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REVERSIBLES



# Recomendations and care

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to be observed on installation

**BAL family**



pumps

**TRIEF**

since 1967

## PRACTICAL TIPS

For pump selection, first determine the required flow rate (lpm), then choose the suitable pump series for the specific application.

## SUCTION LINE

In most applications, truck-mounted pumps are located under the tank. The pump is expected to achieve its rated capacity provided that it has sufficient suction head. However, a restrictive intake condition may exist in cases where the suction line is too long or the pipe diameter is too small. This restrictive condition can even choke off the required liquid from the pump. It can, in fact, cause cavitation by decomposing the liquid into a mixture of vapour and liquid as it enters the pump. Cavitation not only results in reduced discharge, but also increased noise, vibration and wear and tear on the pump and other parts of the system. Cavitation can also occur due to use of other undersized components in the line, such as valves, elbows and emergency suction strainers, with a consequent reduction in flow rate.

## DISCHARGE LINE

The piping, hose, meters and other discharge system equipment must be selected for minimum flow rate reduction. If they are too small, this could oblige the use of low pump speeds in order to remove excessive pressure from the system, with a consequent decrease in pumping frequency. If a system is to be redesigned for larger sizes, it should be borne in mind that the simplicity of the system also reduces its resistance. Consideration should be given to shortening line lengths and reducing the number of bends and other fittings.

## PUMP ROTATION

Both the pump rotation and the required power must be considered and compared with the power take-off. Trief vane pumps can rotate both clockwise and anticlockwise. When looking from the motor shaft, clockwise places the suction inlet on the right-hand side, while anticlockwise places it on the left. Although the pump rotation direction must be specified when the pump is ordered, rotation of Trief pumps can be changed reliably on site.

## HOW TRIEF'S SLIDING VANES WORK

Trief vane pumps employ a rotor fitted with vanes that draw the liquid behind each vane through the inlet port and into the pumping chamber. As the rotor turns, the liquid is transferred between the vanes to the outlet port where it is discharged, while the pumping chamber is subjected to compression. Each vane applies a positive mechanical thrust to the liquid in front of it. The vanes are maintained in contact with the chamber walls by three forces:

1. The centrifugal force from rotation of the rotor.
2. Push rods acting between opposing pairs of vanes.
3. The pressure from the liquid penetrating through the grooves in the vanes and acting on the rear of the vanes.

Each revolution of a Trief pump displaces a constant volume of fluid. Pressure variations have a minimal effect. Losses and turbulence are reduced to a minimum, while high volumetric efficiency is ensured.

## PERFORMANCE EQUALS ENERGY SAVINGS

The high efficiency of Trief vane pumps means they require less power than other positive displacement pumps. As a result, you will have to invest less in electricity and motors to run the pump.

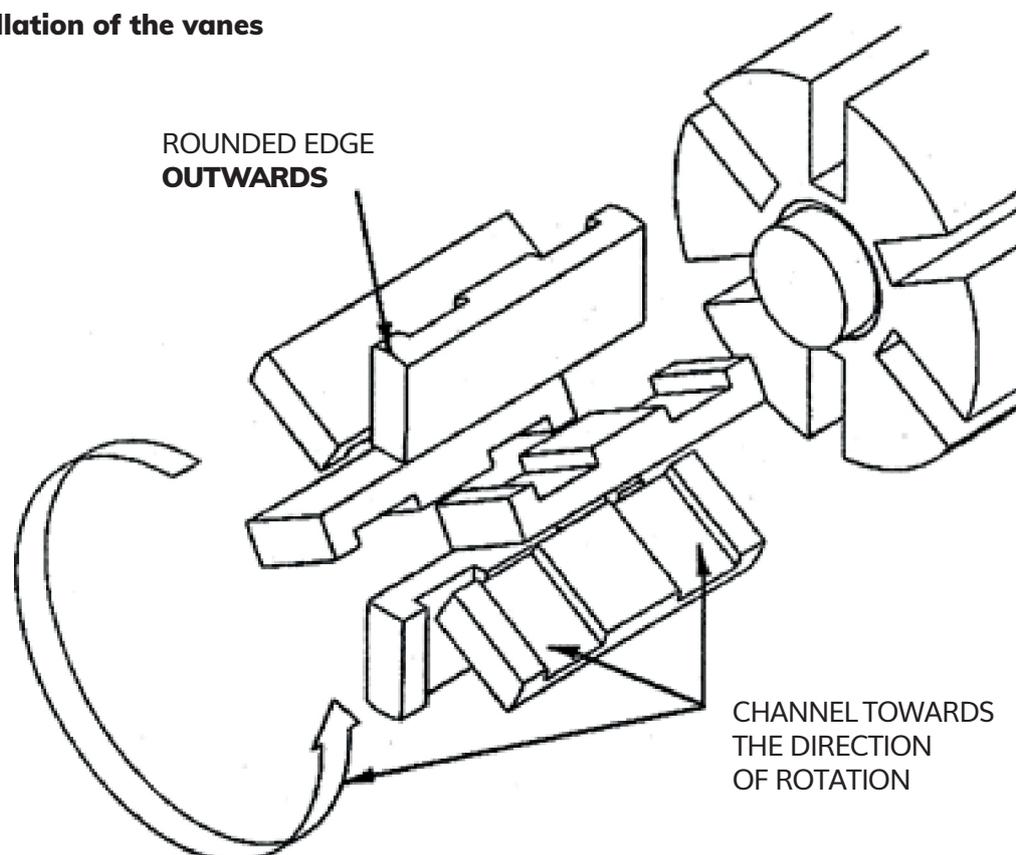
## SELF-ADJUSTING VANES KEEP PERFORMANCE HIGH

The efficiency of vane pumps decreases as wear increases. Compensating for this drop in performance means either increasing the rotational speed, which could cause increased wear, or accepting a decrease in pump capacity until it reaches a point where pump performance is totally unacceptable. The vanes in Trief pumps automatically extend out from the rotor slots to compensate for the wear. There is no need to increase rotational speed and poor performance is a thing of the past. Trief vane pumps maintain their original performance and capacity for the lifetime of the vanes.

## REPLACING THE VANES

- 1.** Remove the bearing cover (No. 13) from the side opposite the drive by loosening the clamping screws. Remove the lock nut (No. 18/1) and the lock washer (No. 18/2).
- 2.** Loosen the cover screws (No. 2D). Remove the cover, taking care not to break the O-ring (No. 27), with which you remove the bearing (No. 18), the fixed race (No. 39/1) and the fixed race O-ring (No. 39/3).
- 3.** Remaining on the shaft (No. 11) will be the rotary part (No. 39/2). Turn this by hand until it comes off the shaft.
- 4.** Turn the shaft (No. 11) by hand until the vane (No. 6) is at 12 o'clock on the rotor (No. 5). Remove the vane.
- 5.** Fit the new vane, making sure that the rounded edge is facing outwards and the grooves are facing in the direction of pump rotation (Fig. 1).
- 6.** Repeat steps 4 and 5 until all the vanes have been replaced.

**FIGURE 1:** Installation of the vanes

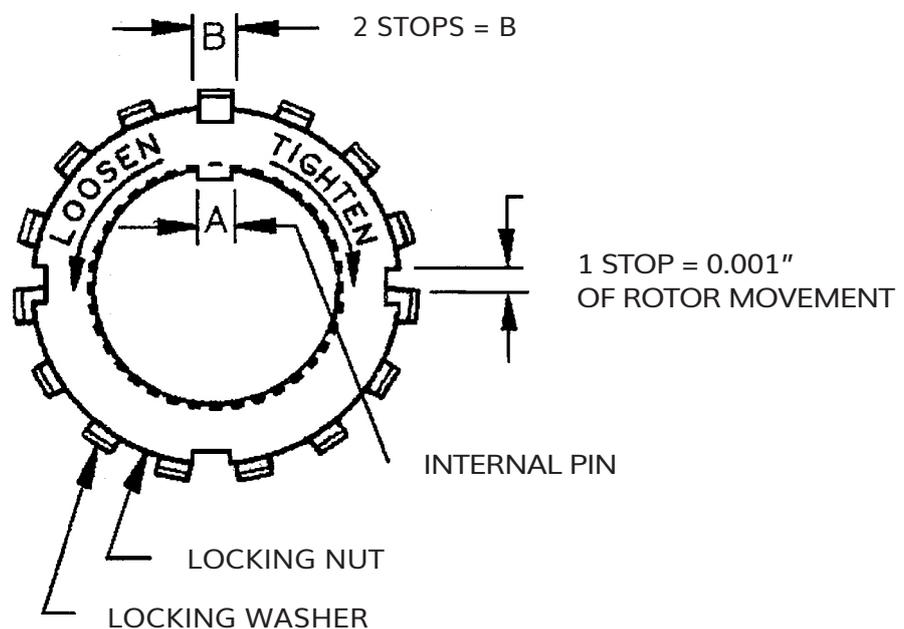


## INSTALLING THE LOCK NUTS AND LOCK WASHERS

It is important to fit and tighten the lock nuts (18/1) and lock washers (18/2) correctly. Over-tightening can lead to bearing failure or breakage of a washer pin. A loose nut can allow the rotor to scuff against the covers, causing wear.

- Fit the lock washers (18/2) to both ends of the shaft with the pins facing outwards. Fit the locking nut with the chamfered side facing inwards.
- Make sure that the inner pin (A) of the washer is located in the groove of the shaft thread, bending it slightly if necessary.
- With the bearings (18) fully seated at right angles, tighten the two nuts, to ensure that the bearings are centred. Do not overtighten, as this could bend or cut the inner washer pin.
- Loosen the two lock nuts by one full turn.
- Tighten one nut until you feel slight friction with the rotor when turning the shaft by hand.
- Back off the nut by the width of the washer pin (B). Make sure that the nearest washer pin fits into the locking nut groove. The pump must rotate freely when turned by hand.
- Tighten the opposite nut by hand until it fits against the bearing. Then, using a spanner, tighten the nut by the width of a washer pin. Tighten until just past the desired pin, then back off until the washer pin engages in the locking nut groove. Make sure that the pin is securely engaged in the groove in the nut. The pump must continue to rotate freely when turned by hand.
- To check the tightness, grasp the nut and washer with your fingers and twist back and forth. If you cannot do this, one or both nuts are too tight and must be loosened alternately, one stop at a time, starting with loosening the last to have been tightened.

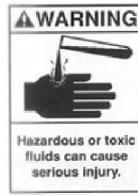
**FIGURE 2: Locking nut adjustment**



**SAFETY DATA**



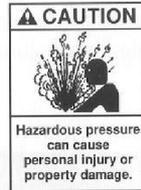
Failure to disconnect and lock out the power before performing maintenance can result in serious injury or death.



If hazardous or toxic fluids are pumped, the system must be flushed and decontaminated, both inside and out, before maintenance.



Operating the pump without properly installed guards can cause serious injury to people, damage to property or death.



Operating the pump with the valve closed can cause breakage of system components, injury to people or damage to property.

**TECHNICAL DATA**

MODELS	PUMP SIZE				
	1.25"	1.5"	2.5"	3"	4"
Maximum pump speed (rpm)	1,400	750	640	640	520
Maximum viscosity <sup>1</sup>	20,000 (4,250)				
Maximum temperature	356°F (180°C)				
Max. differential pressure	125 psi (862 kPa)				
Max. working pressure	175 psi (1207 kPa)				

1. The viscosity shown is in SSU (cP).  $cP = cSt$  for a fluid of density 1.0

\* Operating limits are for standard construction materials only

## INSTALLATION

### Note:

Trief motor-driven pumps must only be installed in systems designed by qualified personnel. The system must comply with all relevant standards and codes and include warning signs for all implied hazards.



- Installation, electrical connection and earthing must comply with local regulations and the national electrical code.
- Install a switch near the pump unit that disconnects all phases.
- Disconnect and lock out the power supply before proceeding with installation or maintenance.
- The power supply must be in accordance with the specifications indicated on the motor nameplate.
- Motors equipped with thermal protection automatically shut off the motor's electrical circuit in the event of an overload.

The motor may start unexpectedly and without warning.

## CLEANING BEFORE INSTALLATION

Foreign particles entering the pump **will cause severe damage.**

The supply tank and suction line must be cleaned and flushed before installation and commissioning.

## LOCATION AND PIPELINES

A poorly designed piping system, or improper pump unit installation, will significantly reduce pump performance and life.

The following piping system layout and pump installation is recommended:

1. To minimise losses in the suction line, position the pump as close as possible to the power supply.
2. The diameter of the suction line and fittings must be at least equal to the pump inlet diameter.

3. Minimise the number of elements (valves, elbows, etc.) in the suction line and changes in line direction. When used, such elements should be located at least 5-10 times the pipe diameter from the pump inlet.
4. We recommend installing a filter at a distance from the pump inlet equal to 5-10 times the pipe diameter. For viscosities below 1,000 SSU, the filter needs to have a net open area equal to 4 times the surface area of the suction pipe. For viscosities over 1,000 SSU, refer to the filter manufacturer's instructions. The filters must be cleaned periodically to prevent lack of supply to the pump.
5. The suction and discharge lines must be free of leaks.
6. To facilitate the expansion and contraction of the pipes, expansion joints should be installed at a distance of 0.9 metres from the pump inlet and outlet.
7. All lines and piping elements must be properly supported to prevent loads in the piping being transmitted to the pump.

## PUMP MOUNTING

We recommend mounting the pump-motor unit permanently by fixing the base plate, with suitably sized anchor bolts, to a properly levelled concrete floor in accordance with recommended industry standards.

A solid foundation will reduce system noise and vibration and improve pump performance.

Consult ANSI standards, or an appropriate pump manual, for information on proper pump mounting and foundations.

Check the alignment of the coupling after fixing the pump and base assembly to the foundation.

## COUPLING ALIGNMENT

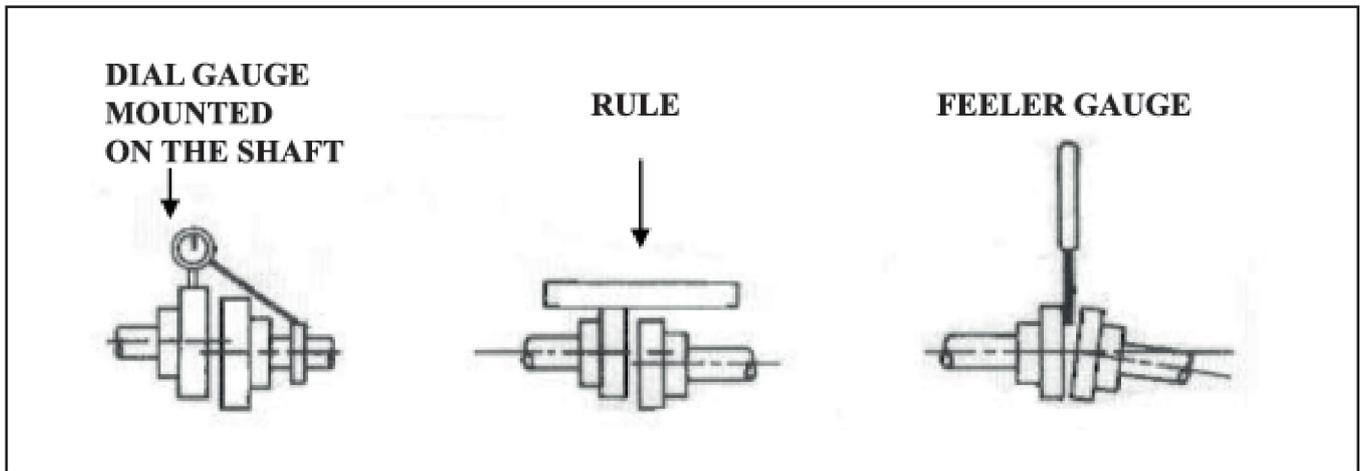
The pump must be coupled directly to the gearbox and/or drive system by means of a flexible coupling.

The coupling alignment, both angular and parallel, between pump, gearbox, motor, etc., **MUST** be maintained in accordance with the manufacturer's instructions.

Use of a dial gauge is considered preferable for checking **parallel alignment** (if a dial gauge is not available, use a rule). Rotate both shafts by hand, checking the clock readings over one complete revolution. The maximum deviation should be less than 0.005" (0.127 mm).

To check the **angular** alignment, insert a feeler gauge between the two halves of the coupling. Check the gap every 90° around the coupling (four check points). The maximum variation should not exceed 0.005" (0.127 mm).

**Checking alignment:**



**PUMP ROTATION**

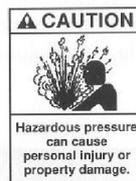
To set the direction of pump rotation:

- If the pump inlet port and the safety relief valve are on the right-hand side, with the drive side of the shaft pointing towards the observer, the pump rotates clockwise.
- If the inlet port and safety relief valve are on the left-hand side, with the drive side of the shaft pointing towards the observer, the pump rotates anticlockwise, i.e. to the left.

**OPERATION**



Operating the pump without properly installed guards can cause serious injury to people, damage to property or death.



Operating the pump with the valve closed can cause breakage of system components, injury to people or damage to property.

## CHECKS BEFORE COMMISSIONING

- Inspect the entire piping system and supports to ensure that loads from the lines are not transmitted to the pump.
- Ensure that all valves and other elements installed in the piping system are in the start-up or operating position.
- Check the motor electrical connections.
- Run the motor briefly to confirm that the pump rotates in the correct direction.

## COMMISSIONING PROCEDURE

- 1.** Start the motor; priming should occur within one minute
- 2.** Check the pressure and vacuum gauges to ensure that the system is operating within the intended parameters.
- 3.** Inspect piping, fittings and equipment associated with the system for leaks, noise, vibration or overheating.
- 4.** If possible, check the flow rate to ensure that the pump is operating within the expected parameters.
- 5.** Check the safety relief valve setting by briefly closing a valve in the discharge line and reading the pressure. The pressure should be 10-20 psi (69-138 kPa) higher than the maximum operating pressure, or of the external bypass valve setting (if fitted).

Do not operate the pump with a closed valve in the discharge line for more than 15 seconds. If readjustments are necessary, see section "Adjusting the safety relief valve" in this manual.

## REVERSE ROTATION

The pump can rotate in the opposite direction to the direction you are looking at, bearing in mind that the pump safety relief valve will stop working.

Installation of an individual safety relief valve is recommended to protect the pump against excessive pressure.

The pump will operate at a lower performance level.

## PUMP SAFETY VALVE

### Note:

The internal pump safety relief valve is designed to protect the pump against excessive pressure. It must not be used as a system pressure control valve.

Pumping volatile liquids under adverse suction conditions can lead to cavitation. **Partial closure of the discharge valve will result in vibration of the internal safety valve, which is NOT recommended.** For this type of application, install an external system pressure control valve and the necessary bypasses to the storage tank.

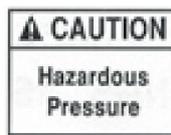
We also recommend installing a system pressure control valve when the pump is to be operated for longer than one minute with a closed discharge valve.

## INSTALLATION AND ADJUSTMENT OF THE SAFETY RELIEF VALVE

We recommend that the safety relief valve be set at least 10-20 psi (69-138 kPa) above the operating pressure, or the system pressure control valve setting.



The safety relief valve cap is exposed to the pumped fluid and may contain some of that fluid.



Incorrect safety relief valve adjustment could cause breakage of system components, injury to people or damage to property.

## PROCEDURE FOR SAFETY RELIEF VALVE ADJUSTMENT

### 1. To increase the pressure setting value.

- Remove the valve cap (part no. 17) and the gasket.
- Loosen the lock nut, if present.
- Turn the tensioning stud (part no. 9) inwards, or clockwise.
- Check the gasket and replace it if necessary..
- Refit the gasket and the safety relief valve cap.

## 2. To reduce the pressure setting value.

- Remove the valve cap and gasket.
- Loosen the lock nut, if present.
- Turn the tensioning stud outwards or anticlockwise
- Check the gasket and replace it if necessary.
- Refit the gasket and the safety relief valve cap.

## PUMP MAINTENANCE

### Note:

Maintenance must only be carried out by qualified technicians following the appropriate procedures and warnings according to this manual.



Failure to disconnect and lock out the power before maintenance may result in electric shock, burns or death.



If hazardous or toxic fluids are pumped, the system must be flushed and decontaminated, both inside and out, before maintenance.



Failure to decompress the system before performing maintenance on the pump may result in injury to people or damage to property.

## SCHEDULED MAINTENANCE

### Filters.

The filters must be cleaned regularly to prevent lack of fluid supply to the pump. The frequency will depend on the application and operating conditions.

### Pump lubrication.

We recommend greasing the ball bearings at least every 3 months. A higher frequency may be required, depending on the application and operating conditions.

### Recommended grease.

Molibgras EP-2

**Lubrication procedure.**

- 1.** Remove the grease fitting (part no. 41) from the bearing housings (part no. 13).
- 2.** Apply grease steadily with a grease gun until grease starts to come out of the hole. Remove excess grease in accordance with the relevant regulations.
- 3.** Replace the grease fittings in the greasing points.

**DO NOT over grease the pump bearings. Although it is normal for some grease to leak out of the grease fitting, excessive leakage from pumps fitted with mechanical seals can cause the seals to break** (the grease indicator hole is located in the head between the bearing and the seal).

**PUMP TROUBLESHOOTING**

SYMPTOM	PROBABLE CAUSE
<p>The pump does not prime</p>	<ul style="list-style-type: none"> <li>• The pump is dry.</li> <li>• Worn blades.</li> <li>• Suction valve closed.</li> <li>• Air entering the suction line.</li> <li>• Filter clogged.</li> <li>• Suction pipe or valves clogged or too restrictive.</li> <li>• Pump blocked by vapour.</li> <li>• Pump speed insufficient for priming.</li> <li>• Safety relief valve partially open, worn or incorrectly seated.</li> </ul>
<p>Reduced capacity</p>	<ul style="list-style-type: none"> <li>• Pump speed too low.</li> <li>• Suction valves not fully open.</li> <li>• Air entering the suction line.</li> <li>• Excessive restriction in the suction line.</li> <li>• Damaged or worn parts.</li> <li>• Excessive restriction in the discharge line resulting in partial flow.</li> <li>• Safety relief valve worn, set at an excessively low value or not closing properly.</li> <li>• Incorrectly installed blades.</li> </ul>

<p>Noise</p>	<ul style="list-style-type: none"> <li>• Excessive pump vacuum due to:             <ul style="list-style-type: none"> <li>- Fittings that are under-dimensioned or have restrictions in the suction line.</li> <li>- Pump speed too high for the viscosity or volatility of the liquid.</li> <li>- Pump too far from the source of the fluid.</li> </ul> </li> <li>• Funcionamiento de la bomba durante mucho tiempo con una tubería de descarga atascada.</li> <li>• Pump operation for a long time with a blocked discharge pipe.</li> <li>• The pump is not firmly mounted.</li> <li>• Worn or damaged bearings.</li> <li>• Vibrations due to improperly secured piping.</li> <li>• Bent shaft or misaligned motor coupling.</li> <li>• Failure of a system valve.</li> <li>• Safety valve set at too low a value.</li> <li>• Damaged blades.</li> <li>• Incorrectly installed blades.</li> </ul>
<p>Damaged vanes</p>	<ul style="list-style-type: none"> <li>• Entry of foreign particles into the pump.</li> <li>• Dry running for long periods of time.</li> <li>• Cavitation.</li> <li>• Viscosity / speed too high for the vanes.</li> <li>• Incompatibility with the pumped liquid.</li> <li>• Excessive heat.</li> <li>• Damaged rods / damaged rod recesses.</li> <li>• Water hammer / pressure spikes.</li> <li>• Vanes incorrectly installed.</li> </ul>
<p>Mechanical leakage</p>	<ul style="list-style-type: none"> <li>• O-rings not compatible with pumped liquids.</li> <li>• Notched, cut or damaged O-rings.</li> <li>• Damaged, worn or dirty shaft in the seal area.</li> <li>• Excessively lubricated ball bearings.</li> <li>• Excessive cavitation.</li> <li>• Mechanical joint faces with cracks, scratches, pitting or soiling.</li> </ul>

**WARRANTY**

For the pump manufactured by us, No.....for the period of one year from the date of manufacture, against all defects in material and construction (within the instructions given in this sheet, in addition to checking the nameplate for all details, including the product to be handled). If an incident occurs, notify the technical support service so they can advise you correctly. If the incident is still not resolved, we will send a technician to solve it. Total or partial disassembly of the pump will result in loss of warranty.

If, once our technician is on site, the problem is found not to be caused by a pump defect, the call-out and travel expenses will be invoiced.

Bilbao, .....202.....

<b>PART</b>	<b>MATERIAL</b>	<b>MODEL</b>
Pump casing	GG.20	BAL.1
Flange cover	GG.20	IBAL.2-D
Rotor	GG.20	BAL.5
Vanes	per product	BAL.6
Rods	Hardened steel	BAL.7
Tensioner cover	GG-20	BAL.8
Tensioner cover gasket	Klinger	BAL.8/1
Tensioner stud	Mild steel	BAL.9
Grating	Mild steel	BAL.10
Shaft	F.114	BAL.11
Bearing housing	GG.20	BAL.13
Bearing housing gasket	Klinger	BAL.13/1
Valve	GG.20	BAL.14
Spring	Steel	BAL.16
Cap	Mild steel	BAL.17
Cap seal	Klinger	BAL.17/1
Roller bearings	Balls	BAL.18
Locking nut	Mild steel	BAL.18/1
Locking washer	Mild steel	BAL.18/2
Oil seals	Nitrile	BAL.26
Casing O-rings	per product	BAL.27
Flanges	Mild steel	BAL.30
Flange gaskets	Klinger	BAL.30/1
Flange screws	M12x35	BAL.31
Mechanical seal	Assembly	BAL.39
Fixed race	GG.20	BAL.39/1
Rotating race	Graphite	BAL.39/2
Fixed race O-ring	per product	BAL.39/3
Clamping screws	M10x40	BAL.40
Grease fitting	M10-H	BAL.41

# Positive displacement vane pumps

