



INSTALLATION, START-UP AND MAINTENANCE



S10 - S15



S20



S30

RUBBER JOINTS - TORAFLEX®

1.-GENERAL INFORMATION.

TORAFLEX® Rubber Joints consist of a flexible main shell made of synthetic rubber with inner reinforcements to provide consistency, with pipe connections by means of loose or integral flanges, or threaded unions.

They can be used either to absorb vibration and noise caused by equipment such as pumps or compressors, or to balance thermal movements in pipe systems due to temperature changes. They also help at installation to balance slight misalignments or length deviations, and reduce the effects caused by water hammers to a certain extent. They are widely used in HVAC, water treatments, process industry, ships, etc.

The equipment is designed, manufactured and tested following procedures and high quality standards dictated by the EN ISO 9001. Each batch number is punched on the rubber for full traceability.

They are excluded from the Pressure Equipment Directive PED 97/23/CE, according to its article 1.3-15.

The label in the product states rubber material and maximum temperature. For complete technical description (dimensions, connections, pressure-temperature rating, materials, etc.) please consult our Data Sheets at www.comeval.es or contact us at +34 961479011.

2. – GUARANTEE.

-TORAFLEX® Rubber Joints are guaranteed against any manufacturing default for a period of 12 months in accordance with Sound Engineering Practice and provided the application, installation and maintenance operations have been properly followed, according to our General Sales Terms.

-The guarantee coverage does not apply to eventual damages caused by operation under duties other than described in our Data Sheet and product label. No claims derived from wrong handling and/or lack of observation of General Technical Rules will be accepted.

-Our guarantee coverage does not cover for any commissioning or in site maintenance jobs or either products proved to have been tampered with or faulted by material wear and tear.

-The Purchaser is responsible for checking that the in-coming product is received in good condition and conforms to the ordered specifications. In case of damage caused during transit it is necessary to immediately complain to the carrier within 24 hours. After this time carriers could not assume the derived costs.

3. – ESSENTIAL SAFETY GUIDELINES

- Read this manual before installing the product.
- Always use the product within the scope of intended service and operating duties.
- Essential safety working regulations are to be strictly kept.
- Only qualified personnel should start up and regularly follow maintenance jobs at the plant.
- Any deviation from the usual installation guidelines should be notified to us for advice and approval.

4. – PRESERVATION, STORAGE & TRANSPORTATION

- Keep storage protection until installation into the pipe. Always use correct handling means and proper packing for transportation.
- Avoid extreme temperatures, high environmental humidity or corrosive environment. Keep the joints away from sunlight, dust, flames or rain to avoid damage and rust of the equipment surface.
- Protect the equipment from sharp objects that could easily damage the rubber faces.
- Avoid bumping or external vibrations. Do not pile up excessive weight. In case of severe bumping inspect the material for any damage and replace if necessary.

5. – INSTALLATION

Bear in mind the following guidelines along with general installation practice:

Outdoor installation reduces the Joints life span. Rubber bellows are affected by weather conditions (sunlight, ozone, etc.).

In Double Sphere Joints (i.e. S20 and S30 types), use of root rings might be necessary with big sizes, hot water and / or working pressures above 10 bar. Please check our Data Sheets or consult us in www.comeval.es

Avoid high velocities (limits depending on fluids). As a general guideline, velocity of liquids should be less than 3-4 m/s and much lower in case of abrasive liquids.

Allow enough space to ease maintenance operations.

Do not paint or lubricate Rubber Joints.

Consider the interaction between the system and the equipment. Proper selection and location of the joints, as well as proper guiding and anchoring of the system are essential for the safe and proper use of the joint, as explained in detail here below.

ATEX: Warning! Elastomeric or fluoropolymer surfaces should be cleaned if necessary with a wet cloth to avoid electrostatic charge. Also consider the risk of electrostatic charges created by the flow.

A Rubber Joint should work either as an anti-vibration device or as expansion joint, but not both functions at the same time; installation, pipe anchoring and guiding requirements are different.

– Reaction forces. Anchoring and Guiding. Limit rods

REACTION FORCES

Rubber Joints are flexible components which break the pipe system rigidity. A Rubber Joint acts as a piston by the forces arising from the internal pressure of the pipe. To prevent the pipes from damage they have to be properly anchored in order to absorb these reaction forces (Fr).

The reaction force caused by internal pressure in a Rubber Joint is calculated by the following formula:

$$Fr (N) = P (kg/cm^2) \times A (cm^2) \times 10$$

Fr = Reaction Force

P = Pressure

(Max. Working Pressure and Testing Pressure must be considered)

A = Effective cross sectional area

Effective area for each Joint type is given in our Data Sheets.

Other Reaction Forces:

- Reaction forces caused by the innate Joint resistance to move, calculated through the Joint stiffness, normally given in N/mm (linear) and Nm (torsion),
- Reaction forces caused by the friction of the guides..
- Apart from reaction forces caused by the joint installation itself, pipe system weight and centrifugal forces on bends caused by velocity of the fluid must also be considered for anchoring.

ANCHORING. FIX POINTS

We call Fix Points to the anchors that absorb reaction forces.

Every Rubber Joint has to be installed between two Fix Points.

Intermediate Fix Points are the ones just absorbing forces caused by joint stiffness and friction of guides, whereas Main Fix Points also absorb the forces caused by internal pressure, centrifugal forces and weights not supported by Guides.

Main Fix Points are normally located in pump groups, valves, bends, crosses, line ending or flow change sections of the pipe work.

GUIDING

Guides not only support the pipe system weight, but also maintain correct alignment so that the Joints work adequately. It is important to notice that guides supporting the pipe system are not fixed points.

The Guides should be positioned according to certain rules given further on and they prevent buckling of the line.

Special Guides can be used to allow movement in more than one direction.

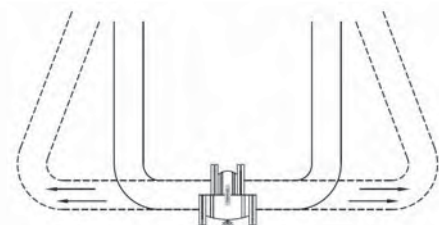
LIMIT RODS

The main purpose of Limit Rods is to absorb the force caused by internal pressure, and avoid reaction force over Fix Points. Fix Points will be released but they are still necessary. A Joint with limit rods will work only with axial movements. They are normally used with high pressures and large DN's, that may require very strong anchoring. They also relieve pump frames.

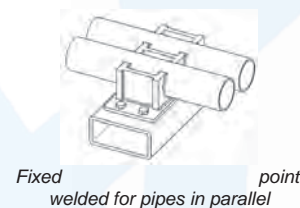
Limit rods can control Joint bellow over-extension and/or over-compression.

Limit rods can be used to avoid or correct mounting mistakes by over expansion.

Limit rods can be used for vacuum service in combination with vacuum rings.



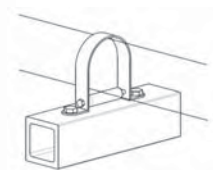
Joint under pressure acts as a piston.
Results shown when working without anchoring



Fixed point welded for pipes in parallel



Fixed point for elbow



Guide with roller stand

Herewith some recommendations for setting fix anchoring points, guides and limit rods.

Installation Guidelines for Rubber Joints absorbing vibration and noise

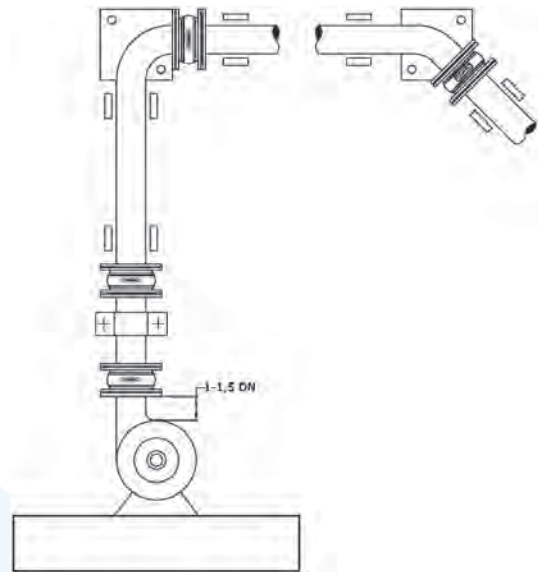
Rubber Joints are commonly installed in pump groups to absorb vibration and noise.

The Rubber Joint must be installed near the pump group, leaving just 1-1,5 DN distance. Leave more distance in case of abrasive media.

The Pump group frame must be properly anchored to absorb the reaction forces and another fix point must be set immediately after the Rubber Joint to limit the vibrations amplitude onto the pipe.

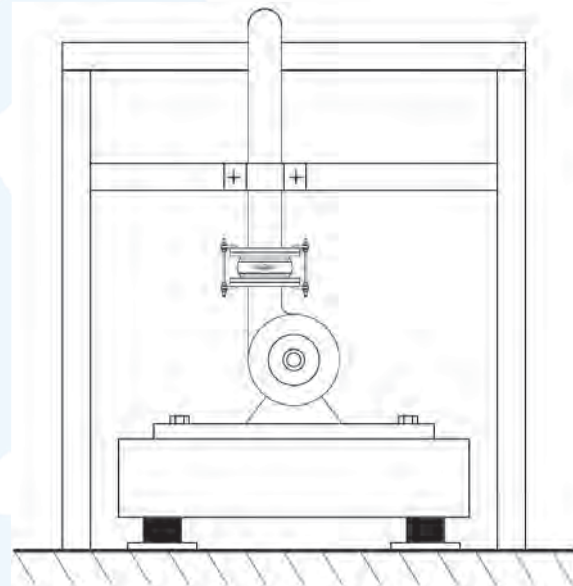
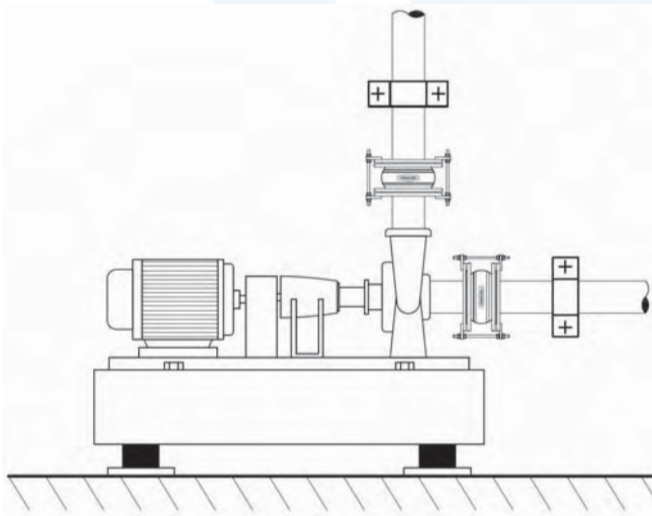
Proper guiding of the pipe is also necessary to ensure the equipment works correctly.

Absorbing pipe expansion/compression must be carried out independently.



Installation of Joints without limit rods

In case Main Fix Points could not be sized to absorb the reaction force caused by internal pressure, limit rods can be used to relieve them from such forces.



Installation of Joints with limit rods

Limit Rods Assembly on Rubber Joints absorbing Vibration and Noise:

- 1) Set the Joint in its rest position.
- 2) Place the plates symmetrically on the external face of counter-flanges, and equidistantly to the flange drillings. Fix plates with nuts and bolts as shown in the picture.
- 3) Introduce the rod through the third orifice of each plate until it remains centred with the Joint.
- 4) Introduce a rubber gasket from each side of the rod and then a metal washer.
- 5) Introduce nuts from each side of the rod, and fix them in the desired position (preferably limiting the Joint expansion to its rest position) by means of counter-nut or with a welding spot.



Installation Guidelines for Rubber Joints working as Expansion Joints

Selection of Expansion Joints and positioning of Fixed Points and Guides in a pipeline must be studied at the same time.

We recommend dividing the complete system into simple configurations. The whole selection depends on the movements to be absorbed, pipe system lay out, possibilities for setting Fixed Points and Guides, and Expansion Joints type to be used.

As above explained we have to differentiate between the Main and Intermediate Fixed Points. Reaction forces to be absorbed by anchors have to be calculated and assigned to the Fixed Points for their correct design.

In case Main Fix Points could not be sized to absorb the reaction force caused by the internal pressure, Limit Rods can be used to relieve them from such forces.

- Calculation of movements to be absorbed by the Joint:

A pipe undergoes and increases in dimensions when its temperature changes. To calculate the change in length in a pipeline it is necessary to know what the temperature differential would be and the expansion coefficient of the pipe.

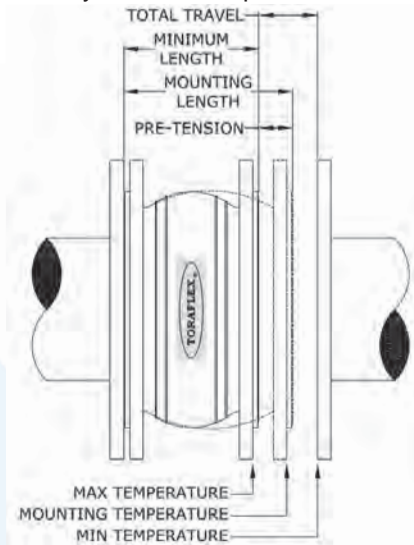
Maximum movements allowed for each Joint type are stated in our Data Sheets.

- Establishing the building installation length.

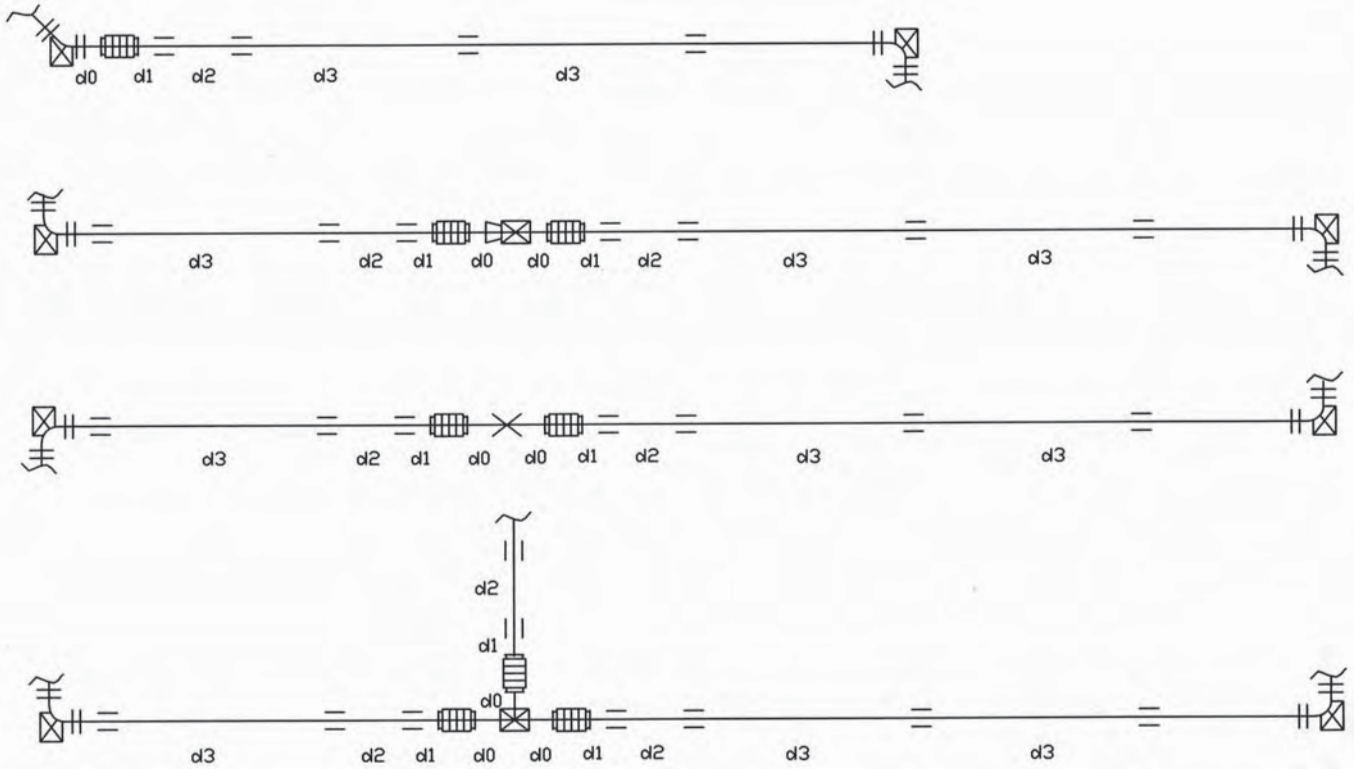
When all or most of the movement is in one direction, the joint can be installed with building length favouring the absorption in such direction.

This can reduce the number of joints needed and thus the number of anchors and guides.

Allowed building length range for each Joint type is stated in this manual.



Herewith some examples and recommendations for location of Expansion Joints with proper anchoring and guiding.



Symbol.

	Compensador de dilatación / Expansion Joint
	Punto Fijo Principal / Main Fixed Point
	Punto Fijo Intermedio / Intermediate Fixed Point

	Guía tubular / Guide
	Codo / Elbow
	Cambio de sección tubería / Section change

Distancias recomendadas / Recommended Lengths

- d0 <= 4 x DN (mm) ó 300 mm (el de menor longitud / whichever is the less)
- d1 <= 4 x DN
- d2 <= 14 x DN (mm)
- d3 <= 400 / DN (mm)

Anchoring and guiding for Joints working as Expansion Joints

Limit Rods Assembly on Rubber Joints working as Expansion Joints:

Installation according to drawings and following similar steps described above.

- To control Joint compression, inner rod nuts can be used, fixed with a welding spot or counter-nut, or alternatively a sleeve in the proper length can be set in the rod part between the plates.
- To control Joint expansion, outer rod nuts can be set with a welding spot or counter-nut. Make sure that Joint expansion/compression limits are not exceeded!
- Limit rods can also be used to pre-expand (with inner rod nuts) or pre-compress (with outer rod nuts). Tightening must be progressive and uniform. Make sure that Joint building length limits are not exceeded!



Limit Rods Assembly on Rubber Joints working with Vacuum:

Description of limit rods use in vacuum service in our Data Sheets

Follow the same procedure explained above, but placing plates on the internal face of the Joint flanges. Internal nuts will prevent the Joint to shrink due to vacuum.

Assembling the Joint to the pipe:

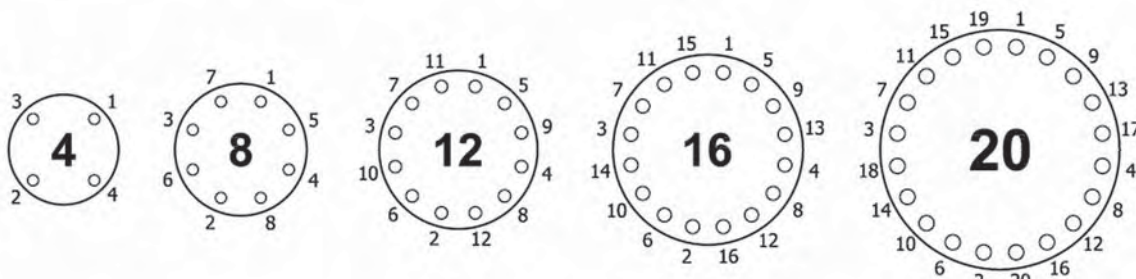
- Remove the storage protection carefully if any just before installation. Special care should be taken in order not to damage the soft parts.
- Ensure that the Joint interior and the piping system are free from dirt, rust, pipe, scale, welding slag or any other foreign material. In case of use of cleaning products, make sure they are compatible with material of construction.
- **Attention!**: Start installation of the Joint only once all work on the adjacent pipe (flanges welding, anchors setting, etc) has been completed and cooled down. Rubber Joints can easily be damaged by welding sparks or heat, sharp objects, etc.
- Avoid gradients, excessive rotation or pipe misalignment that could exceed the permissible movements of the joint in use.

INSTALLATION POSITION:

- TORAFLEX® Rubber Joints are bi-directional, and can be installed either in horizontal or vertical pipelines, subject to proper anchoring and guiding.

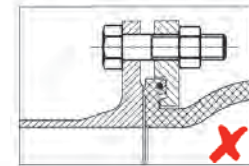
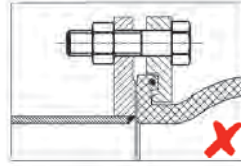
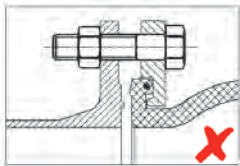
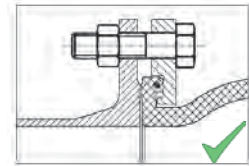
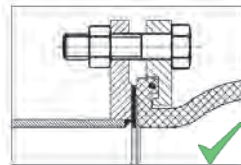
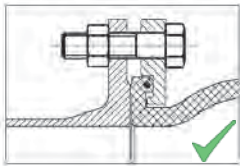
INSTALLATION OF RUBBER JOINTS WITH FLANGES:

- Make sure that counter-flanges are compatible with the standard of the Joint flanges .
- Ensure that contact faces of joint flanges and counter-flanges are free of grease and in good condition.
- Ensure pipe alignment. Counter-flanges should fit smoothly. Make sure that the gap between the 2 counter flanges has enough clearance to fit the equipment without damaging the rubber faces (carefully retract slightly counter flanges if necessary).
- The rubber shell itself acts as sealing gasket, so no additional gaskets have to be added.
- Types S10, S15, S20 have loose flanges which eases assembly.
- Tighten opposing nuts/bolts gradually according to the following sequence.



- Maximum tightening torques: 60 Nm up to DN80, 80 Nm DN100 and larger.

Pay attention to the following recommendations:



Counter-flanges contact faces should be flat. Do not use grooved counter-flanges.

Use a spacer with additional gasket between spacer and counter-flange when installing slip-on flanges, since pipe ends could cut the Joint rubber face.

Rubber can swell under operation. Make sure bolts are set in such a way to avoid the contact with the Joint rubber.

INSTALLATION OF RUBBER JOINTS WITH THREADED ENDS:

- Make sure that the pipe screw has the correct finish and compatible cone with the valve. The standard system otherwise specified in the order is according to EN 10266-1 (ISO 7-1, DIN2999-1, BS21) "pressure-tight joints made on the threads", the Joint unions with parallel female threads (Gas – Rp – BSPP) and the tube with taper male threads (R – BSPT).
- Use proper sealant according to duty, such as hemp core, Teflon, etc.
- Check that pipe introduction in the Joint does not exceed valve thread, leave at least 1 mm as safety margin.
- Tighten with a plain or adjustable wrench on the hexagon end of the Joint only. Apply force to any other area may seriously damage it. Do not use hook spanners or other wrenches that could damage the hexagon surface. It should be threaded smoothly. If not, do not try to force the thread and avoid wrench extensions since this could lead to breaking the valve or damaging the thread. A general recommendation is not to exceed the tightening torque of 30Nm.

6. – START UP & OPERATION

- Re-check all the issues raised in previous chapter "Installation".
- Make sure that all guides and anchoring points are firmly secured in their right place and working properly before and during first load.
- Filling, warming-up and starting-up shall be gradual so as to avoid any inadmissible stress.
- Inspect guides to discard jamming.
- Check for tightness in Joint/pipe connections. Retighten flange union bolts/nuts crosswise and gradually if necessary until leakage elimination. If leakage persists, correct alignment and centring of the equipment should be checked, and surfaces should be thoroughly cleaned. If contact surfaces are irreversibly damaged replace them.
- Maximum recommended hydraulic test pressure 1,1 x (PMS or Ps marked in the rubber bellow). Test Pressure medium to be water at room temperature.
- Do not exceed the test time according to EN12266-1.
- **Warning!** Temperatures above 50°C or below -10°C may cause personnel injuries if joints are touched. Ensure that the corresponding warning signs are displayed on the valve or surrounding area, or isolate the equipment in case of danger.

7. – MAINTENANCE AND REGULAR CHECKING.

Rubber Joints are subject to wearing down and material fatigue. Thus, life span is limited and largely related to parameters such as service pressure, service temperature, movements amplitude, environmental conditions and ozone exposure, number of cycles and product compatibility.

Rubber bellow should be preventively replaced. Corresponding intervals should be defined and scheduled by the plant operation personnel according to service level.

Before starting any maintenance work at the plant, wait for the valve medium to cool down and release the pressure from the system. Clean the pipe system thoroughly in the event of toxic, corrosive, flammable or caustic fluids.

Check periodically for tightness and good condition of bellow surface and flanges, as well as the rest of pipe system (especially anchoring and guiding). If bellow is scratched or worn down, replace it.

Check the Joint length and position in the pipe to ensure that the equipment is working properly.

In case of excessive swelling or deformation, check material compatibility, working parameters, pipe anchoring and guiding. Replace the bellow when necessary.

Warning! when used in ATEX zone, consider the risk of electrostatic charges created by the flow. The user is responsible for preventing the risk. Use a wet cloth when cleaning the rubber bellow surface.

Replacing the bellow rubber:

Joint should be carefully anchored to a bench. With the assistance of a special shape wrench (hook end type) the rubber neck must be slipped under the flange by deformation. Repeat the operation at the other end. Place the new bellow inversely making sure it is not damaged during the assembly.

8. – TYPICAL APPLICATIONS

Marine: (Fresh Water Generators, Machine Room Equipment, Marine Engines, On Deck Systems, Water Cooling Lines, Lubricating circuits...).

H.V.A.C: (Heating, Ventilating and Air Conditioned, specially absorbing vibrations and noise caused by pulsating pressure stations, cooling towers, condensers, chillers, compressors, rooters,,)

Power: (Hydroelectric plants, Turbine lines, cooling towers, condensate lines and deaireators..)

Water Works and Environmental Services: (Water Treatment plants, Pollution filters, strength balance in sewage lines, centrifugal rooters, sludge pumping lines....)

Process Industry: (slurries, solvents and other chemical compounds).

Full technical support always available through our website www.comeval.es.