 5)

Compensation of axial expansion by deflection to angular movement using expansion joints with tie rods. Advantage: Significant axial expansion can be absorbed by only two expansion joints. The reaction forces of the expansion joint are absorbed by the joint tie rods. The plain bearings serve only for correct initiation of movement in the expansion joint!

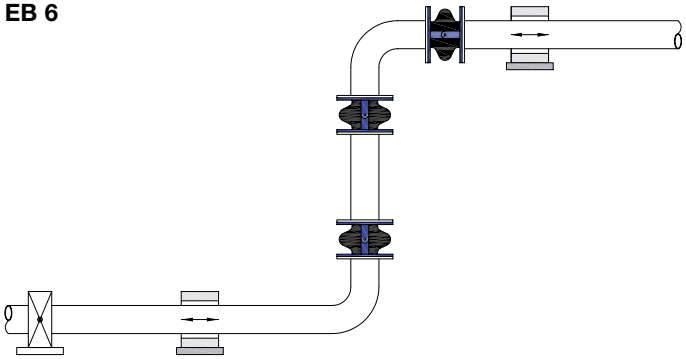
EB 5



Fitting example 6 (EB 6)

Arrangement of pipe joint expansion joints in three joint systems for compensating expansion in two directions. Advantage: High expansion compensation, low adjusting forces, soft corner. The reaction forces of the expansion joint are absorbed by the joint tie rods. The plain bearings serve only for correct initiation of movement in the expansion joint!

EB 6



Expansion joints for pump connection (with/without tie rods) for absorbing vibrations.

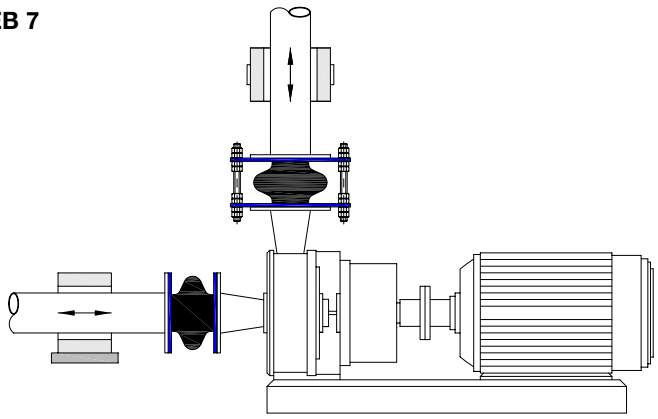
Where rubber expansion joints are used on pumps, these should prevent the transmission of forces,

stresses and vibrations in order to decouple the pipe system from the pump.

Fitting example 7 (EB 7)

Expansion joints with tie rods should always be used for arrangement in pressure pipes to prevent the pump support from being overloaded due to the reaction forces. A vacuum support ring should be used on the suction side if possible.

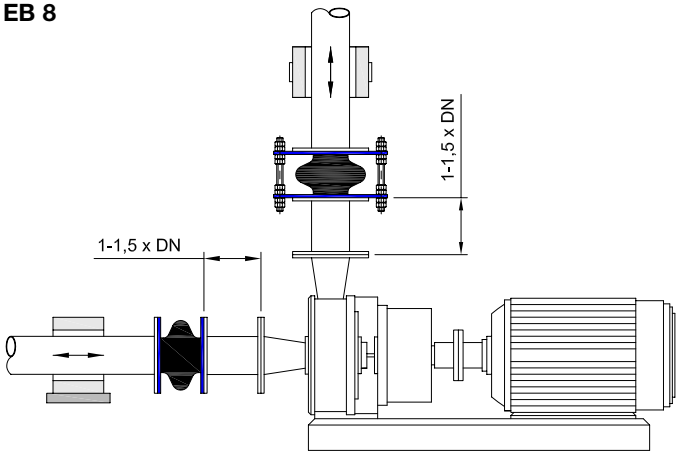
EB 7



Fitting example 8 (EB 8)
- IMPORTANT!!

For the transport of abrasive media (liquids containing solids such as water/ sand), the expansion joints must not be arranged directly on the pump support (suction/pressure side, as there is a risk of the expansion joints being damaged due to relatively high velocities from swirl and vertebration on the pump support. This applies similarly to elbows and outlets. The fitting distance from the pump support to the expansion joint/elbow must be 1 to 1.5 x DN. Pump operation against a fully or partly closed gate or flap valve must be avoided. Cavitation must also be avoided as this can quickly damage the expansion joint.

EB 8

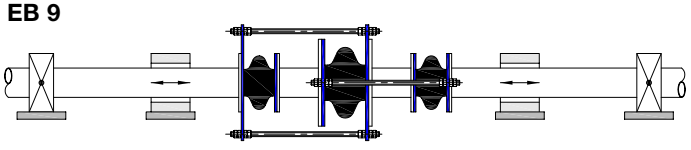


Expansion joints with pressure relief for absorbing axial and lateral movement. Pressure-relieved expansion joints can be used to prevent the transmission of reaction forces resulting from excess or low pressure to adjacent fixed bearings, apparatus or machines.

Fitting example 9 (EB 9)

Expansion joints for absorbing axial expansion without the transmission of reaction forces resulting from excess or low pressure to adjacent fixed bearings, apparatus or machines (observe adjusting forces).

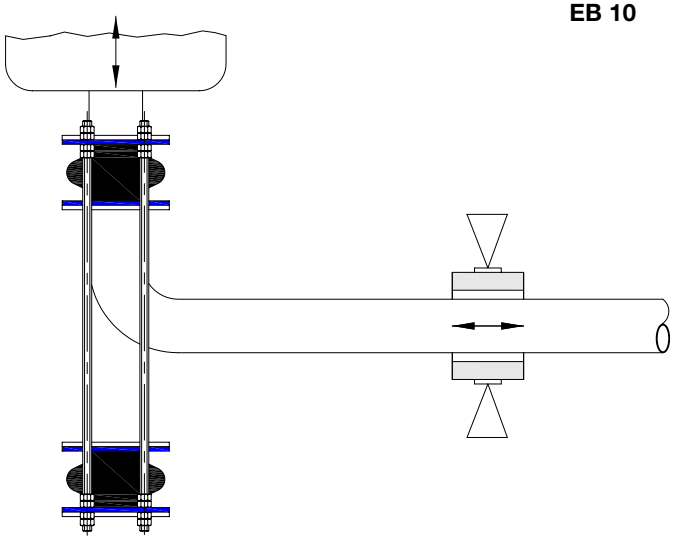
EB 9



Fitting example 10 (EB 10)

Expansion joints for absorbing axial and lateral expansion on an elbow without the transmission of reaction forces resulting from excess or low pressure to adjacent fixed bearings (adjusting forces).

EB 10



Expansion joints (with tie rods) for fitting/removal

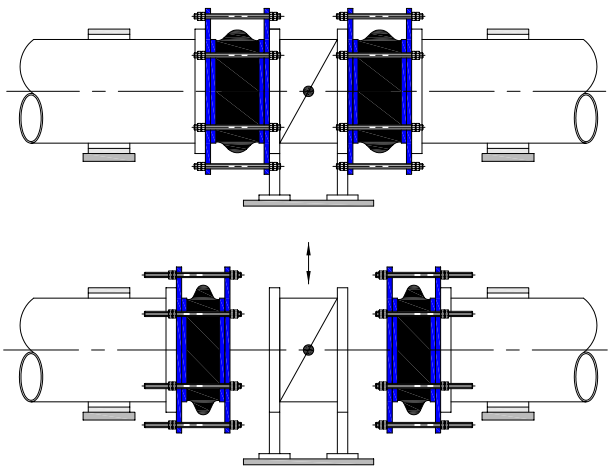
To compensate for fitting inaccuracies or for easy fitting or removal, an expansion joint with tie rods can also be mounted directly on a valve.

Fitting example 11 (EB 11)

Expansion joint with tie rods for fitting/ removal.

Tie rods prevent the transmission of reaction forces to a connected valve and by loosening the flange connection with the aid of the tie rod flange, the rubber bellow can be compressed to its maximum axial limits to enable removal of the valve.

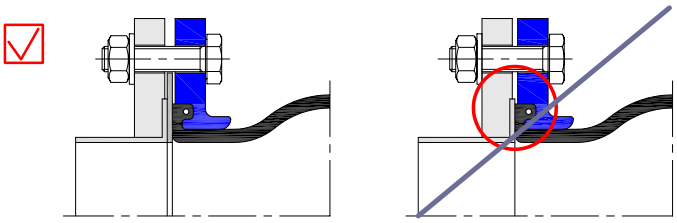
EB 11



Fitting example 12 (EB 12)

For rubberised pipes or valves, a blank gasket must be used to prevent a rubber-on-rubber seal.

EB 12



2. BUILT PLANNING

Arrangement of pipe supports

The fixed points of the guide bearings must be arranged in such a way that:

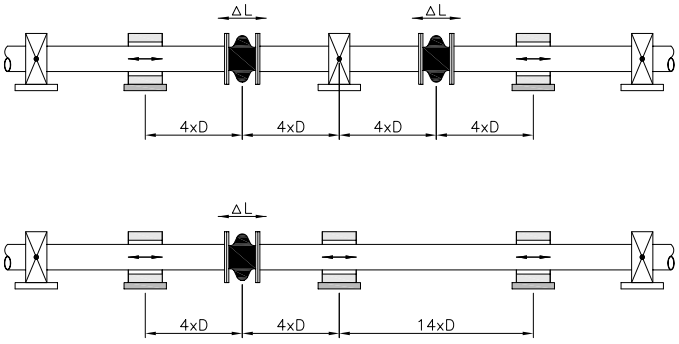
- the expansion joint is not loaded by the weight of the pipe
- bending due to the arrangement of fixed or loose bearings is prevented
- suspension in self-aligning bearings is avoided; plain or roller bearings must be used as guide bearings

Arrangement of floating bearings

The distance between the expansion joint and first bearing can be max. 4 x the pipe diameter.

- The distance between the first and second bearing can be max. 14 x the pipe diameter
- The distance between the remaining pipe bearings can be max. 21 x the pipe diameter. This distance must be reduced if necessary due to the inherent stability of the pipe

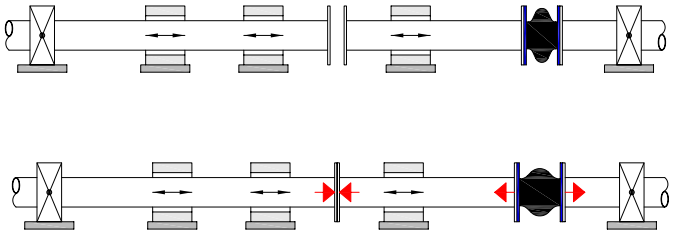
EB 13



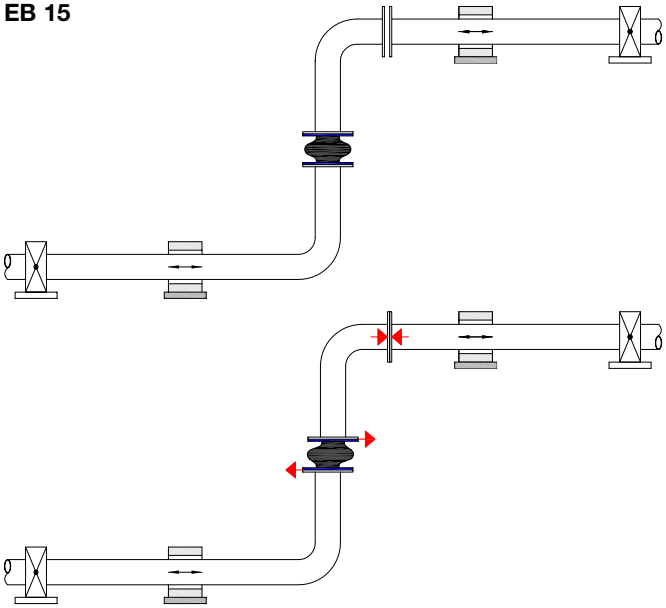
Initial tension of expansion joints

If an expansion joint is fitted with an initial tension greater than 10 mm axially or 5 mm laterally, the expansion joint must be fitted first and then the appropriate initial tension generated with the permanently fitted expansion joint at an open point in the pipe. (Fitting example EB 14 + 15)
Reason: A not yet fitted expansion joint with a higher initial tension will cause the sealing bead to spring out of the groove of the steel flange and this could damage the sealing bead or cause a leak.
For planning purposes, it must be ensured that the pipe can be opened!

EB 14



EB 15



3. SAFETY MEASURES

Excess pressure, temperature rise, vacuum

Protect pipes against inadmissible excess pressure, excessive temperature rise and uncontrolled vacuum. The limiting values are shown in the data sheets of our catalogue.

Water hammer and vacuum drop

Draining and venting options are provided to prevent water hammer and vacuum drop.

Resistance

The inner material of the bellow coming into contact with the medium must be suitable for the medium transported in the pipe.
If the list does not contain a specific medium, we must be provided with appropriate data from the safety data sheet for chemical substances and preparations according to DIN 52900, clauses 1 to 2.13 in order to enable us to determine whether the inner liner of the expansion joint is suitable.

Flow rate

For high flow rates, it must be clarified whether the expansion joints must be used with or without guide tube in order to prevent wear due to excessive vertebration.

Vacuum support spiral/ring

If the expected vacuum is higher than 0.8 bar absolute, a vacuum support spiral or vacuum support ring must be provided.
These prevent the bellow from collapsing. For use directly downstream of a pump, flap valve or elbow, a check must be made to ensure correct positioning after fitting – see Fitting instructions + Fitting example (EB 16)!

External influences

Extreme external influences make it necessary to protect the expansion joints via special measures:

- Ground protection cover: Protects against damage to bellows, fouling and earth pressure on buried pipes.
- UV protection cover: Protects against UV radiation and influences of weather in regions exposed to extreme sunlight.
- Flame-retardant protective cover: Protects against fire up to 800°C for 30 minutes.

Dangerous media

The expansion joints must be provided with suitable splash protection for pipes used for transporting dangerous or environmentally harmful media.

Mating flanges/Flange connection

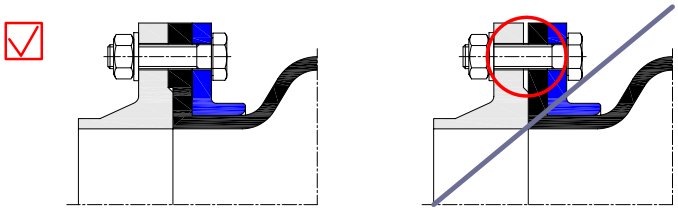
Mating flanges and flange connections must be as described in the following Fitting example 16 (EB 16) to ensure a reliable seal and to prevent damage to the rubber expansion joints.

Mating flanges with and without projection according to EN 1092-1:2001 Form A or B must be used for expansion joints with rotatable flanges. Only smooth mating flanges should be used for expansion joints with solid flanges. Other types are available on request.

Fitting example 16 (A - E)

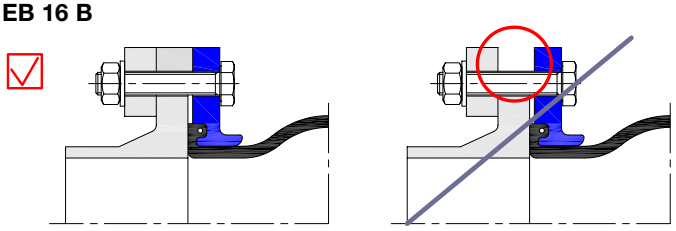
If a smooth flange cannot be used for expansion joints with solid rubber flanges, the recess of the mating flange must be compensated with a seal with an appropriately thick ring or taken into account in rubber flange fabrication.

EB 16 A



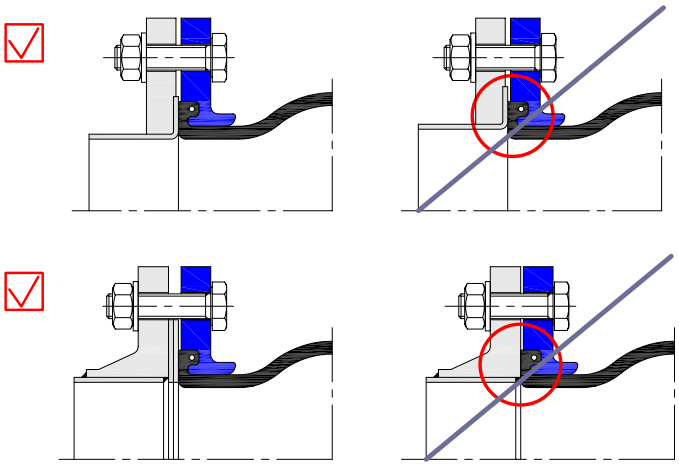
When using backing flanges with thick bead, the gap above the bolts between both flanges must be filled with an appropriate ring. This stops the backing flange from tilting and thus avoids incorrect contact with the sealing surface!

EB 16 B



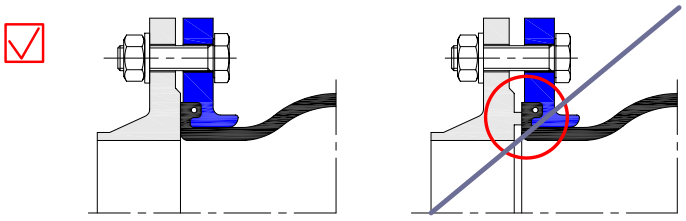
When using flare flanges and slip-on flanges, it must be ensured that the internal diameter of the sealing surface of the mating flange corresponds to the internal diameter of the bellow.
If this is not the case and the internal diameter of the mating flange is larger, a blank metal gasket and an additional seal must be used!

EB 16 C



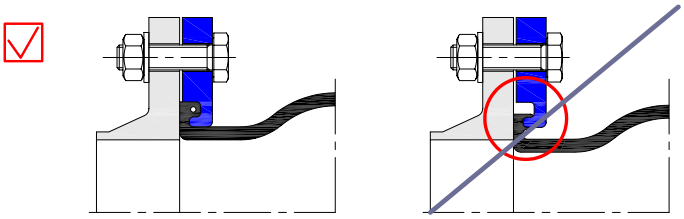
Mating flanges with groove or tongue must not be used.

EB 16 D



It must be ensured during fitting that the rubber bead is located correctly in the groove of the expansion joint flange, otherwise the sealing surface may be damaged and leaks can occur!

EB 16 E



4. PACKAGING

- Check the packaging for external damage
- Check the contents against the deli very note or packing list
- If possible, do not unpack the expansion joints prior to assembly
- Only open the packaging with a blunt object
- Ensure that nails or staples in wooden crates do not come into contact with the rubber bellow

5. STORAGE

- See DIN 7716 - Guidelines for the storage of rubber parts.
  Rubber expansion joints must be stored without being subject to stress, deformation and kinking
- Rubber expansion joints with steel flanges must be stored upright on the flanges (risk of crushing)
- Store in a cool, dry, dust-free and moderately ventilated room
- Protect rubber parts against draughts and cover if necessary. Ozone-generating equipment such as electric motors, fluorescent light sources, etc., must not be used at the place of storage
- Do not store any solvents, fuels, chemicals or similar together with the expansion joints

6. TRANSPORT

- Leave the parts packed
- Note „TOP“ at the top and „cable or lifting hook“
- Steel backing rings (with bracing) and the rubber expansion joint flanges must remain fastened until final fitting to avoid excessive loads on the rubber part!
- Do not use any sharp-edged tools, wire ropes, chains or lifting hooks (risk of damage to rubber)
- Always lift both steel flanges simultaneously.
  Shackle at both sides or place padded tie-bars through the expansion joint
- For ground level transportation without means of transport, roll the expansion joint on the flanges

7. FITTING

Rubber expansion joints are intended for absorbing movements under certain pressure and temperature conditions to be determined in advance. To ensure that the maximum service life is reached, the following must be observed for fitting.

Prior to fitting

- Check the packaging of the rubber expansion joints and after unpacking also the expansion joint itself for damage. Damaged expansion joints must not be fitted
- Check the pipe run to ensure that it is straight in the area in which the expansion joint is to be fitted and that the pipe is limited by appropriate fixed points

  Only one expansion joint or several expansion joints coupled to form a unit may be fitted between two fixed points
- Check the size of the fitting gap. The mating flanges should be fitted in alignment with each other. The maximum deviation between the fitting gap and expansion joint can be +/-10 mm axially and +/-5 mm laterally
- Note: If the aforementioned tolerances cannot be maintained, the procedure is as described in the section “Initial tension of expansion joints” Fitting example 8 (EB 8)
- The pipe flanges must not be twisted towards each other when fitting an expansion joint with solid rubber flanges, as the expansion joint will be subject to torsion – this must be avoided as torsion can damage the expansion joint
- The pipe flanges must be clean, grease-free, smooth, flat and burrfree
- It must be ensured that the flange connections are as described in the section “Mating flanges/flange connections – A-E” under “Safety”
- If an expansion joint is to be provided with a guide tube, this must be inserted into the expansion joint prior to fitting in the pipe (do not forget seal between guide tube and mating flange)
- If the use of a vacuum support spiral or vacuum support ring is necessary due to low pressure, these same must be fitted in advance. For a vacuum support ring, the section “Vacuum support ring” in the following must be observed (EB 17)!

IMPORTANT

Welding in the vicinity of expansion joints must be avoided. If this cannot be avoided, the expansion joint must be covered with a flame-retardant and heat resistant material to protect it against welding heat and flying sparks. When welding the complete pipe system, steel wire expansion joints can be damaged by stray currents or electrical earth conduction. The anode and cathode of the electric welding connection must always be located on the same line section. (Not separated by the rubber expansion joint!) The rubber bellow must not be painted after fitting in the pipe.

It is also important to note that the expansion joint must not be insulated at temperatures above 50°C, as this will cause the rubber bellow to heat up and harden as a result of the accumulated heat.

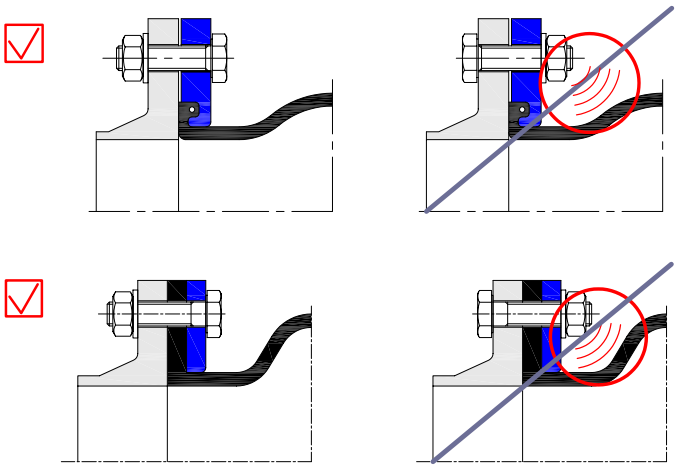
The bellow must not be painted.

Fitting an expansion joint with flange connection

- Centring mandrels, rubber hammer and torque wrench are required for fitting. Do not use any sharp-edged tools!
- Carefully push the expansion joint into the fitting gap. Take care not to damage the sealing surfaces
- No additional seals are required. The rubber bead or rubber flange seals directly against the pipe flange Attention: Exceptions for rubber ised pipe flanges, valves or blank gaskets – see corresponding sec tion above!
- Fix the expansion joint at both flanges using at least two bolts or threaded rods. If necessary, the lifting device can be detached/ removed
- When fitting expansion joints with tie rods, it must be ensured that the tie rods are loosened so that the expansion joint is able to adjust itself to the fitting gap when tighte- ned. Readjustment of the tie rods subsequently takes place after fit ting the expansion joint – see fol- lowing description “Fitting the tie rods”
- The remaining fixing bolts can now be inserted and tightened hand-tight
- For the bolted flange connection, bolts with the strength class 8.8 should be used
- Do not use a washer on the expan sion joint flange

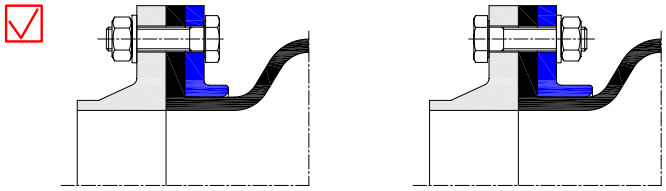
The following must be noted when inserting the bolts:

- See Flange bolt torque (table 1 and 2, page 20 and 21)
- For expansion joints with through holes, all bolts must be inserted with the bolt head towards the bellow to prevent damage to the bellow under pressure.

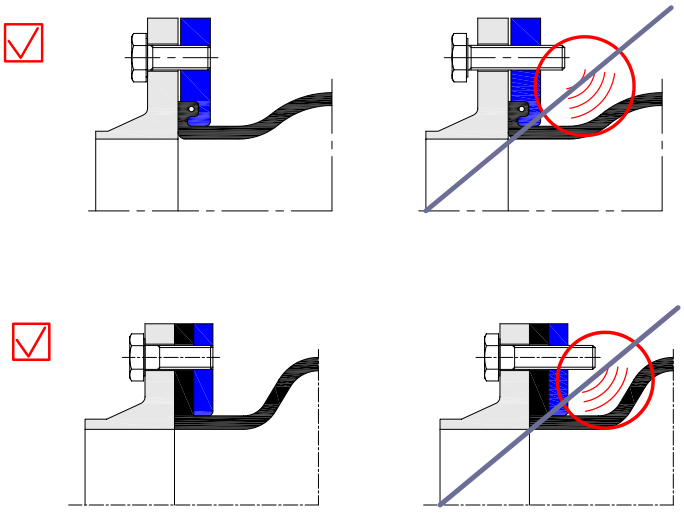


Exception

If the expansion joint has a long collar (supporting shoulder), the bolt can also be inserted the other way round – however the bolt must not be longer than the collar!



- **For expansion joints with tapped holes in the flange,** the bolts should be flush towards the bellow side with the flange, as protrud ing bolts are liable to damage the bellow under pressure.



- **The bolted flange connections must be tightened as follows:**

Step 1:

- Tighten all bolts by hand
- Apply torque evenly according to Step 1 crosswise
- Check gap width on outer edge of flange
- Settling time >= 30 minutes

Step 2:

- Tighten all bolts crosswise accord-ing to Step 2
- Check gap width

Step 3:

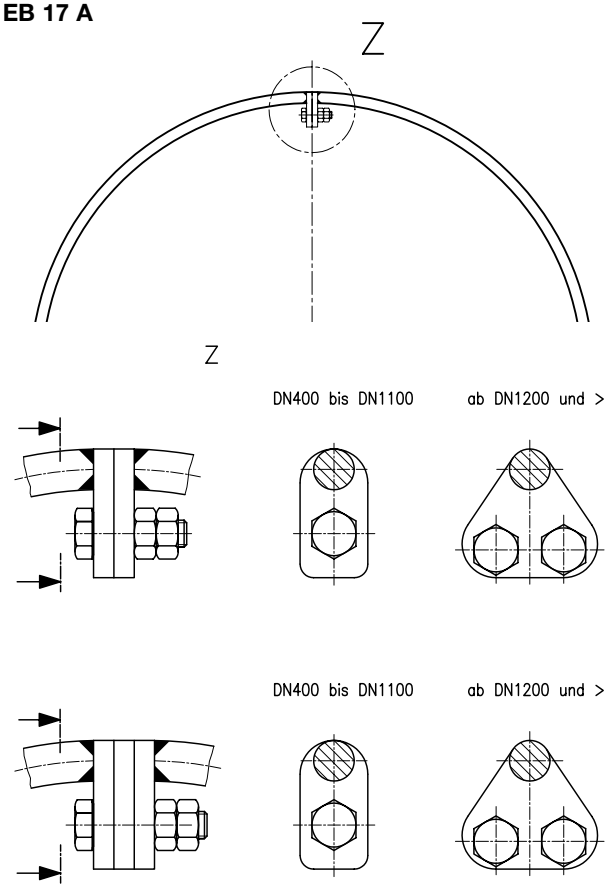
- Apply final torque according to Step 3 in two passes crosswise
- The bolts do not require further tightening as this would ultimately damage the sealing surface
- Throughout the entire fitting pro cess, it must be ensured that the sealing bead does not tilt
  The protruding sealing surface should be compressed evenly on all sides
- When fitting silicone rubber expan-sion joints, the specified tightening torques must be reduced by 30%.
- If a leak should occur during the subsequent pressure test, the bolts must be tightened with the torque according to Step 3. If the bolted flange connection is still leaky, the tightening torque must be increased slightly.
  Before retightening the bolts, the pressure in the expansion joint must be reduced.
- Throughout the entire fitting process, it must be ensured that the expansion joint is not overexpanded or crushed.

Vacuum support ring (EB 17)

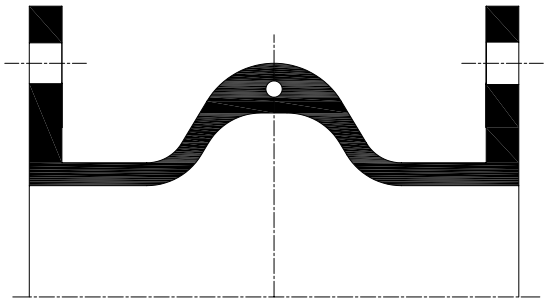
For vacuum support rings arranged directly downstream of a pump, flap valve or elbow the vacuum support rings must be checked for correct positioning after fitting as follows (EB 17 A):

- Firm seating (max. 10 - 15 mm clearance between bellow and ring on one side)
- If necessary, adapter plates should be used to obtain the permissible seat clearance
- The connection lock should always be in the lower flow area (6°)
- At high flow rates, a check must be made to determine whether an expansion joint with vulcanised support ring should be used in order to avoid fatigue failures due to strong turbulence (EB 17 B)
- After fitting, check that the hexagon bolts and nuts are securely locked to prevent loosening

EB 17 A



EB 17 B



8. FINAL FITTING CHECK

- Check the expansion joints on all sides for any visible damage and in particular clean the gap between the steel backing flange and rub ber bellow (remove foreign bodies, sand, etc.)
- After being fitted, the expansion joints should be provided with suitable protection against damage, which must only be removed directly prior to commissioning
- The rubber parts must not be painted.Solvents and chemicals attack the surface and damage the bellow
- The expansion joints must not be insulated as this can cause the bellow to overheat and dry out and ultimately lead to damage of the bellow
- The best results are obtained when the expansion joint is able to function stress-free under operating conditions (initial tension must be taken into account when fitting)
- For expansion joints with tie rods, check the tie rods. They should be able to be turned hand-tight. The lock nuts must be tightened
- If possible, check the support spirals/rings, if present, for correct seating and locking

9. MEASURES PRIOR TO PRESSURE TEST AND COMMISSIONING

- Remove the protective covers and clean the expansion joint
- Check the expansion joint for damage
- Check that all supports, fixed and plain bearings are fitted and functional
- Check the tie rods for even loading and if necessary adjust them to the prevailing conditions

10. PRESSURE TEST

The rubber expansion joint is not a proper pressure vessel, but is classified according to the Pressure Equipment Directive as a “pipe accessory” (pipe component).
When fitting the expansion joint in piping, sealing does not take place via a separate seal, but directly on the sealing surface of the integrated rubber bellow.

A one hundred per cent pressure test of the rubber expansion joint at the manufacturer can adversely influence the integrated rubber sealing surface.
Pressure testing of the rubber expansion joints at the manufacturer therefore takes place only
at the special request of the customer with the utmost care.

The pressure test normally takes place only after the rubber expansion joints have been fully installed in the pipe system.
All of the instructions contained in these fitting instructions should be observed prior to the pressure test.

If leaks should occur in the area of the flange connection during the pressure test, the bolted flange connection must be retightened according to the tightening table Step 3.

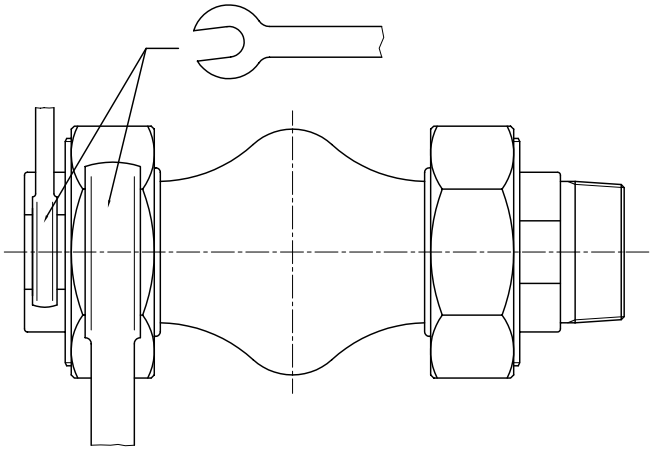
11. SUPPLEMENTARY ASSEMBLY AND FITTINGS INSTRUCTIONS FOR TYPE 45 - 46

Rubber expansion joints type 46 must be fitted stress-free.
The bolted connections should always be made using two wrenches to avoid torsion on the expansion joint (EB 18).

- Mount the bolting parts on the pipe and check the fitting gap! The fitting gap should have the same length as the expansion joint bellow (e.g. 130 mm +/- 5 mm type 46 and 120, 130,140 or 155 mm depending on the nominal diameter for type 45)
- Insert the expansion joint and tighten using two wrenches as follows:
  - **DN 20/25 type 46 and DN 20–50 type 45**
    The front threaded part must be used as a counter support and the sleeve nut tightened (to avoid torsion on the bellow)
  - **DN 32–50 Type 46**
    The rear threaded part must be used as a counter support and the sleeve nut tightened (to avoid torsion on the bellow)

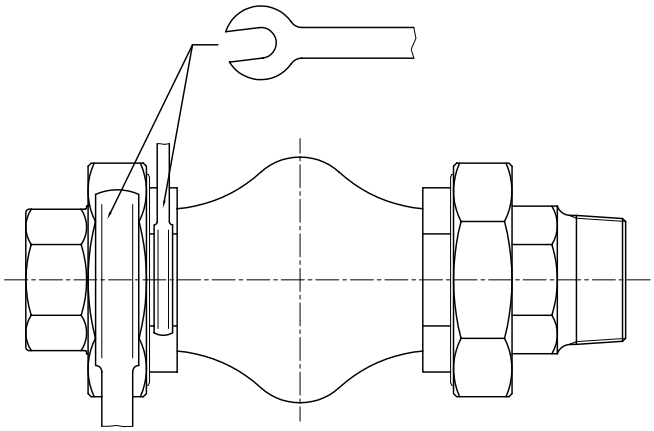
EB 18 A

DN 20/25 Typ 46 und DN 20 – 50 Typ 45



EB 18 B

DN 32 – 50 Typ 46



All other fitting positions are as described in our main fitting instructions.

Tightening torques for all types 100 Nm.

12. SUPPLEMENTARY ASSEMBLY AND FITTING INSTRUCTIONS FOR TYPE 60 - WRG

- The rubber-metal pipe connector type 60 WRG must be fitted stress-free
- The fitting gap must be 70 mm
- The pipe connector must not be subjected to tension, torsion or bending
- No additional seals are required
- Only hexagon head bolts according bed in our main fitting instructions to DIN 933 with washer should be used
- The bolt tightening torque is 30 Nm

All other fitting positions are as described in our main fitting instructions.

SCREW MEASURES FOR

DN	Flange PN 6	Flange PN 10
20	4 x M10 x 25	4 x M12 x 30
25	4 x M10 X 25	4 x M12 x 30
32	4 x M12 x 30	4 x M16 x 30
40	4 x M12 x 30	4 x M16 x 30
50	4 x M12 x 30	4 x M16 x 30
65	4 x M12 x 30	4 x M16 x 30
80	4 x M16 x 35	8 x M16 x 35
100	4 x M16 x 35	8 x M16 x 35
125	8 x M16 x 35	8 x M16 x 40
150	8 x M16 x 35	8 x M20 x 40
200	-	8 x M20 x 45

13. SUPPLEMENTARY ASSEMBLY AND FITTING INSTRUCTIONS FOR TYPE 61

- Type 61 is fitted as part of the pipe installation. Installation in the fitting gap is only difficult in the case of very large nominal diameters
- The pipe ends must be long enough to reach the beginning of the shaft on both sides
- Only use wide GBS clamps for fixing the expansion joint (min. 20 x 1 mm)
- At an operating pressure of up to 2 bar, one clamp is adequate per side. Above 2 bar, two clamps should be used

All other fitting positions are as described in our main fitting instructions.

14. SUPPLEMENTARY ASSEMBLY AND FITTINGINSTRUCTIONS FOR TYPE 64

The expansion joint must not be fitted before all work on the pipes and flanges has been completed and all anchors and supports mounted.
This is intended to prevent the expansion joint from being damaged by welding sparks, sharp-edged objects, etc.

Since the expansion joints type 64 are made from highly flexible materials, the durability depends on careful and correct fitting.

- Avoid sharp edges and folds.
- Ducting flanges, backing flanges or other steel parts included in the delivery should be checked and correspond to the drawings. The bolt holes must be arranged symmetrical in each flange.
- For lifting the expansion joint, it is recommended to use a sup port plate or inner frame Preferably, the expansion joint should be pre-assembled with backing flanges and internal sleeve (if included in the delivery) on the ground before lifting.

All other fitting positions are as described in our main fitting.

TIGHTENING TORQUES FOR TYPE 64

Material	Backing flange / Bolts			
	40 x 10 / M10	50 x 10 / M12	60 x 10 / M12	60 x 12 / M16
NBR	60 Nm	70 Nm	80 Nm	80 Nm
EPDM	60 Nm	80 Nm	80 Nm	80 Nm
Vion	-	80 Nm	80 Nm	80 Nm

15. SUPPLEMENTARY ASSEMBLY AND FITTING INSTRUCTIONS FOR TYPE 80

- The expansion joints are delivered with protective covers.
  These covers must only be removed directly prior to assem bly. If these covers need to be removed in advance for the pur pose of inspection, they must be screwed back into place in any event
- Welding, soldering and brazing on the PTFE bellow is forbidden as the bellow can be damaged and highly toxic gases can develop
- The use of seals between PTFE/ PTFE sealing surfaces is unneces sary. It is recommended to use a 5 mm thick PTFE seal for connec tions to glass, enamel and other components
- The flange connection bolts must be tightened according to the torque table 3, page 21)
- The limiting bolts (tie rods) must be adjusted to the maximum permissible expansion after assembly of the expansion joint. The limiting bolts must not be removed
- In the course of commissioning, the flange connections should be retightened with the specified torque after reaching operating temperature
- If leaks occur, the flange connec tions must be checked for paral- lelism of the flanges, fouling or damage to the sealing surfaces

Minor indentations or damage can be removed with emery cloth.

16. MAINTENANCE AND MONITORING

- Prior to final commissioning, the flange connection tightening tor que must be checked a single time
- First inspection 1 week after commissioning.
  Further inspections after 1, 4 and 12 months and then yearly.
  The following must be checked:
  - External damage of rubber bellow, flange and tie rods
  - Deformations of the rubber flange between the bolts (displacement of flange surfaces)
  - Changes to the rubber bellow (bubbles, brittleness, cracks, hairline cracks
  - Check of the tie rods for impermissible displacement and misalignment
  - Assessment of corrosion and wear on the entire component.
- The expansion joints can be cleaned with a weak soap solution and clear water.
  Do not use sharpedged objects, wire brushes or emery cloth.

TABLE 1: FLANGE BOLT TORQUE FOR TYPE 40, 42, 58 AND 59

DN	Step 1	Step 2				Step 3		
	Pre-assembly	PN 6	PN 10	PN 16	ASA 150	PN 6	PN 10	ASA 150
	Nm	Nm	Nm	Nm	Nm	Nm	Nm	Nm
200	100	160	200	160	200	200	250	250
250	100	160	160	200	200	200	200	250
300	150	160	160	240	280	200	200	350
350	150	200	160	200	360	250	200	450
400	150	160	240	280	320	200	300	400
450	150	200	160	280	360	250	200	450
500	150	160	240	360	360	200	300	450
550	200				400			500
600	200	240	320	520	480	300	400	600
650	200				440			550
700	200	240	320	440	440	300	400	550
750	250				480			600
800	250	320	440	560	640	400	550	800
850	250				600			750
900	250	360	440	520	640	450	550	800
950	250				720			900
1000	250	360	560	720	680	450	700	850
1050	250				720			900
1100	250				720			900
1150	250				720			900
1200	250	440	680	960	720	550	850	900
1250	250				880			1100
1300	250				920			1150
1350	250				1000			1250
1400	250	560	840	1000	960	700	1050	1200
1450	250				1040			1300
1500	250				1000			1250
1600	250	600	1120	1360	920	750	1400	1150
1650	250				1160			1450
1800	250	680	1120	1360	1120	850	1400	1400
1950	250				1320			1650
2000	250	840	1160	1560	1480	1050	1450	1850
2100	250				1520			1900
2200	250	880	1480		1640	1100	1850	2050
2250	250				1840			2300
2400	250	920	1520		2040	1150	1900	2550
2550	250				2320			2900
2600	250	1120	1560		2560	1400	1950	3200
2700	250				2560			3200
2800	250				2680	1450	2050	3350
2850	250				2960			3700
3000	250	1160	1880		3200	1450	2350	4000

TABLE 2 FLANGE BOLT TORQUE FOR TYPE 48, 49, 50, 51, 53, 55, 56 AND 65

DN	Step 1 for all Nm	Step 2 for all Nm	PN 6 Nm	PN 10 Nm	Step 3 PN 16 Nm	PN 25 Nm	ASA 150 Nm
25	by hand	50	60	80	80	80	80
32	by hand	50	60	80	80	80	80
40	by hand	50	60	80	80	80	80
50	by hand	50	60	80	80	80	80
65	by hand	50	60	80	80	80	80
80	by hand	50	60	80	80	80	80
100	by hand	50	80	100	100	100	100
125	by hand	50	80	100	100	100	100
150	by hand	50	80	100	100	100	100
175	by hand	50	90	100	100	100	100
200	by hand	50	90	100	100	100	100
250	by hand	50	90	100	100	110	100
300	by hand	50	100	110	110	110	100
350	by hand	50	120	130	135	165	110
400	by hand	50	120	140	155	200	140
450	by hand	50	140	145	165	200	145
500	by hand	50	120	145	170	200	145
600	by hand	100	185	210	255	280	210
700	by hand	100	200	225	300	300	230
800	by hand	100	235	300	360	410	300
900	by hand	100	235	300	360	415	300
1000	by hand	100	300	360	425	525	360

TABLE 3: FLANGE CONNECTION DIMENSIONS ACCORDING TO DIN 2501

DN	PN 10 Screws Quantity	PN 10 Screws Thread	PN 10 Bolt torque Nm	PN 25 Screws Quantity	PN 25 Screws Thread	PN 25 Bolt torque Nm
20	4	M12	10	4	M12	10
25	4	M12	20	4	M12	20
32	4	M16	30	4	M16	30
40	4	M16	40	4	M16	40
50	4	M16	50	4	M16	50
65	8	M16	70	8	M16	40
80	8	M16	40	8	M16	40
100	8	M16	40	8	M20	50
125	8	M16	50	8	M24	80
150	8	M20	60	8	M24	90
200	8	M20	90	12	M24	100
250	12	M20	60	12	M27	120
300	12	M20	70	-	-	-
350	16	M20	110	-	-	-
400	16	M24	160	-	-	-
500	20	M24	180	-	-	-
600	20	M27	240	-	-	-
700	24	M27	260	-	-	-