O&M / INSTALLATION INSTRUCTIONS FOR RUBBER BELLOWS

Always read these instructions before commencing installation of rubber bellows -

A. PRE-INSTALLATION CHECK

1. *SELECTION*

Prior to installation, check that you have the right bellows for the particular duty.

Rubber bellows have temperature and pressure limitations. Maximum allowable pressures need to be derated at temperatures above 50°C.
See EA data sheets for allowable pressures and temperatures.

All rubber bellows will extend under pressure. These pressure thrust forces can be very substantial at pressures above 2 bar and 65mm N.B. size. Unless the pipe work can be sufficiently anchored a tied bellows should be fitted (see fig.2.).Vacuum support rings may be required when bellows are fitted to suction side of pumps and where vacuum conditions could occur.

2. *MATING FLANGES*

We recommend that the rubber bellows are mated up against full-bore weld neck flanges (see fig.3.). If installed in this manner no additional gaskets are required.

We advise against using slip on or screwed flanges as mating flanges as these can damage the rubber bellows. Once the sealing face has been damaged medium will penetrate the reinforcement layers and destroy the integrity of the bellows.

If it is unavoidable to use this type of mating flange, a gasket must be used (this should be a hard gasket such as Klingerite and be at least 3mm thick. The gasket should reach the internal bore of the rubber bellows see fig.4.). Another option is to fill the gap of the slip on flange with weld and grind it flush (see fig.5.).

3. *MISALIGNMENT*

Check that the two mating flanges are parallel and that they are in line (maximum allowed offset is 5mm in any direction). The gap between flanges should be within +/- 5mm of the bellows neutral length (see fig.6.).

Ensure that the pipework is adequately supported. The bellows must not support pipes or plant.

B. INSTALLATION

1. *BOLTS*

Bolts should be inserted from the bellows side (see fig.3.). On some larger sizes this may not be possible. In that case a bolt of the exact length needs to be selected. An alternative is to use studding cut to length and fitted with a nut at both sides (see fig.7.). This is important as the bellows will increase in diameter under pressure. Even if there is space between the bolt and the bellows in an unpressurised state, they may foul when pressurised.

Bolts of the right diameter must be used to ensure correct alignment.

2. *ALIGNMENT*

Take care when inserting the bellows into the gap between the two mating flanges. Sharp edges can damage the sealing face of the rubber bellows. Before tightening the bolts, ensure that the bellows sits evenly in its flange groove and does not get pinched between flanges. The sealing face of the bellows must be concentric with the sealing face of the mating flanges.

3. *TIGHTENING THE BOLTS*

Great care has to be taken with the tightening of the flange bolts. Remember that you are tightening against a rubber face. As with gaskets, over tightening will cause the joints to leak and it will damage the bellows. *"Tighter is definitely <u>not</u> better!"*

Tighten opposite bolts to get an even pressure all round (check the gap between the flanges). Use a torque wrench to tighten the bolts to values listed in table 1. Torque the nuts and not the bolts.

Rubber will set and the bolts will have to be retightened after 24 hours.

The values given in table 1. are for new bellows only. The torque settings may be exceeded by up to 50% without damage to the bellows. Values are without pressure in the system.

4. *TIE BARS*

Once the bellows is fitted, ensure that the tie bars are tight. If necessary, adjust nuts at either end. All tie bars should be at equal length. When three or more tie bars are fitted it may be necessary to remove one tie bar to install the bellows. Ensure that washers are re-assembled in the right order and orientation. A lock nut must be re-fitted.

C. TAKING CARE OF RUBBER BELLOWS

1. *PAINT*

Do not paint rubber bellows. The paint will attack the rubber. (This also applies to paint splatter).

2. *WELDING*

Protect the rubber from weld spatter. When welding, always ensure that the bellows is bridged using a continuity strap (applies to the type 'AS' only).

3. *LAGGING*

Do not Lag rubber bellows on heating systems. The increased temperature will reduce the life of the bellows.

4. *TIE BAR CHECK*

Once the system is filled but not under pressure, check that the tie bars are still tight (pipe work on springs may have dropped due to the weight of the water). Re-tighten the bars if slack.
Note :- tie bars should never be slackened off to reduce noise or vibration transmission, major damage to equipment may occur.

5. *WATER TREATMENT*

Most bellows use an EPDM inner liner. EPDM is a proven material in heating and chilled water systems. It is resistant to glycol and to most chemicals used in water treatment, when used in normal concentrations. As suppliers of water treatment chemicals are reluctant to give information about their formulations, we cannot approve any specific chemical.

Always check with the chemical supplier that the additives are suitable for use with EPDM rubber or any other rubber quality supplied (Butyl, Perbunan). For other mediums check with EA for compatibility.

D. BEST PRACTICE

The following are only recommendations but if followed they will ensure proper installation and maximum service life of the rubber bellows.

1. Selection *- Use nylon reinforced bellows (Stenflex type A or GR) on chilled water, condenser water, hot water services etc. and steel wire reinforced bellows on heating (Stenflex type AS).*

2. Fitting *- We recommend the use of stool pieces to align mating flanges and to ensure the correct gap. (They are available from EA).*

3. System *- When the bellows are installed on rotating equipment such as pumps to absorb noise and vibration, the pipe work either side of the bellows should be guided. This ensures that the bellows moves and not the pipe work (see fig.8.) thus acting as an acoustic break.*

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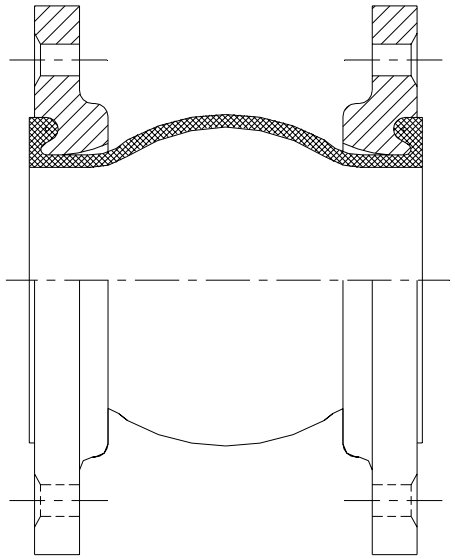
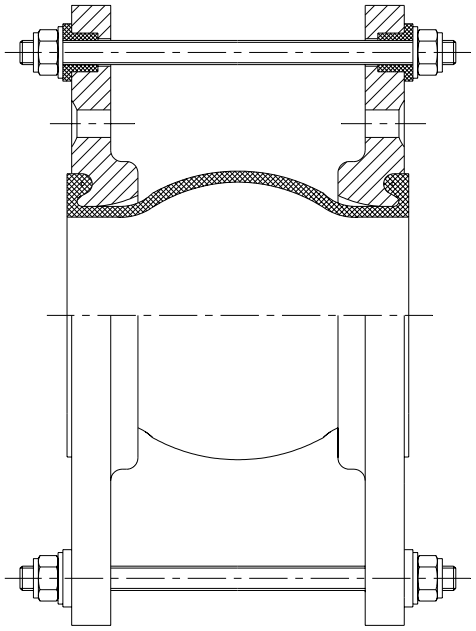
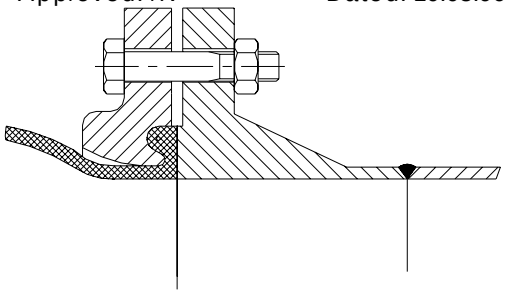


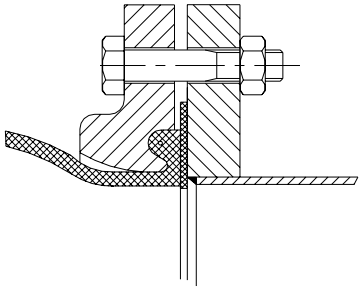
Untied Bellows Fig.1.



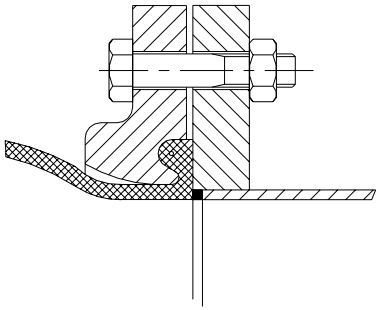
Tied Bellows Fig.2.



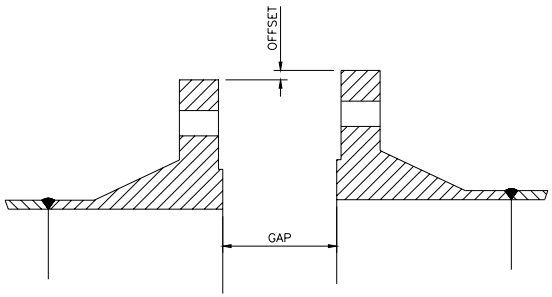
Full bore weld neck flanges Fig.3.



Slip on mating flanges Fig.4.

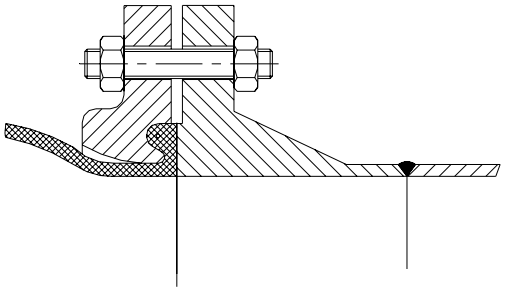


Gap filled with weld then ground flush Fig.5.

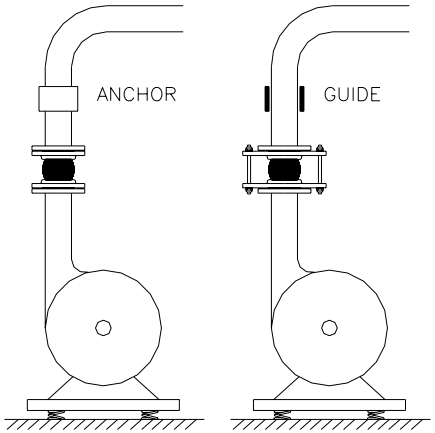


Max. allowed offset +/- 5.0mm Fig.6.

Gap = bellows length +/-5.0mm



Use of studding Fig.7.



Pipe guides/anchors on rotating equipment Fig.8.

Nominal bore	*Torque Setting (Nm)*
32/40	*90*
50	*90*
65	*90*
80	*90*
100	*90*
125	*90*
150	*180*
200	*180*
250	*45*
300	*60*

Note: for PN16 drilled only. Contact office for other drillings. *Torque Settings Table.1.*