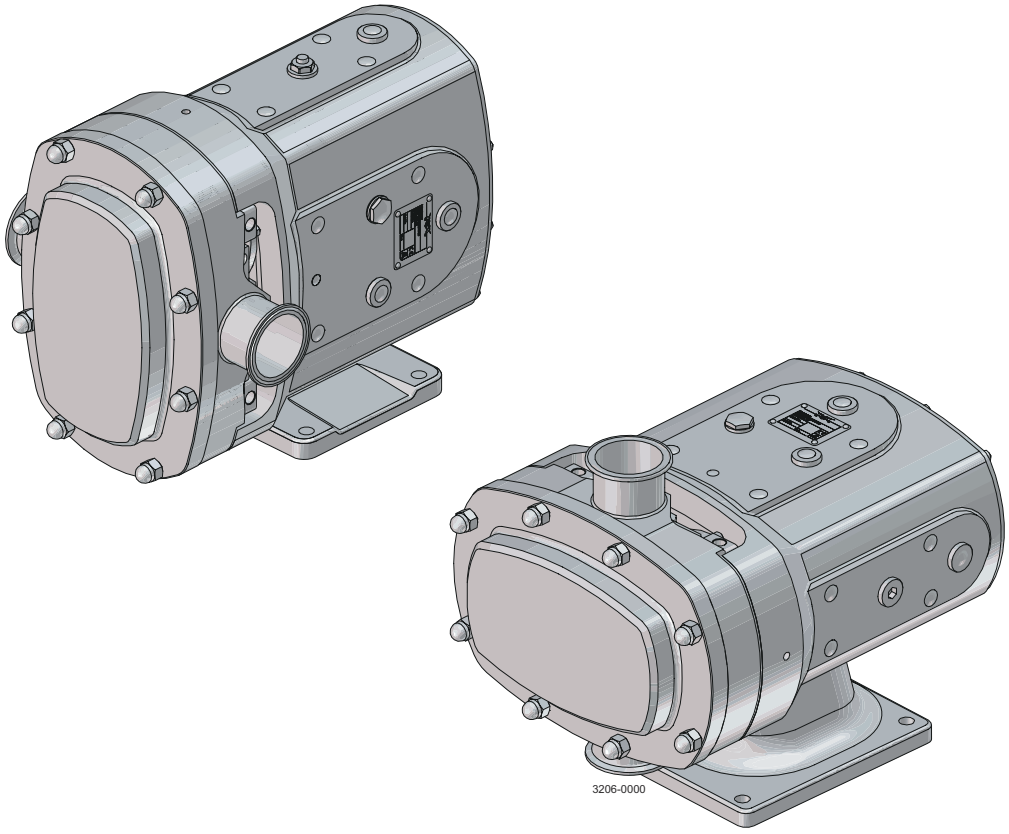
Alfa Laval DuraCirc®

Circumferential Piston Pump



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Instruction Manual including addendum for DuraCirc Aseptic

BRITISH ENGLISH

Published by
Alfa Laval Kolding A/S
Albuen 31
DK-6000 Kolding, Denmark
+45 79 32 22 00

The original instructions are in English

Contents

1 Declarations of Conformity

1.1 EU Declaration of Conformity

The designated company

Alfa Laval Kolding A/S, Albuen 31, DK-6000 Kolding, Denmark, +45 79 32 22 00

Company name, address and phone number

Hereby declare that

Pump

Designation

DuraCirc 32;33;34;42;43;52;53;54;62;63;72;73;74

Type

Serial number from E10.000 to E1.000.000
Serial number from AAX000000001 to AAX999999999

is in conformity with the following directives with amendments:

- Machinery Directive 2006/42/EC
- RoHS Directive 2011/65/EU and amendments

The person authorised to compile the technical file is the signer of this document.

Vice President BU Hygienic Fluid Handling Head of Product Management	Mikkel Nordkvist
Title	Name
Kolding, Denmark	2025-01-01
Place	Date (YYYY-MM-DD)

Signature

DoC Revison_ 01_012025 / This Declaration of Conformity replaces Declaration of Conformity dated 2022-10-01

1.2 UK Declaration of Conformity

The designated company

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Company name, address and phone number

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Pump

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Type

Serial number from E10.000 to E1.000.000
Serial number from AAX000000001 to AAX999999999

is in conformity with the following directives with amendments:

- The Supply of Machinery (Safety) Regulations 2008
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Signed on behalf of: Alfa Laval Kolding A/S.

Vice President BU Hygienic Fluid Handling Head of Product Management		Mikkel Nordkvist
Title		Name
Kolding, Denmark	2025-01-01	
Place	Date (YYYY-MM-DD)	Signature

DoC Revison_ 03_012025

2 Safety

Read this first

This Instruction Manual is designed for operators and service engineers working with the supplied Alfa Laval product.

Operators must read and understand the ***Safety, Installation and Operating*** instructions of the supplied Alfa Laval product before carrying out any work or before you put the supplied Alfa Laval product into service!

Not following the instructions can result in serious accidents.

This documentation describes the authorized way to use the supplied Alfa Laval product. Alfa Laval will take no responsibility for injury or damage if the equipment is used in any other way.

This Instruction Manual is designed to provide the user with the information to perform tasks safely for all phases in the lifetime of the supplied Alfa Laval product.

The operator shall always read the chapter ***Safety*** first. Hereafter the operator can skip to the relevant section for the task to be carried out or for the information needed.

Always read the chapter ***Technical Data*** thoroughly.

This is the complete Instruction Manual for the supplied Alfa Laval product.

NOTE

The illustrations and specifications in this Instruction Manual were effective at the date of printing. However, as continuous improvements are our policy, we reserve the right to alter or modify the Instruction Manual without prior notice or any obligation.

The English version of the Instruction Manual is the original manual. Alfa Laval cannot be held responsible for incorrect translations. In case of doubt, the English version applies.

2.1 Safety Signs

Mandatory Action Signs

	General mandatory action sign.
	Refer to instruction manual.
	Use eye protection - safety glasses.
	Use protective hand wear - safety gloves.
	Wear protective equipment - safety helmet.
	Use ear protection in noisy environments - noise protector.
	Wear protective equipment - safety shoes.

Warning Signs

	General warning.
	Electricity.
	Transportation with forklift truck or other industrial vehicles if heavy.
	Heavy object lifting.
	Hot surface and burning danger.

	Cutting danger.
	Corrosive substance.
	Crushing of hands.

2.2 Safety Precautions

All warnings in the manual are summarised on this page. Pay special attention to the instructions below so that severe personal injury and/or damage to the Supplied Alfa Laval Product is avoided.

General

	To prevent unexpected start and contact with electrical live and moving parts. **Always** disconnect the power supply safely: • The power supply disconnecting device must be disconnected (in off position) and locked. • In case the pump is capable of being plugged into an electrical supply, removal of the plug is sufficient, provided that the operator can check from any of the points to which he has access that the plug remains removed. **Always** refer to the motor Instruction Manual for installation and maintenance of the motor. **Never** touch the rotors through the inlet/outlet during start/stop as this can cause serious injury.

Transportation and Lifting

	**Never** lift or elevate in any way other than described in this manual. **Always** use the original packaging or similar during transportation. **Always** ensure that personnel must have experience with lifting operations. **Always** transport the pump in its upright position. **Always** ensure that no leakage of lubricants can occur. **Always** drain the pump head and accessories of any liquid.
	**Always** ensure that the unit is securely fixed during transportation. **Always** use suitable transport device ie. forklift or pallet lifter. **Always** use appropriate lifting equipment for heavy parts when relevant. Use lifting logs when available. **Always** keep an eye on the load and stay clear during the lifting operation.

Installation

	If the local safety regulations prescribe that the installation has to be inspected and approved by responsible authorities before the supplied Alfa Laval product is put into service, consult with such authorities before installing the equipment and have the projected installation approved by them. **Always** follow this manual thoroughly. **Always** read the ***"Technical Data"*** thoroughly. **Never** start in the wrong direction of rotation with liquid in the pump.
	**Always** ensure all pipe lines (product, air, and water) are depressurized and emptied before installation, inspection, assembling and disassembling.
	**Always** have the drive electrically connected by authorized personnel. (See the motor instructions supplied with the drive unit.) **Alfa Laval recommends the supply disconnecting device shall be in accordance with EN60204-1.**
	**Never** put your hands or fingers inside the port connections or anywhere close to rotating parts.

Operation

	**Always** read the ***"Technical Data"*** thoroughly. **Never** stand on the pump or pipelines. **Never** run the pump when partially installed or not completely assembled. **Always** ensure any guards are securely in place and in good condition. **Never** run the pump unless fully assembled, i.e. pump head must not be removed from gearcase. **Never** run the pump with either or both suction side and pressure side blocked. **Necessary** precautions must be taken if leakage occurs as this can lead to hazardous situations. **Never** use the pump for products not mentioned in the Alfa Laval pump selection program. The Alfa Laval pump selection program can be acquired from your local Alfa Laval sales company.
	**Never** put your hands or fingers inside the port connections or anywhere close to rotating parts.
	**Never** touch the pump or the pipelines when pumping hot liquids or when sterilising. In certain operating conditions the external surface of the pump and/or ancillary equipment may exceed 80 °C / 176 °F. As such users should avoid touching the pump and/or ancillary equipment during operation taking precautions if it is unavoidable to do so.
	**Always** follow the instructions in the safety data sheets from the suppliers of cleaning agents, detergents, oils etc. **Always** handle lye and acid with great care. **Always** handle toxic and acidic liquids in accordance with the manufacturer's instructions and recommendations.

Maintenance

<table>
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In order to optimise the operation of the supplied Alfa Laval product and to minimize the down time due repair activities, the maintenance should consist of:
• Inspection and maintenance of the supplied Alfa Laval product: strictly follow the technical documentation
• Preventive maintenance: visual inspection of the supplied Alfa Laval product followed by necessary adjustments and planned periodic replacement of wear and tear parts
• Repairs: unscheduled break-down of a component, often causing the system to stop. Damaged components shall be replaced or repaired
• Stock of Alfa Laval genuine spare parts: Alfa Laval recommend keeping a stock of genuine spare parts facilitating preventive maintenance and reducing down time in case of unplanned break-downs
Please refer to drive and coupling operating manuals supplied with the unit for maintenance instructions.

Always read the “Technical Data” thoroughly.
Never service the pump if pressurised.
Always use Alfa Laval genuine spare parts.

Motors with grease nipples:
Always lubricate according to motor manufactures recommended procedures.

Always locate and remove grease vent plugs, if provided, prior to adding grease.
Always check motor nameplate for grease type and lubrication intervals.

Always ensure the pump and pipelines are de-pressurised when the pump is serviced.
</td>
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<tr>
<td>  </td>
<td>Never put your hands or fingers inside the port connections or anywhere close to rotating parts.</td>
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<tr>
<td>  </td>
<td>Never service the pump when it is hot.
Always ensure pump and ancillary equipment has been allowed to cool before touching.</td>
</tr>
<tr>
<td>  </td>
<td>Always disconnect the power supply when servicing the pump.
Always ensure the power supply is disconnected (in an off position) and is locked out to prevent accidental operation.</td>
</tr>
</table>

Storage

Alfa Laval recommend:

- Store the supplied Alfa Laval product as supplied in original packaging
- Port opening(s) should be protected against any ingress
- Plastic or gasket type port covers should be left in place
- Bare steel (not stainless) should be lightly oiled/greased
- Store in a clean, dry place free from vibration and without direct sunlight or UV light
- Temperature range -5 °C to +40 °C / 23 °F - 104 °F
- Relative humidity less than 60%
- If a moist or dusty atmosphere is used for storage, further protect the pump or unit with a suitable cover
- No exposure to corrosive substances (including contained air)
- Rotate the pump/pump unit by hand weekly, to prevent bearing damage
- All associated ancillary equipment should be treated similarly

Noise

Under certain operating conditions, the supplied Alfa Laval product and/or the systems in which they are installed can produce high sound pressure levels. Appropriate noise protection measures should be taken when necessary and in accordance with local legislation.

Hazards

Burn Hazard

- Lubrication oil, machine parts and various machine surfaces can be hot and cause burns. Wear protective gloves

Corrosive Hazard

- **Always** handle cleaning liquids, lye and acid with great care and in accordance with separate instructions for those fluids
- When using chemical cleaning agents and lubricants, make sure you follow the general rules and suppliers recommendation regarding ventilation, personnel protection etc.

Cut Hazard

- Sharp edges, especially on bowl discs and threads, can cause cuts. Wear protective gloves

Crushing Hazard

- Avoid placing hands in pinch points

Safety check

A visual inspection of any protective device (shield, guard, cover or other) on the supplied Alfa Laval product shall be carried out at least every 12 months. If the protective device is lost or damaged, especially when this leads to deterioration of safety performance, it shall be replaced. The fixing of the protective device should only be replaced with fixings of the same or an equivalent type.

Inspection acceptance criteria:

- It should not be possible to reach moving parts originally protected by a protective device
- The protective device must be securely mounted
- Ensure that screws for the protective device are securely tightened

Procedure in case of non-acceptance:

- Fix and/or replace the protective device

2.3 Warning Signs in Text

Pay attention to the safety instructions in this Instruction Manual.

Below are definitions of the four grades of warning signs used in the text where there is a risk for injury to personnel or damage to the supplied Alfa Laval product.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate damage to the supplied Alfa Laval product.

NOTE

Indicates important information to simplify or clarify procedures.

2.4 Requirements of Personnel

Operators

The operators shall read and understand this Instruction Manual.

Maintenance personnel

The maintenance personnel shall read and understand this Instruction Manual. The maintenance personnel or technicians shall be skilled within the field required to carry out the maintenance work safely.

Trainees

Trainees can perform tasks under the supervision of an experienced employee.

People in general

The public shall not have access to the supplied Alfa Laval product.

In some cases, specially skilled personnel may need to be hired (i.e. electricians, welders). In some cases the personnel has to be certified according to local regulations with experience of similar types of work.

2.5 Recycling Information

Unpacking

Packing material may consist of wood, plastics, cardboard boxes and in some cases metal straps.

	• Wood and cardboard boxes can be reused, recycled or used for energy recovery • Plastics should be recycled or burnt at a licensed waste incineration plant • Metal straps should be sent for material recycling

Maintenance

During maintenance, oil (if used) and wear parts in the supplied Alfa Laval product should be replaced.

- Oil and all non-metal wear parts must be disposed of in accordance with local regulations
- Rubber and plastics should be burnt at a licensed waste incineration plant. If not available they should be disposed of in accordance with local regulations
- Bearings and other metal parts should be sent to a licensed handler for material recycling
- Seal rings and friction linings should be disposed of to a licensed land fill site. Check your local regulations
- All metal parts should be sent for material recycling
- Worn out or defected electronic parts should be sent to a licensed handler for material recycling

Scrapping

At end of use, the equipment must be recycled in accordance with the relevant local regulations. Besides the equipment itself, any hazardous residues from the process liquid must be considered and dealt with in a proper manner. When in doubt, or in the absence of local regulations, please contact your local Alfa Laval sales company.

How to contact Alfa Laval

Contact details for all countries are continually updated on our website.

Please visit *www.alfalaval.com* to access the information directly.

3 Introduction

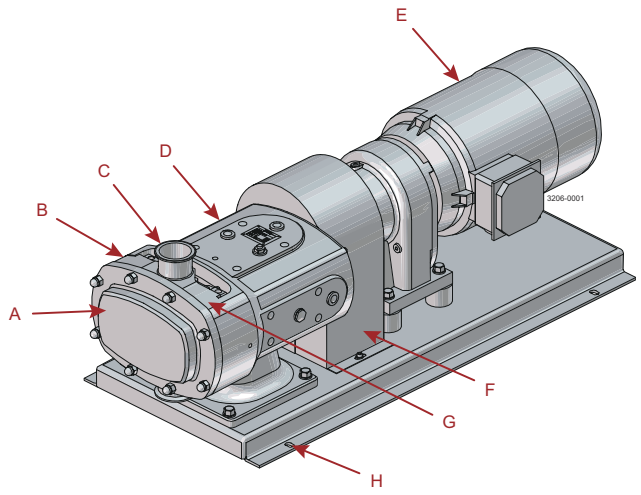
The Alfa Laval DuraCirc delivers the perfect balance of durability, reliability, high efficiency and superior hygienic performance. Combined with design features enabling simple service, the DuraCirc keeps process running. In additional to a class leading range of flow and pressure capabilities, DuraCirc comes with globally recognized hygienic certification. The innovative design also includes features that make cleaning and maintenance faster, easier and more dependable.

3.1 General Information

The DuraCirc pump supplied is a positive displacement circumferential piston pump, which may be supplied with or without a drive unit. The drawing shown indicates main components of the pump unit.

The DuraCirc range has a universal gearbox design which enables the flexibility of mounting pumps with the inlet and outlet ports in either a vertical or horizontal plane. The port orientation, vertical or horizontal, may be changed by moving one of two available bolt-on feet on the gearbox. Port orientation should be specified when ordering, but the alternative foot design allows pumps that are already installed being changed should the need arise.

Drawing shows only mounted unit



A Rotorcase cover
B Rotorcase
C Ports
D Gearbox
E Drive unit
F Coupling guard (encloses coupling)
G Product seal area (inside rotorcase)
H Baseplate fixing holes

Pump duty conditions

The pump should only be used for the duty for which it has been specified. The operating pressure, speed and temperature limits have been selected at the time of order and MUST NOT be exceeded. These details are stated on the original order documentation and if not available may be obtained from your supplier quoting pump model and serial number.

Vibration Limits

Bare shaft pump units have been tested and found to be within the limits published under ISO 10816-7 Category 2 under normal operation conditions. Actual vibration of mounted units can be effected by numerous external factors such as mounting method, foundation, alignment, speed and duty point. As such, we recommend the maximum operating limit of 8.5 mm/s RMS with a trip limit of 10.6 mm/s RMS as per ISO 10816-7 Cat. 2 is observed in any monitoring equipment if used.

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4 Installation

4.1 Unpacking, Handling and Storage

WARNING

Always ensure any personnel undertaking lifting operations have the suitable experience and training to do so safely.

Ensure any lifting equipment used is in good condition and has been suitably tested, using lifting lugs when applied.

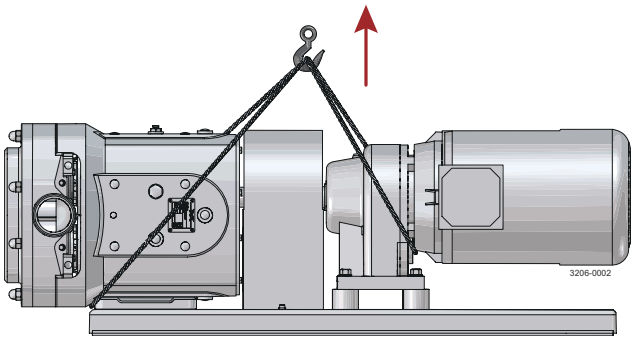
Ensure any lifting equipment used is rated for and used within the load limits. Refer to the pump weights guide.

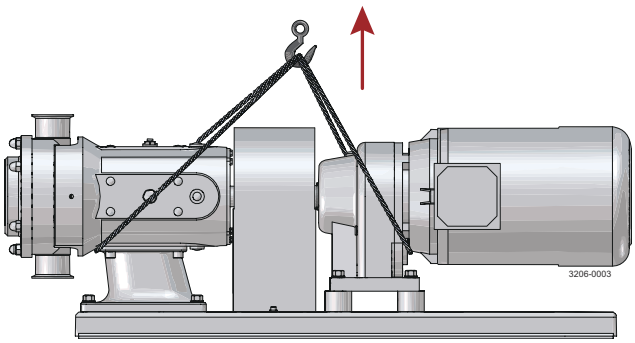
Always ensure that the lifting points are in line with the centre of gravity and adjust lifting point if necessary.

Always keep an eye on the load and stay clear during the lifting operation.

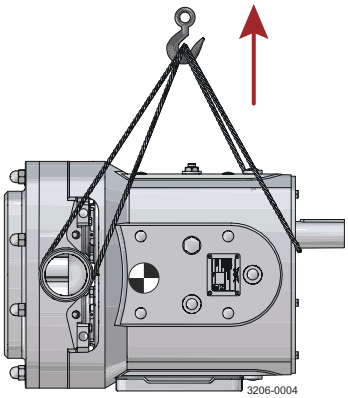
The diagrams below show examples of how the equipment should be lifted, however the user is to ensure this can be done safely with the equipment at hand:

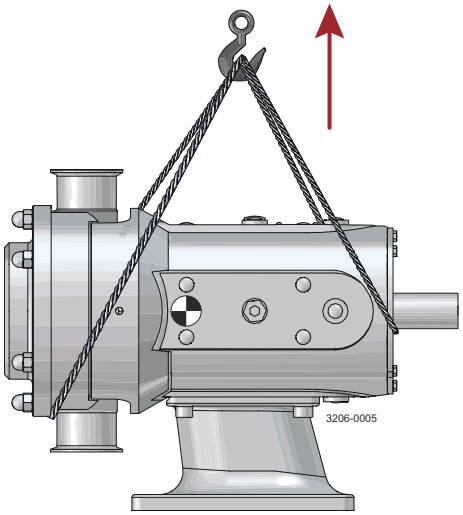
Pump with drive unit





Bareshaft pump (typical location of centre of gravity shown)





On receipt always:

- Check the delivery note against the goods received
- If motorised, check that the drive instructions are available
- Be careful not to discard any manuals that may be enclosed with the packaging
- Inspect the packing for signs of damage in transit
- Carefully remove the packing away from the pump
- Inspect the pump for any visible signs of damage
- Clean away the packing from the pump port connections
- Report any damage immediately to the carrier

After receipt and inspection:

If the pump is not to be installed immediately, the pump should be repacked in the original packaging and placed in suitable storage, see *Safety Precautions* on page 10.

4.2 System Design, Installation and Operation

When designing, installing and operating pipework systems where pumps are used, especially where the pumped media is viscous, there are general recommendations and good engineering practices that should be employed to ensure long term, reliable pump and system operation.

4.2.1 System Design

- Confirm the Net Positive Suction Head (NPSH) available from the system exceeds the NPSH required by the pump, as this is crucial for ensuring the smooth operation of the pump and preventing cavitation.
- Avoid suction lifts and manifold/common suction lines for two pumps running in parallel, as this may cause vibration and/or cavitation.
- Protect the pump against blockage from hard solid objects e.g. nuts, bolts welding slag etc. Also protect the pump from accidental operation against a closed valve by using relief valves, pressure switches or current limiting devices.
- Fit suction and discharge pressure monitor points for diagnostic purposes.
- Fit valves, it two pumps are to be used on manifold/common discharge lines.
- Make the necessary piping arrangements if flushing is required for the seal.
- Allow at least 1 m / 3.3 ft for pump access/maintenance all around the pump.

To reduced the risk of damaged caused by sudden changes in temperature (thermal shock) ensure any temperature changes are done gradually and equipment temperature is allowed to stabilise before operation.

4.2.2 Pipework

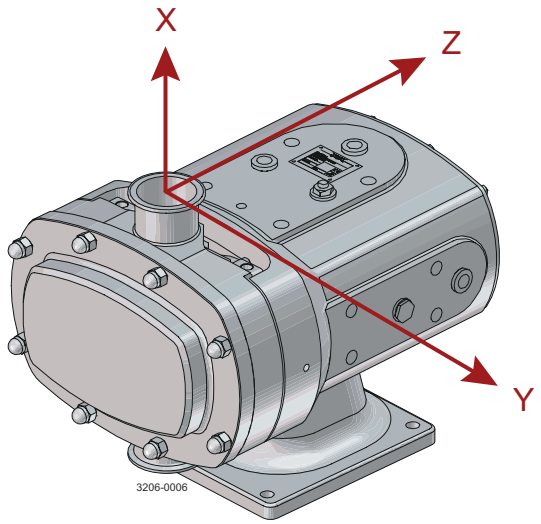
All pipework must be supported. The pump must not be allowed to support any of the pipework weight beyond the limits set as shown in the *Table of Maximum Forces and Moments* on page 24.

NOTE

Remember!

- **Pipework supports must also support the weight of the product being pumped.**
- **Design short straight suction lines to reduce friction losses in the pipework thereby improving the NPSH available from the system.**
- **Avoid bends, tees and any restrictions close to either suction or discharge side of pump. Use long radius bends wherever possible.**
- **Provide isolating valves on each side of the pump when necessary.**
- **Keep pipework horizontal where applicable to reduce air locks. Include eccentric reducers on suctions lines.**

4.2.3 Table of Maximum Forces and Moments



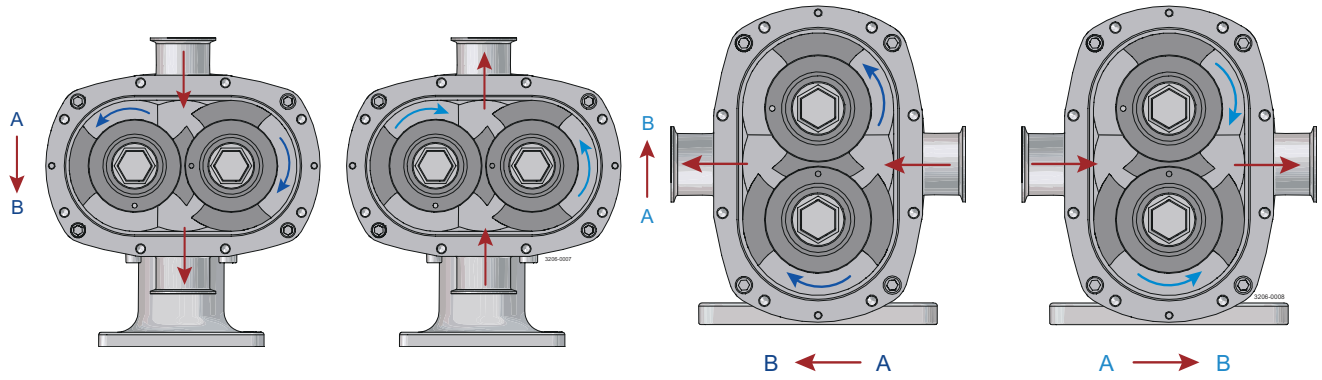
Port Size (mm)		Forces			Moments		
		Units	F (x, y or z)	F (total)	Units	M (x, y or z)	M (total)
25	1"	N	190	270	Nm	85	125
		lbf	43	61	lbf.ft	63	92
40	1.5"	N	255	360	Nm	115	170
		lbf	57	81	lbf.ft	85	125
50	2"	N	295	420	Nm	145	210
		lbf	66	94	lbf.ft	107	155
65	2.5"	N	360	510	Nm	180	263
		lbf	81	115	lbf.ft	133	194
80	3"	N	425	600	Nm	215	315
		lbf	96	135	lbf.ft	159	232
100	4"	N	505	720	Nm	260	385
		lbf	114	162	lbf.ft	192	284
150	5"	N	720	1020	Nm	385	365
		lbf	162	229	lbf.ft	284	417

NOTE

At no time shall the values of Fx, Fy and Fz or Mx, My and Mz be the maximum values.

4.2.4 Direction of Flow

The direction of flow is dictated by the direction of rotation of the drive shaft. Reversing the direction of rotation will reverse the flow direction.



A Suction
B Discharge

A Suction
B Discharge

4.2.5 Pump Lubrication

The pump will be supplied pre-filled with food grade (NSF-1) synthetic (PAO based) oil as standard.

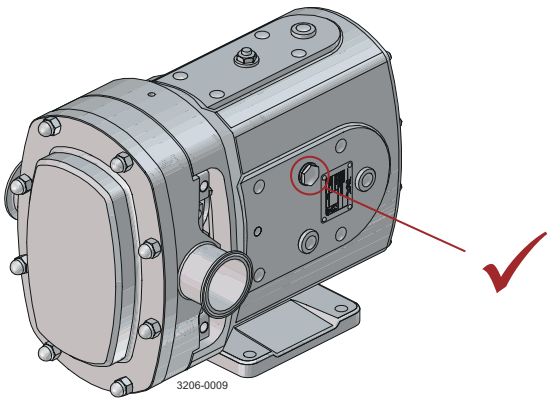
Oil level must be checked with the pump static using the oil sight glass fitted to the side of the gearbox.

The oil should be changed every 3000 hrs of operation or every 2 years, whichever is soonest.

Oil filling: Fill with oil through the filler plug to the mid level of in the sight glass.

NOTE

On horizontally ported pumps the sight glass must be fitted to the upper hole on the side of the gearcase. Refer to *Technical Data* on page 71 for oil quantities required.



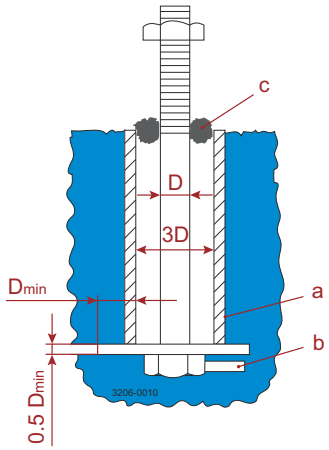
Food Grade Oil (NSF H-1) **-20 °C to +150 °C (-4 °F to 302 °F)**
Mobil SHC Cibus 150
Bel-Ray No-Tox HD 150 #62686
Castrol Optileb GT 150
Klüber Klüberoil 4 UH1-150 N
Fusch Cassida GL / GLE 150
Mobil Glygole 150 (US/CAN)

Above oil recommendations may use different base oil technologies (mineral or PAG) which are incompatible with the existing PAO based oil. Care should be taken to follow the oil manufactures recommendation on flushing if changing the oil type.

4.2.6 Baseplate Foundations

Pumps when supplied with a drive unit are normally mounted on a baseplate. Alfa Laval standard positive displacement pump baseplates have pre-drilled fixing holes to accept base retaining bolts. To provide a permanent rigid support for securing the pump unit, a foundation is required which will also absorb vibration, strain or shock on the pumping unit. Methods of anchoring the baseplate to the foundation are varied, they can be studs embedded in the concrete either at the pouring stage as shown below, or by use of epoxy type grouts. Alternatively, mechanical fixings can be used.

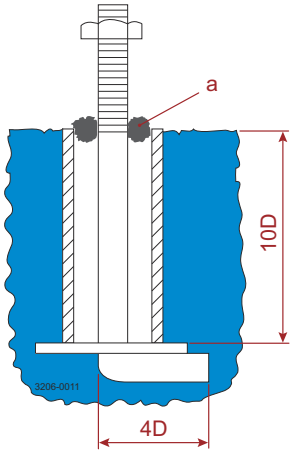
Ensure the floor is able to support the weight of the pump unit.



a Sleeve

b Lug welded to bolt head

c Waste put around bolt before pouring concrete



a Foundation surface left through to anchor ground

The drawing above shows two typical methods for foundation bolt retaining. The sleeve allows for “slight” lateral movement of the bolts after the foundation is poured. Rag or wastepaper can be used to prevent the concrete from entering the sleeve while the foundation is poured. A minimum of 14 days is normally required to allow the curing of the concrete prior to pump unit installation.

Ball Foot Baseplate with Adjustable Feet

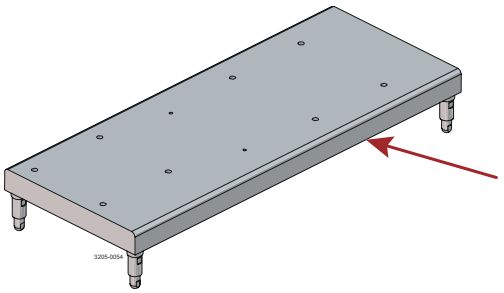
The pump can be supplied with an optional ball foot baseplate with height adjustable feet.

When used:

- **Ensure** the floor is level and is able to support the weight of the complete unit
- **Ensure** the unit is supported by all feet equally

3A Approved Ball Foot Baseplate with Adjustable Feet

For 3A approved mounted pumps a 3A approved ball foot baseplate is required which has additional sealant applied to the underside.



4.2.7 Coupling Alignment

Before the pump unit is installed is it important to ensure that the mounting surface is flat to avoid distortion of the baseplate, which may cause pump/motor shaft misalignment and pump/motor unit damage. Once the baseplate has been secured, the pump shaft to motor shaft coupling alignment should be checked and adjusted as necessary. This is achieved by checking the maximum angular and parallel misalignment for the couplings as stated below. Shaft alignment that is outside the stated tolerances can be corrected by applying shims under the motor or pump foot, or, by moving the pump or drive sideways on the baseplate. All bolts that have been loosened should be re-tightened to the stated torque figure.

The following dimensions and tolerances apply to standard supply couplings only (Fenner HRC Type).

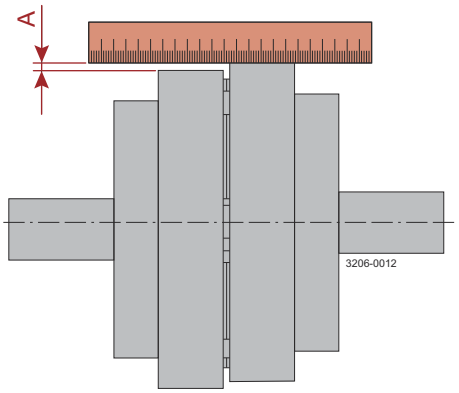
Recommended bolt torques for pump and motor mounting.

Thread Diameter	M6	M8	M10	M12	M16	M20	M24
Torque (Nm)	6	15	30	50	120	150	200
Torque (ft lbf)	4.4	11.0	22.1	36.8	88.5	110.6	147.5

Parallel Misalignment

Measure 4 positions at 90° around coupling

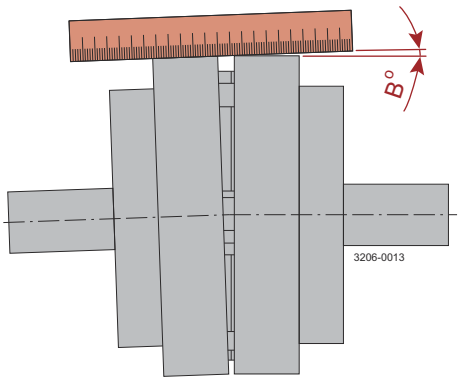
Coupling size	Dimension A Maximum
70	0.3 mm / 0.12 in.
90	0.3 mm / 0.12 in.
110	0.3 mm / 0.12 in.
130	0.4 mm / 0.16 in.
150	0.4 mm / 0.16 in.
180	0.4 mm / 0.16 in.
230	0.5 mm / 0.24 in.
280	0.5 mm / 0.24 in.



Angular Misalignment

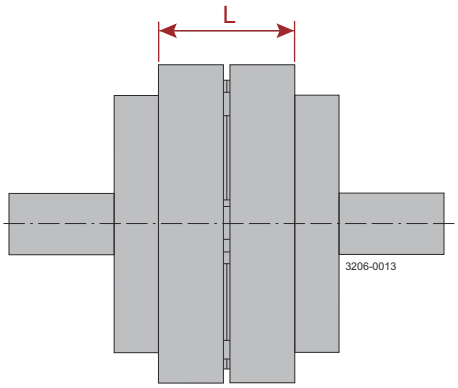
Measure 4 positions at 90° around coupling

Coupling size	Dimension A Maximum
70	1°
90	1°
110	1°
130	1°
150	1°
180	1°
230	1°
280	1°



Assembled length

Coupling size	Dimension A Maximum
70	25.0 mm / 0.98 in.
90	30.5 mm / 1.20 in.
110	45.0 mm / 1.57 in.
130	53.0 mm / 2.08 in.
150	60.0 mm / 2.36 in.
180	75.0 mm / 2.95 in.
230	85.5 mm / 3.36 in.
280	105.5 mm / 4.15 in.

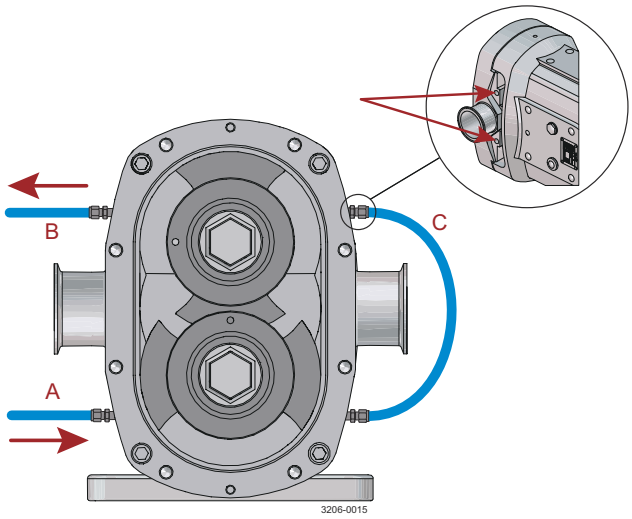


4.3 Flushing Seal Arrangement and Pre-Start Up Checks

1 A flushed seal arrangement may be fitted in order to cool, heat or clean the seal area (dependant on application). It is important that:

- The flush is correctly connected (see diagram).
- A compatible flushing fluid is used and supplied at the correct pressure and flow rate (see Flush Pressure and Flow Rates below)
- The flush is turned on at the same time/ prior to starting the pump and turned off at the same time/after stopping the pump.

A Flush inlet
B Flush outlet
C Link pipe



2 **Connecting the flush.** The following equipment is strongly recommended when using a flushing system:

- Control valve and pressure gauge, to enable the correct flushing pressure to be obtained and monitored.
- Isolation valve and check valve, so that the flush can be turned off, and to stop any unwanted substances flowing in the wrong direction.
- A method of visibly indicating flushing fluid flow.

Flush Connection Size (Femail)

Model	Size BSP(G) / NPT w/Adapter
32/33/34	1/8"
42/43	1/8"
52/53/54	1/4"
62/63	1/4"
72/73/74	1/4"

3 **Flushing fluid.** The choice of flushing fluid is dependent upon the fluid being pumped and duty conditions i.e. pressure and temperature. Usually water is used for cooling or flushing water-soluble products. For both single flushed and double mechanical seal arrangements the temperature of the flush media should never be allowed to exceed the maximum temperature of the pumped media. For advice on selecting a suitable flushing fluid please contact pump supplier.

4 **Flush pressure, flow and temperature limits:**

Single Mechanical Flushed - 0.5 bar / 7 psi max

Double Seal (SiC/Carbon) - 1 bar / 14.5 psi above pump discharge upto 16 bar / 232 psi max

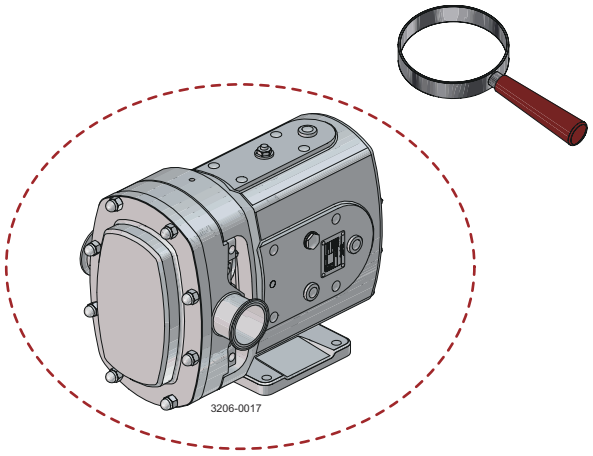
Double Seal (SiC/SiC) - 1 / 14.5 psi bar above pump discharge upto 20 bar / 290 psi max

O-Ring Seal Flushed - 0.5 bar / 7 psi max

Flush Media Flow (all seal types) - 30 l/h / 8 usgph per seal minimum

5 **Pre-start up checks**

- Check the pipework system has been purged to remove debris.
- Check all obstructions have been removed from pipework and pump.
- Check pump connections and pipework joints are tight.
- Check lubrication levels are correct.
- Check seal flushing is connected if applicable.
- Check all safety guards are in place.
- Check that inlet and outlet valves are open.



5 Maintenance

5.1 Cleaning In Place (CIP)

The DuraCirc pump range has been designed for Clean in Place (CIP) operation with both 3A and EHEDG certification. However, due to variations in pumped products, system design, cleanliness requirements and chemicals used we recommend that users develop suitable CIP processes during commissioning on normal operating conditions and products and verify these meet the required levels of cleanliness ensuring a minimum flow velocity of 1.5 m/s (4.92 ft/s).

To ensure optimum drainability of the rotorcase we recommned the pump is specified with vertical porting (top/bottom).

Thermal Shock

Where metallic components are subjected to sudden changes in temperature the differing rates of contraction / expansion experienced, especially where there are very small clearances, can allow contact between the rotating and static parts potentially causing surface damage and pump seizure.

To minimise the risk of thermal shock occurring it is recommended that, if during process steps, the pumped media and/or seal flush media have a differential temperature of more than 50° C (90° F), the pump should be stationary and allowed to stabilise for a minimum of 15 minutes before operating.

WARNING

Never touch the pump or the pipelines when pumping hot liquids or when sterilising.

A suitable by-pass is recommended.

WARNING

Always handle cleaning agents with great care and follow instructions in the safety datasheets.

Always rinse well with clean water after using a cleaning agent.

Always use rubber gloves and protective goggles when handling caustic cleaning agents.

Always store/discharge cleaning agents in accordance with current rules/directives.

5.1.1 Non-Galling Alloy (ASTM A-494) Compatibility

ASTM A-494 is the standard rotor material for DuraCirc pumps. This alloy was developed specifically for corrosion resistance and close operating clearance requirements of high performance rotary positive displacement pumps. ASTM A-494 is a nickel based, corrosion-resistant, non-galling or seizing material. The ASTM designation is A-494 Grade CY5SnBiM (UNS N26055), and the material is listed in the 3-A Sanitary Standards as acceptable for product contact surfaces.

The above properties make ASTM A-494 the ideal material for the DuraCirc pump range. This rotor material permits close operating clearances in the liquid end which provides improved pump efficiency and reduced shear damage as well as being non-galling in the event of contact with the body or cover during operation.

The corrosion resistance of ASTM A-494 is approximately equal to AISI 300 Series Stainless Steel. However, ASTM A-494 has limited resistance to certain aggressive chemicals that may be commonly used in contact with AISI 300 Series Stainless Steel.

Nitric Acid is commonly used to passivate new installation of stainless steel equipment however is not chemically compatible with the ASTM A-494 material used for the rotors. Therefore, when passivating with Nitric acid, special considerations should be made:

- If possible, the pump should be removed from the system during the passivation process and passivated separately by hand
- If removal of the pump is not possible ensure the passivation media is circulated by a separate pump unit
- Ensure the passivation media is used as per the manufacturers instructions (dilution, temperature and time) and not left in contact with the pump for extended periods of time
- Ensure the pump is fully flushed after passivation with clean water to ensure no residue remains

Commissioning Plugs

Commissioning plugs are offered for cases where the pump cannot be removed and there are concerns about damage to the rotors due to the passivation process.

These plugs allow the rotors to be removed and are fitted over the shafts and allow the pump to be passivated without leakage of the media.

The plugs are available to order as spare parts. Please contact Alfa Laval for further details.

5.2 Maintenance Schedule

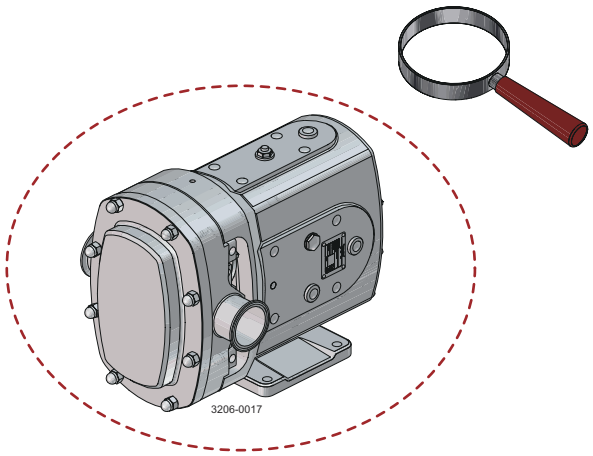
It is advisable to install pressure gauges on both sides of the pump the DuraCirc pump range.

NOTE

Below checks to be carried out when the pump is not operational, and any electrical supply has been safely disconnected and locked so accidental operation cannot occur. In certain operational circumstances the pump will pose a thermal hazard and as such should not be touched until allowed to reach safe temperature before undertaking checks.

Periodic checks:

- Check seals for leakage
- Check the lip seals for leakage
- Check pumping pressures are within expected duty
- Check oil level in the gearcase with pump stationary



Any loss or damage to any guards or covers, especially if this leads to a deterioration of safety performance, shall be replaced immediately. The fixings of any guards or covers should only be replaced with fixings of the same type and specification.

If any problems are observed further investigation should be carried out and problems rectified before re-starting.

Annual checks (in addition to the above):

- Remove the rotors and check for signs of damage, condition of splines and for signs of stress cracking in the wing / hub radius
- Check wet end clearances are within specifications

Oil should be changed every 3000 hours of operation or a period of 2 years, whichever is the soonest.

5.2.1 Recommended Spare Parts

The table shows recommended spare parts that should be retained within your maintenance schedule.

Part description	Quantity
Complete Service Kit • Full wet end elastomer kit • Mechanical seal kit	1

Rotor Nut P-Ring Elastomer Replacement Interval

It is recommended that the rotor nut elastomer seal is replaced every 12 months to maintain a bacteria tight seal.

Rotor Nut P-Ring Elastomer Inspection

Periodically inspect the rotor nut elastomer seal for any discoloration, nicks, or cracks. If any of the defects above are noticed, the elastomer seal must be replaced following the procedure below for 3A compliance:

Cleaning Procedure for Soiled Rotor Nut Tapped Hole (3A)

1. Remove rotor nut from the shaft.
2. Submerge and soak nut for 5 minutes in COP tank with 2% caustic wash.
3. Scrub the hole with internal thread vigorously by plunging a clean sanitary bristle pipe brush in and out of the hole for two minutes while submerged.
4. Soak nut in acid sanitizer for 5 minutes, and then scrub the hole again with the pipe brush for two minutes.
5. Rinse well with clean water and blow-dry blind tapped hole with clean air.
6. Swab test the inside of the tapped hole to determine cleanliness.
7. Should the swab test fail, repeat steps 2 thru 6 above until swab test is passed. Should swab testing continue to fail, or time is of the essence, install a new rotor nut.

5.3 Dismantling

Before dismantling the pump refer to *Safety Precautions* on page 10.

Refer to *Parts Lists and Exploded Views* on page 85.

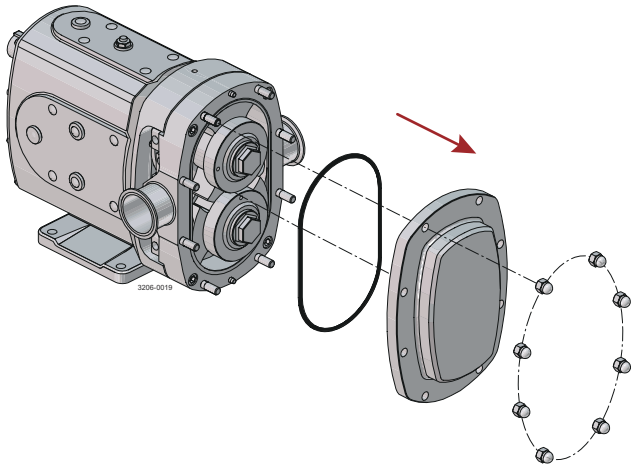
NOTE

It is recommended to mark the positions of the rotors and rotorcase (e.g. Top/Bottom or Left/ Right) prior to removal to ensure parts are refitted in the same position.

1 Removing rotorcase cover

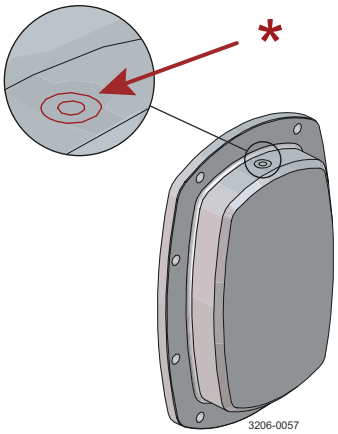
a) Remove rotorcase cover nuts (8) and cover (1).

b) Remove front cover P-ring (5).



NOTE

***) Pump models 62 to 74 are supplied with a M6 tapped hole in the front cover for use with a lifting eye (not supplied) to aid lifting**



2 Removing rotors

a) Insert a plastic (nylon) block between the two rotors (3) to stop them turning.

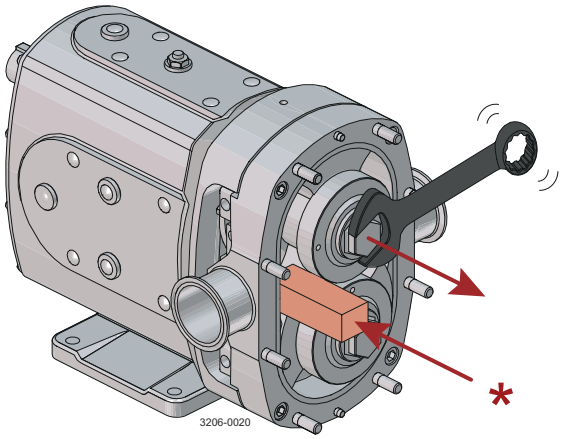
b) Remove rotor retention nuts (4).

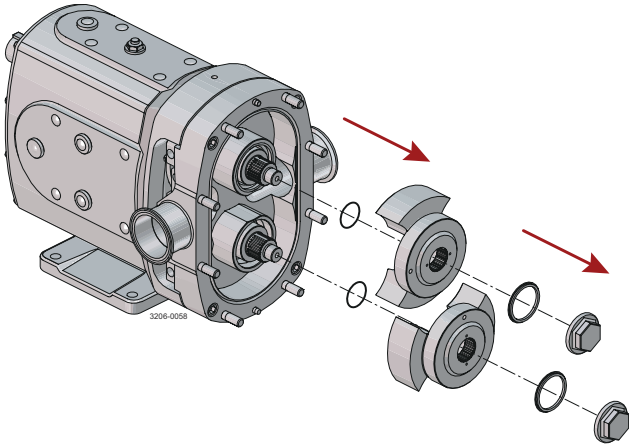
c) Remove rotors (3)

- Orientate rotors to be perpendicular to each other (one rotor at 12/6 o'clock, one rotor at 3/9 o'clock) then remove the rotor with both wings exposed first.

d) Remove the rotor nut P-rings (6) and rotor shaft O-rings (7).

* Plastic block





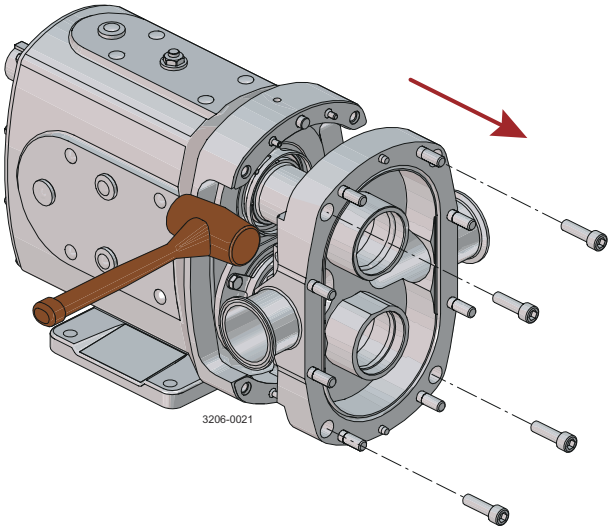
3 a) Remove rotorcase retaining screws (11).

b) Remove rotorcase (2) tapping both sides with a soft mallet if required.

c) If Double Mechanical seals are fitted remove from the shaft.

NOTE

Shim retainer (13) and Shims (12) should not be removed unless rotor clearances require resetting.



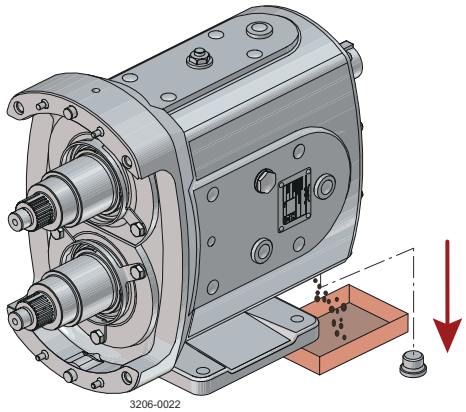
4 Draining pump lubrication

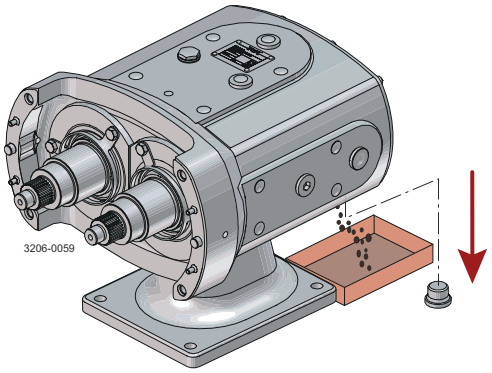
a) Place a tray under the gearcase to collect the waste lubricating oil.

b) Remove the lower drain plug (46) at the bottom of the gearcase (31).

NOTE

Used oil should be disposed of appropriately as per local regulations.



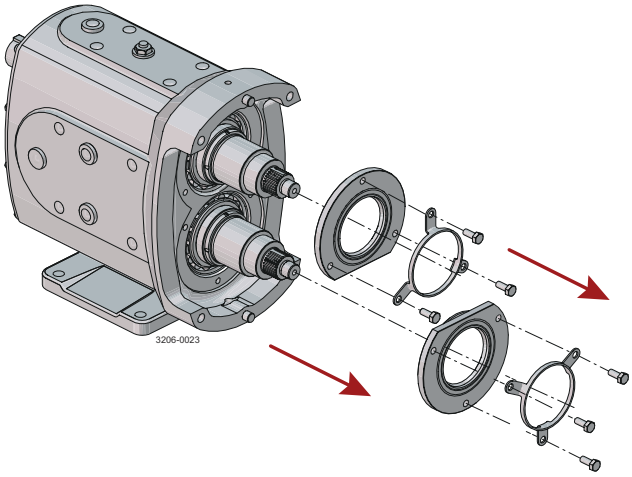


5 Removing gland guards seal retainers

a) Remove screws (40).

b) Then remove gland guards (22) and seal retainers (34).

c) Remove the lip seals (36) and seal retainer o-rings (37) from the seal retainers and dispose. It is essential to renew the lip seal and o-ring prior to reassembly.

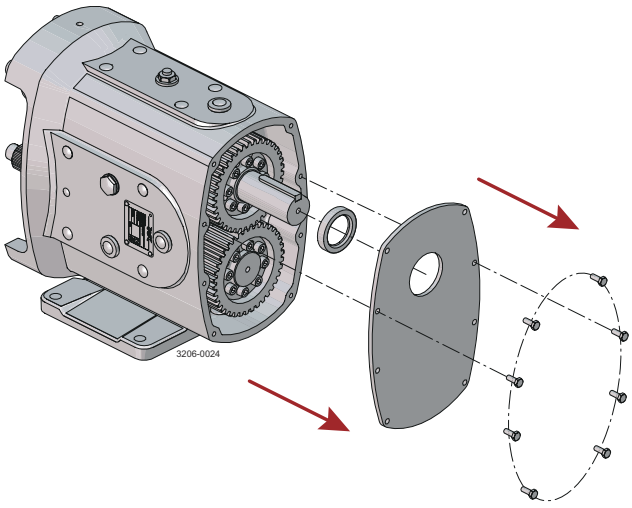


6 Removing Gearcase Cover

a) Remove drive key (65) and then remove rear cover screws (42).

b) Tap the center of the cover to help break the gasket seal then remove the gearcase cover (35).

c) Remove the lip seal (38) from the cover and dispose. It is essential to renew the lip seal prior to reassembly.

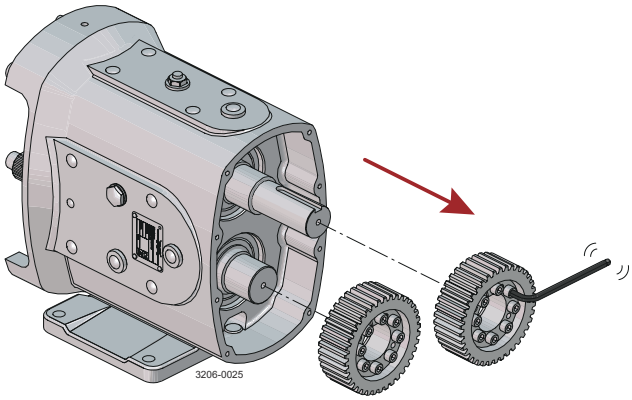


7 Removing timing gears

a) Lock the timing gear in position by placing a small soft rod between the gear teeth.

b) Loosen the torque lock assembly screws (39) but do not remove fully.

c) Remove gears (36) and torque lock assembly from the shafts (51 and 52)



NOTE

If the torque locking assembly is difficult to loosen from the shafts then three screws can be removed completely and inserted in the exposed threaded holes, tightening gradually in a radial pattern to remove.

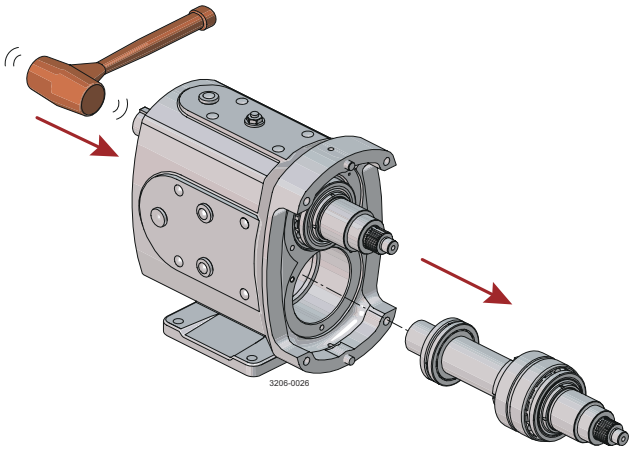
8 Shaft assembly removal

a) Using a soft mallet gently tap the rear end of each shaft (51 and 52) and remove through the front of the gearcase (31).

b) Support each shaft during removal from the gearcase.

c) Remove the shaft shims (53) fitted in to the bore marked by a dimple when viewed form the front.

d) Pump size 32 to 43 only: Remove the rear circlip (60) and outer rear bearing (58) race from the rear bearing bores.



9 Bearing removal

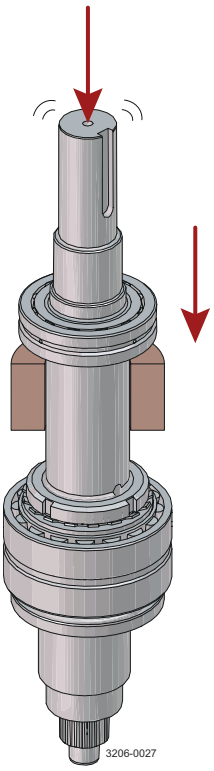
NOTE

Removal of the bearings requires the use of a press. Ensure any tooling used is adequately rated for the job and in good working condition, appropriate personal protection equipment (PPE) is worn and the user is competent at using the tools safely.

10 Rear Bearing Removal

a) Remove the shaft circlip (59) from the shaft (51 and 52)

b) Mount the shafts vertically in a press with a tool positively located against the rear bearing inner race (58) as shown and apply pressure to the top of the shaft so that the shaft moves through the bearing. Ensure the shaft is supported and is not allowed to drop once bearing is removed.



11 Front Bearing Removal

a) Remove the shafts from the press and hold in a vice using soft jaws to protect the areas where the lip seals will be located.

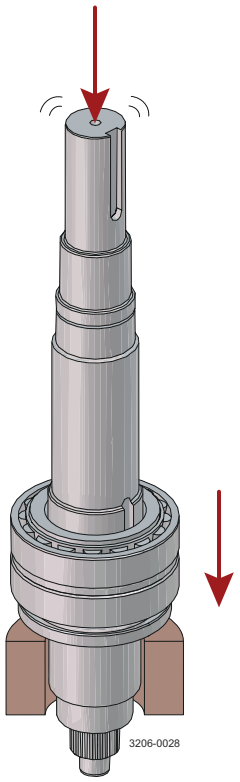
b) Bend the tab on the tabbed lock washer (56) up and remove the bearing nuts (57) using a ‘C’ spanner and tapping with a mallet.

c) Mount the shaft vertically in a press with a tool positively located against the front bearing inner race (54) as shown and apply pressure to the top of the shaft so that the shaft moves through the bearing and spacer pack.

d) Once the first bearing is free remove from the shaft together with the spacer (55) and the outer race of the second bearing (54).

e) Continue to apply pressure to the top of the shaft so that the inner race of the second bearing is free and remove. Good engineering practice suggests that if bearings are removed from the shafts for any reason they should be renewed.

f) Clean and examine all components for wear or damage. Renew where necessary.



5.4 Assembly

NOTE

Ensure all screws and nuts are torqued to the values stated in *Tool Requirements* on page 74.

1 Fitting bearings to shafts

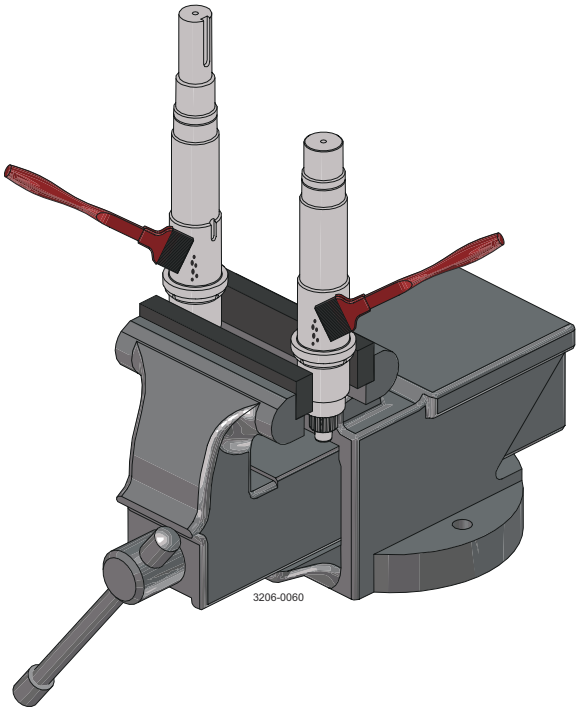
Take care not to damage shaft surfaces, in particular where the lip seals will be located.

On DuraCirc 32 to 43 models, bearings do not require heating. For DuraCirc 52 to 74 models, heat the bearing inner cones to 115° C / 239° F.

Do not use any form of live flame when heating, as this will damage bearings.

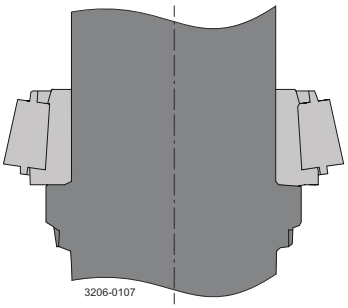
2 Front Bearings

Position shafts (51 and 52) vertically in a vice using soft jaws and apply anti-seize compound to the bearing diameters.

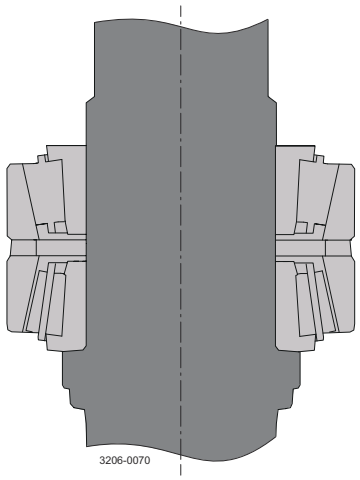


3 DuraCirc models 52 to 74 only: Heat the first inner bearing cone (54) using a bearing heater to 115 °C / 239 °F

Place the inner cone of the bearing (54) on the shaft as shown ensuring a positive fit against the shaft shoulder using a press and appropriate tool if required.



4 Fit the first bearing outer cup, bearing spacer (55) and rear bearing outer cup on the shaft as shown. Fit the second inner bearing cone to the shaft as per Step 2 above.



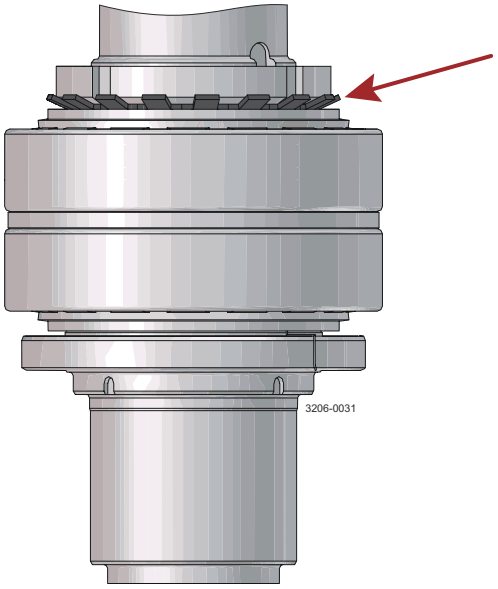
5

a) DuraCirc models 52 to 74 only: Allow bearings to cool to ambient temperature. Failure to do so will result in incorrectly set bearings.

b) Fit the tabbed lock washer (56) on the shaft with the tabs angled away from the bearing.

c) Locate and tighten the bearing nut (57), whilst at the same time rotating the bearings (54) and spacer (55). The bearings are correctly adjusted when the spacer can only be moved with a light tap of a mallet.

d) Once in place bend one of the tabs of the tabbed lock washer (56) in to the nearest cut out on the bearing nut (57). If no tab is aligned with the cut out on the bearing nut tighten the bearing nut slightly until aligned with a tab.



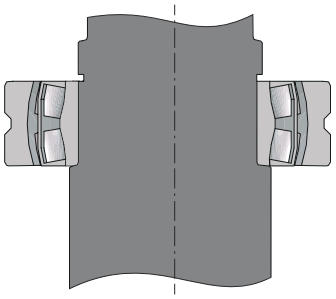
6 Rear Bearings

Position shaft (51 and 52) vertically in a vice using soft jaws and apply anti-seize compound to the bearing diameters.

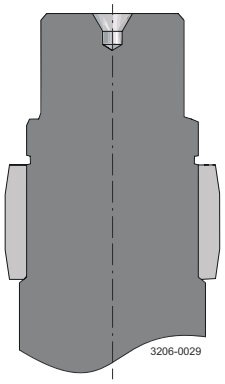
7 DuraCirc models 52 to 74 only: Heat the rear bearing (58) using a bearing heater to 115 °C / 239 °F

Place the bearing (58) (Inner race part only on the DuraCirc models 32 to 43) on the shaft as shown ensuring a positive fit against the shaft shoulder using a press and appropriate tool if required.

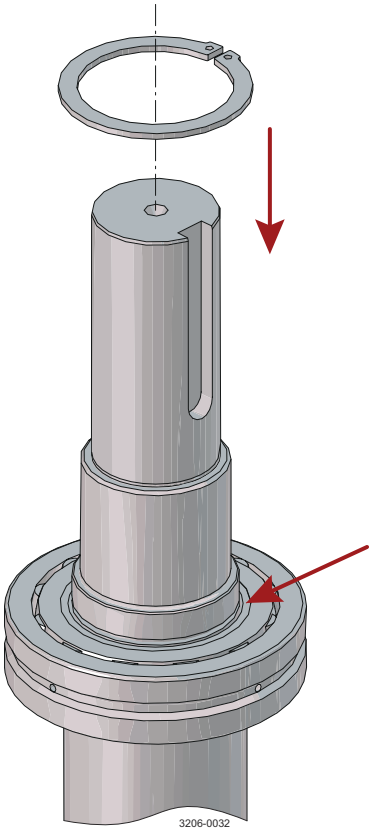
DuraCirc 52 to 74



DuraCirc 32 to 43



8 Fit the bearing shaft retaining circlip (59) in the groove on the shaft.



9 Apply small amount of recommended gearbox oil to the bearings.

10 Fitting Shaft Assemblies.

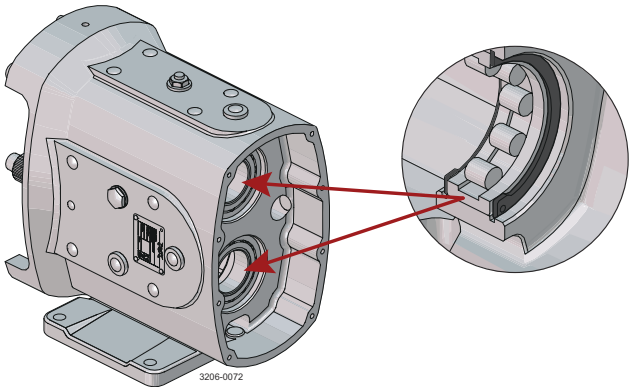
DuraCirc models 32 to 43 only:

a) Lightly oil the rear bearing bores of the gearcase (31) with gearbox oil.

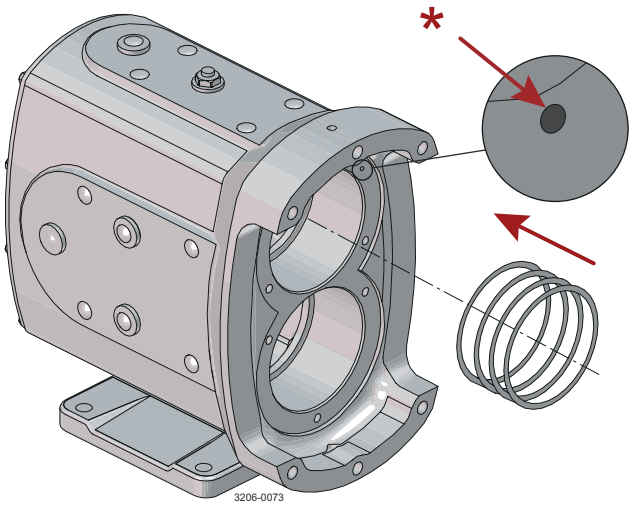
b) Fit first bearing circlip (60) in the inner most groove in the rear bearing bore of the gearcase (31).

c) Locate the outer race of the rear bearing (58) in the rear bearing bore.

d) Fit second bearing circlip (60) in the outer most groove in the rear bearing bore.



11 Replace the shaft shims (53) in to the bore marked with a dimple (as viewed from the front of the gearcase).



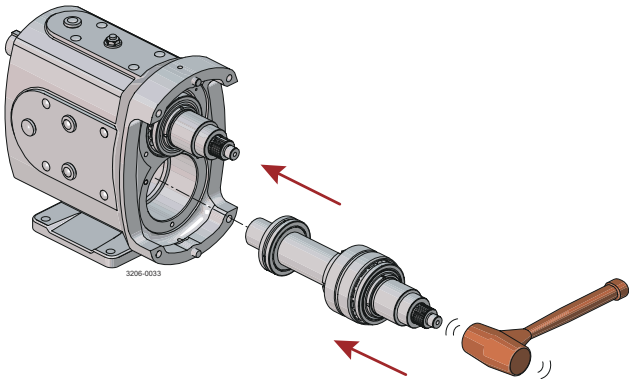
12 Identify the drive (51) and auxiliary (52) shaft positions according to the gearcase cover (5) orientation or original pump specification.

13 a) Lightly oil the bearing bores of the gearcase (31) with gearbox oil.

b) Using a soft faced mallet tap the shafts (51 and 52) into the gearcase (31).

NOTE

For Duracirc 52 to 74 pump models ensure the outer race of the rear bearing (58) is kept perpendicular to the rear bearing bore to avoid hold up on the bore. Only light tapping with a soft mallet should be used and only if required. If the shaft does not easily slide into the bore check bearing alignment and front bearing tension.



14 Fitting and retainers and gland guards

Clean the rear face of the seal retainers (14) and the front face of the gearcase (31), fit in position and tighten.

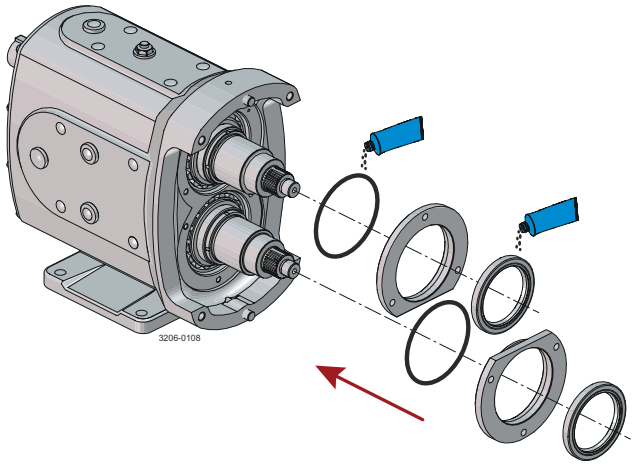
15

a) Check rotor alignment is correct by referring to the rotor abutment alignment in step 18 and adjust as required.

b) When rotor alignment is correct remove seal retainers and press new lip seals (36) until flush with front face.

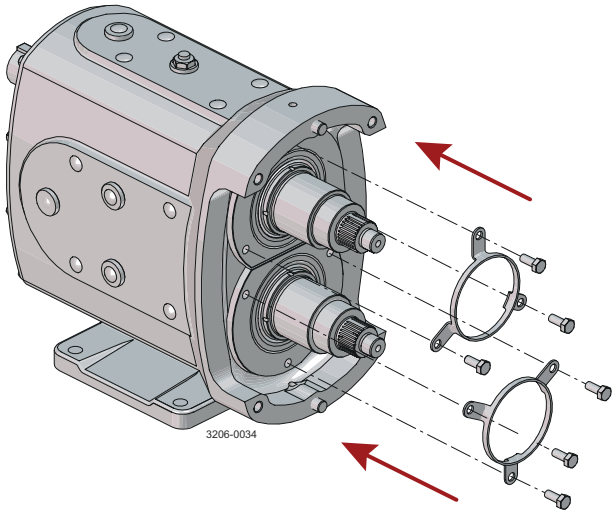
c) Lubricate with a small amount of lubricant and fit a new O-ring (37) to the seal retainer

d) Apply a small amount of gearbox oil to the inner lip of the lip seal (36) and push the seal retainers into position. Make sure lip seals are not damaged when sliding them onto the shafts.

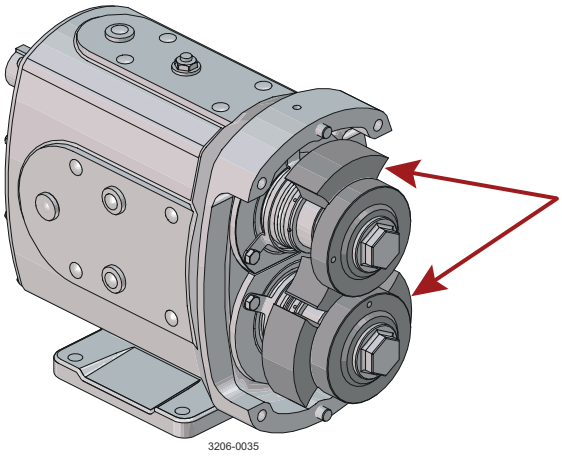


16 Position the gland guards (22) and tighten the screws (40).

If the rotor abutment has been checked and is within specification move to Step 20.



17 Checking rotor abutment alignment.



NOTE

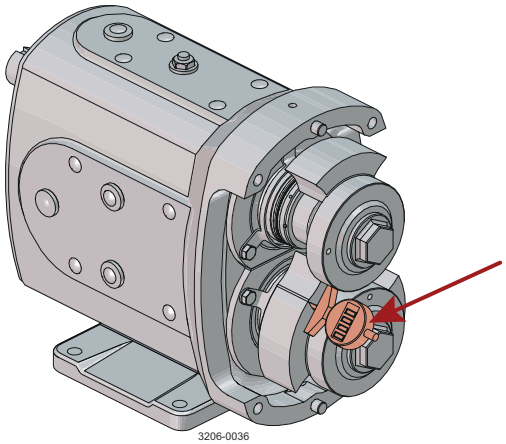
Incorrect setting of rotor alignment will damage the pump.

a) Set the position of the missing spline in the shafts (51 and 52) to approximately 90deg to each other (e.g. 12 o'clock and 3 o'clock).

b) Fit the rotors (3) ensuring to align the missing spline in the rotors with the missing spline on the shafts.

c) Fit the rotor nut (4) and tighten fully locking the rotors against each other if required.

18



a) Rotate the rotors to allow measurement of the rotor wing face to face axial alignment.

b) Using a depth micrometre ensure axial alignment is within a tolerance of 0.015mm (0.0006 in) across each wing, rotating the rotors as required.

c) If the alignment is within tolerance move to step 15. If the alignment is incorrect, note the adjustment required and move to step 19 to adjust the abutment shims (37).

NOTE

If used rotors are being refitted it may be difficult to accurately measure face to face axial alignment due to rotor wear. In this case the rear rotor hub to rotor front wing clearance should be checked using a feeler gauge.

19

a) Remove the rotor nuts (4) and rotors (3).

b) Remove the seal retainer (34) only from the shaft position marked with the dimple on the gearcase (3).

c) Remove this shaft only (either 51 or 52) from the gearcase and remove the gearbox shims (53).

d) Measure the removed shims and adjust (add, swap or remove) shims by the required amount as noted during measurement above. Add shims to move the rotor position forward, remove shims to move the shaft backwards.

e) Refit the adjusted shim pack into the front bearing bore marked with the dimple of the gearcase.

f) Refit the shaft following the instructions in step 13.

g) Refit the seal retainer and tighten.

h) Repeat steps 17 and 18 above to verify rotor abutment is now within tolerance.

i) Return to step 15.

20

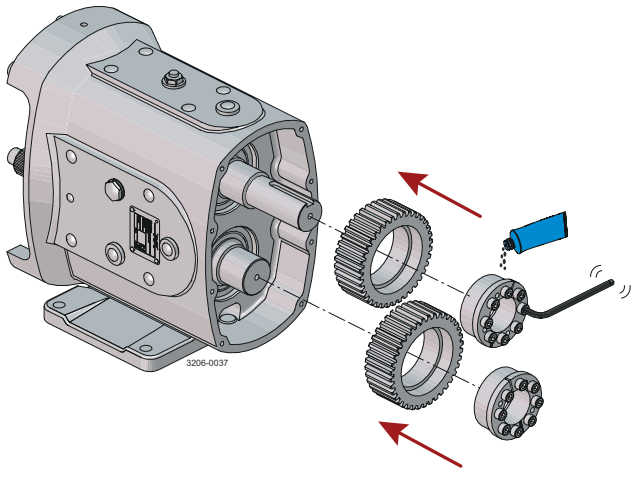
Fitting timing gears and torque locking assemblies (TLA).

a) If re-using torque locking assemblies (62) ensure the screws are fitted in the correct holes (i.e. not holes used for removal) and ensure the screws are fitted loosely.

b) Lightly lubricate the TLAs with the recommended gearbox oil.

c) Ensure the recess of the timing gear (61) and rear face of the TLAs are free from debris and fit the TLA to the timing gear.

d) Slide the timing gear and TLA on to the shafts (51 and 52) together.

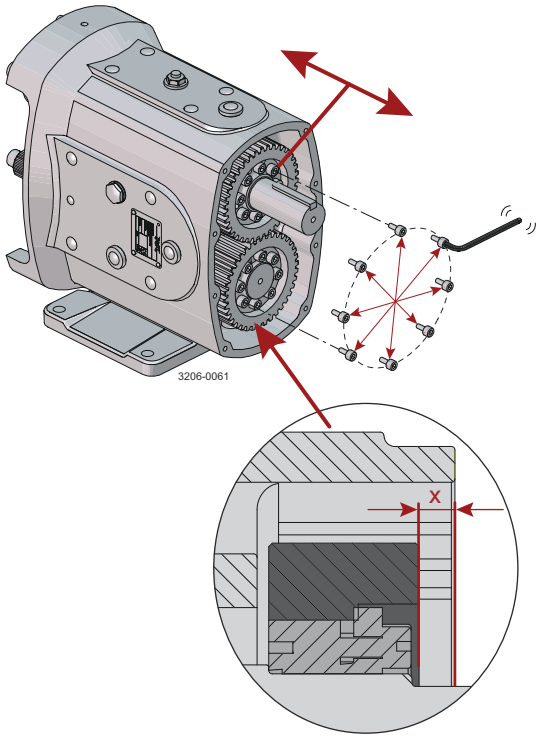


21

a) Gradually tighten the TLA screws (62) in a circular pattern until hand tight and the shafts can be rotated. Ensure the TLA is pushed fully back on the shaft and that the timing gear is pulled forward during tightening to ensure correct placement.

b) Check that the face of the timing gear does not sit proud of the rear face of the gearcase by checking the dimension from the rear face of the timing gear to the rear face of the gearcase is as per the table below. If not, loosen the TLA slightly and repeat Step 21.

c) Timing adjustment is now required.



Model	Dimension X (mm/in.)
32/33/34	1.5 / 0.060
42/43	4.0 / 0.157
52/53/54	6.0 / 0.236
62/63	9.5 / 0.374
72/73/74	6.0 / 0.236

22

Adjusting rotor timing

NOTE

If the rotor timing requires adjustment (and assuming the pump has not yet been re-built), it is important to establish the cause for the rotors mistiming before proceeding.

23

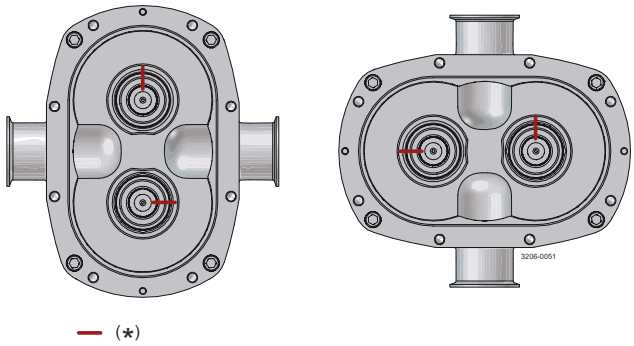
Tighten one of the torque locking assemblies (62) fully as per the below list to the torque stated in *Tool Requirements* on page 74.

- Horizontally Ported: Top Shaft
- Vertically Ported: Right Shaft
  (as looking from the front of the pump)

24

a) Set the shafts (51 and 52) with the missing spline as per the diagram (shown with the rotorcase fitted for demonstration).*)

* Missing Spline

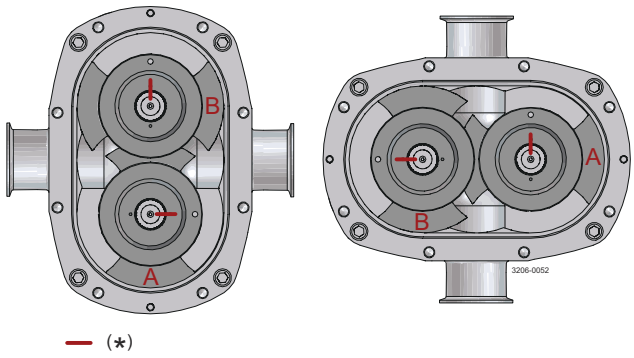


b) If rotors (3) are not fitted then fit on the shafts in the sequence shown in the diagram ensuring to align the missing spline in the rotor with the shafts. *)

*) Missing Spline

A = First

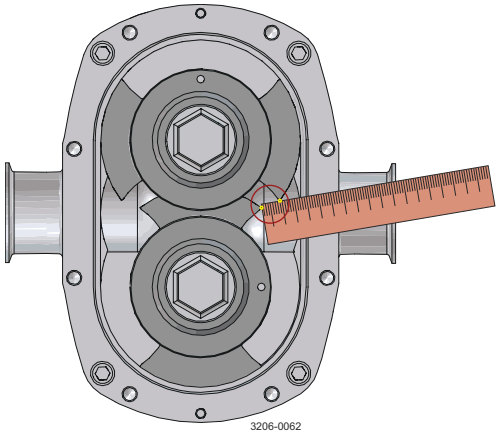
B = Second



c) Fit the rotor nuts (4) and tighten to the torque value stated in *Tool Requirements* on page 74, locking the rotors against each other to tighten if required.

d) Check to ensure shafts are still in the correct position above and adjust if required.

e) Measure the rotor wing tip to tip gap is equal on both sides If not hold the top rotor or right rotor firmly and tap the other rotor with a soft mallet to adjust the timing.



f) Recheck the rotor wing tip to tip gap is equal on both sides. If not repeat the previous step.

g) When the gap is equal on both sides tighten the TLA (62) fully to the torque stated in *Tool Requirements* on page 74, ensuring the shaft and rotor assembly does not move.

h) Recheck the rotor wing tip to tip gap is equal, if not loosen the TLA and repeat above steps.

i) Rotate the rotors 90 degrees and check the gap is equal, repeat until all tips have been checked.

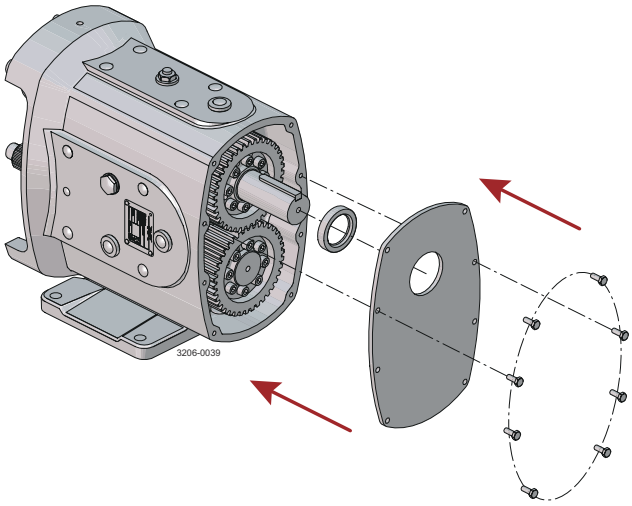
j) Remove the rotor nuts and rotors.

25 Fitting gearcase cover

a) Remove all old gasket material from both mating faces and wipe clean with a solvent. Clean the bore of the gearcase cover (35) and press a new lip seal (38) into the cover until flush.

b) Apply liquid gasket (such as Teroson MS930 or similar) to the rear face of the gearbox, ensuring the sealant is applied to the inner side of the cover screw thread holes.

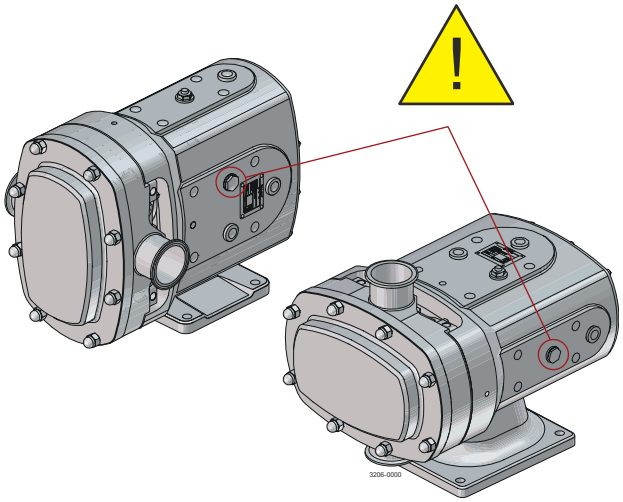
c) Apply a small amount of gearbox oil on the inner lip of the lip seal and carefully slide the cover over the shaft ensuring the lip seal is centered and not cut or damaged then secure with the gearbox cover screws (42).



NOTE

It is recommended to allow the sealant time to set before filling with oil. Follow the recommendations of the sealant manufacture.

26 Refit any blanking plugs (45) removed during the disassembly checking the O-rings are not damaged and replacing as required. Refit the oil sight glass (44) in the side of the gearcase (31) as shown. Refill with the recommended oil (as stated in *Pump Lubrication* on page 25). Quantity guidelines for each pump size and orientation as given in *Technical Data* on page 71, however oil should be added to the gearbox until the sight glass is filled with oil. Check the pump for any signs of oil leakage and rectify as required.



27 Fitting and shimming of Rotorcase

Whenever the rotor case and rotors have been removed it is good engineering practice to check the clearances of the pump to ensure they are within specification shown in the clearance charts before putting back in to operation.

If the existing rotorcase and rotors are being refitted and no changes have been made to the rotor abutment setting (gearbox shims) then no changes to the rotorcase shims should be required. In this case please proceed to step 29.

If a new rotorcase and/or new rotors and/or changes to the rotor abutment setting (gearbox shims) has been made then reshimming of the rotorcase will be required. In this case please proceed to step 28.

NOTE

Your supplier can advise the correct clearances from the pump serial number. Any incorrect setting of clearances is likely to damage the pump in operation. Shims can be stacked unequally providing the clearances are achieved.

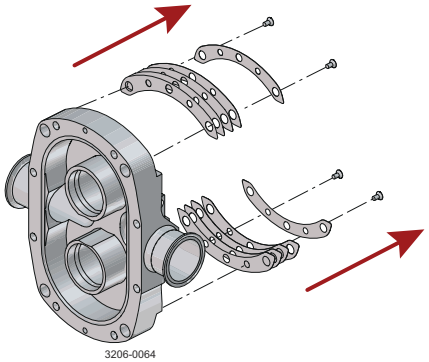
28

a) Remove the shim retainer screws (14), shim retainers (13) and shims (14) if fitted.

b) From the shim set select and measure out initial shims totalling as below:

- DuraCirc models 32 to 43: 0.5 mm / 0.019 in.
- DuraCirc models 52 to 74: 0.6 mm / 0.023 in.

c) Fit the shims, shim retainer and shim retainer screws and tighten to the correct setting. Ensure the shim retainer is fitted the correct way round with the counter sunk holes visible and check the screws do not sit proud of the shim retainer.

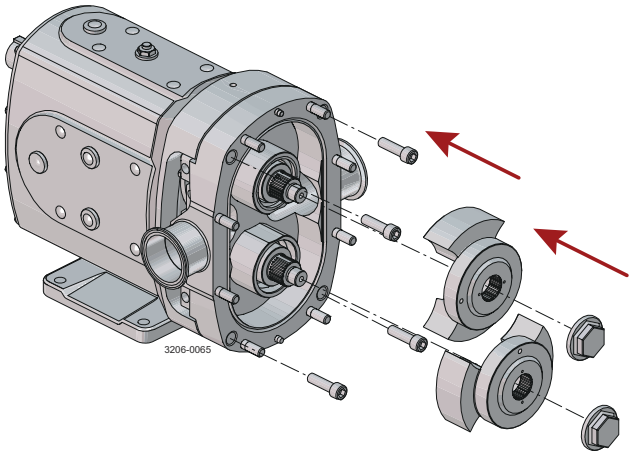


29

a) Ensure the shim retainers are correctly fitted to the rotorcase (3) and that the shim retainer screws (14) are not sitting proud of the shim retainers (13). If the shims have been removed during disassembly and not been kept in the matched sets please follow the instructions in step 30.

b) Refit the rotorcase to the gearcase (31) observing the correct orientation as marked during disassembly, refit the rotorcase screws (11) and tighten.

c) Refit the rotors (3) observing the correct position as marked during disassembly, refit rotor nuts (4) and tighten.

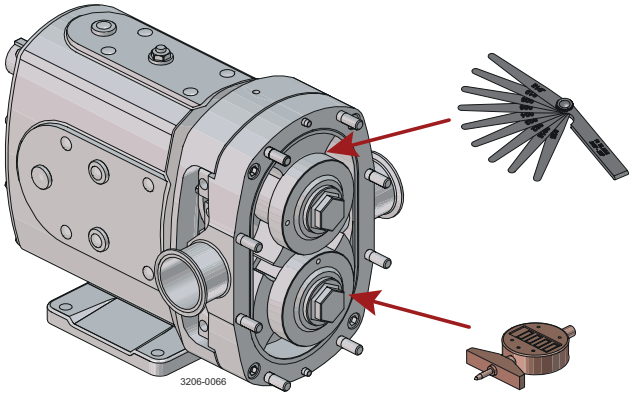


30

a) Using feeler gauges to check the back clearance (rear rotor face to rotorcase) and a depth micrometer to check the front clearance (front rotor face to rotorcase) record the values and check against the clearance charts for the appropriate pump model.

b) If the clearances are within the specification, then no further adjustment is required and can proceed to step 32.

c) If the clearances recorded are outside the specification, then adjustment to the rotorcase shims will be required.



31

a) Remove the rotor nuts, rotors and rotorcase and place face down on a suitable surface.

b) Remove the shim retainer screws (14), shim retainers (13) and shims (12) ensuring to make note of the position of each.

c) Measure the removed shims and adjust (add, swap, or remove) shims by the required amount as noted during measurement above. Add shims to move the rotorcase forward (decrease back clearance) or remove shims to move the rotorcase backwards (increase back clearance).

d) Fit the shims, shim retainer and shim retainer screws and tighten to the correct setting. Ensure the shim retainer is fitted the correct way round with the counter sunk holes visible and check the screws do not sit proud of the shim retainer.

e) Repeat step 30 above to recheck the clearances.

32

Once the clearances have been checked and are within specification remove the rotor nuts and rotors. Depending on the seal type fitted the rotorcase may need to be removed also. Please refer to *Primary Seals Removal and Fitting* on page 55 for seal fitting instructions.

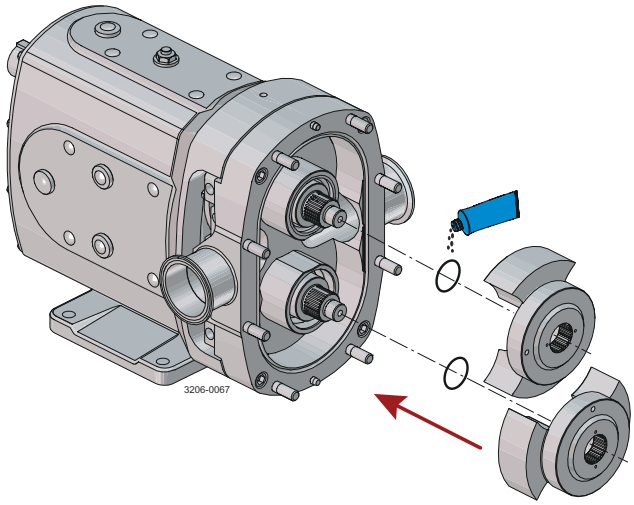
33

Fitting rotors

a) Ensure the rotorcase is fitted and the rotorcase screws are tightened as per the specification in *Tool Requirements* on page 74.

b) Lubricate and fit new rotor O-rings (7) to the shaft (51 and 52).

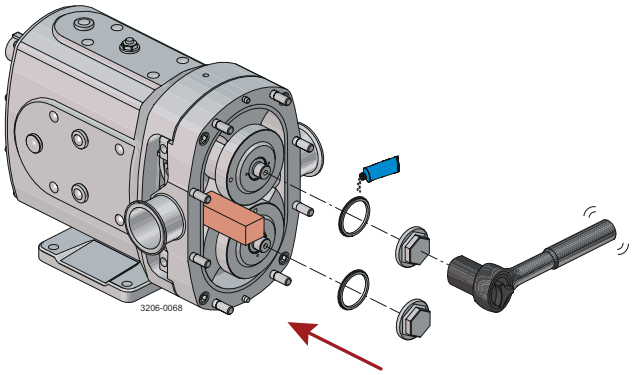
c) Refit the rotors (3) ensuring to align the missing spline in the rotor with the shafts and observing the position marks made during disassembly if refitting existing components.



34

a) Lightly lubricate and fit new P-ring elastomer (6) into the groove on the rotor nuts (4) ensuring the correct orientation.

b) Fit rotor nuts and tighten to torque shown in *Technical Data* on page 71. Use a plastic (nylon) block to stop the rotors from turning during tightening.



35

To check rotors are correctly synchronised turn the drive shaft (51) by hand and check all clearances with a suitable gauge against recommended clearance figures as shown in seperate addendum for Pump Head Clearances.

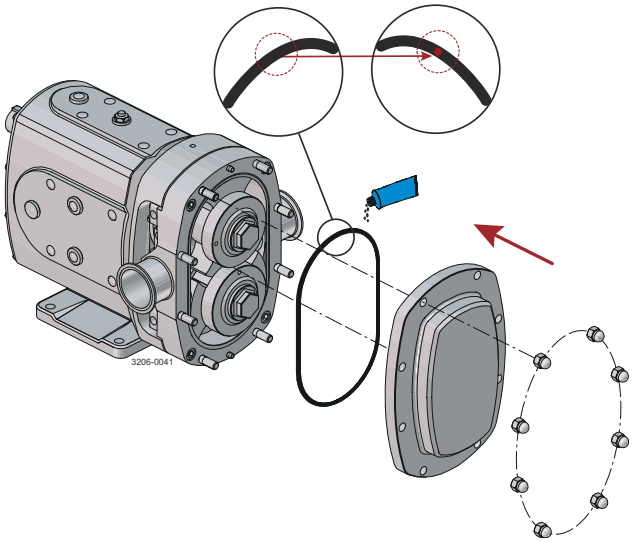
36

Fitting rotorcase cover

a) Lubricate and fit new P-ring elastomer (11) (Red ID Mark) to the rotorcase (2) ensuring the coloured mark is towards the rotor case and is fully seated in the groove.

b) Fit rotorcase cover (1) onto rotorcase (2) and tighten rotorcase cover nuts (8).

c) Refer to pump start up checks prior to operation.

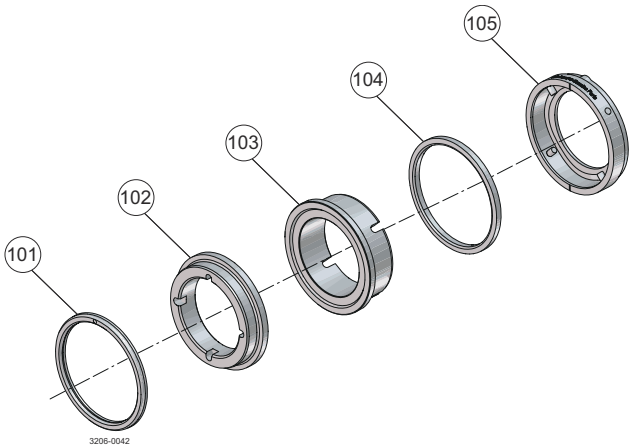


5.5 Primary Seals Removal and Fitting

(1) Single mechanical seal

Mechanical seals are fragile. Take extreme care when handling. Clean components before fitting, checking there is no damage to sealing faces. New elastomeric parts should be fitted during assembly.

Item	Description
101	Square Ring (Yellow ID mark)
102	Rotary Seal Face
103	Static Seal Face
104	Squad Ring (White ID mark)
105	Static Assembly



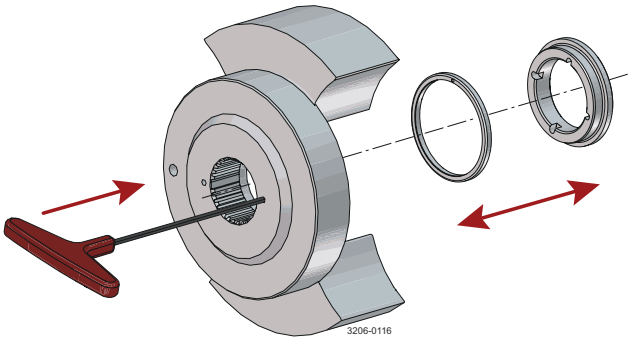
Seal Removal

NOTE

It is recommended to mark the positions of the rotors and rotorcase (e.g. Top/ Bottom or Left/Right) prior to removal to ensure the parts are refitted in the same positions.

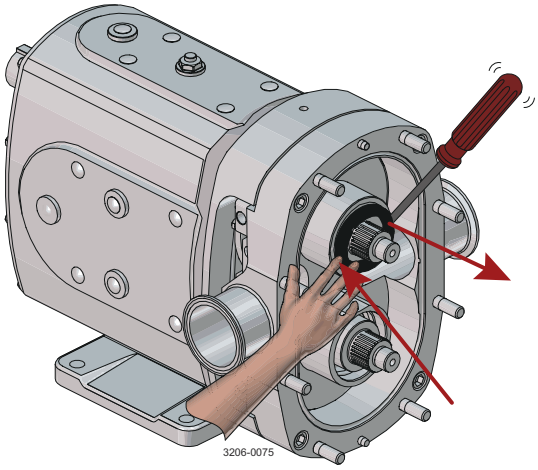
2

a) Remove rotorcase cover (1) and rotors (3).



b) Extract the rotary seal face (102) and square ring (101) from the rotor.

- A small diameter tool can be passed through the holes in the front of the rotor to aid removal without damaging the rotor or seal.



c) Remove the static seal face (103) and squad ring (104) from the static assembly (105) using a small screwdriver if required.

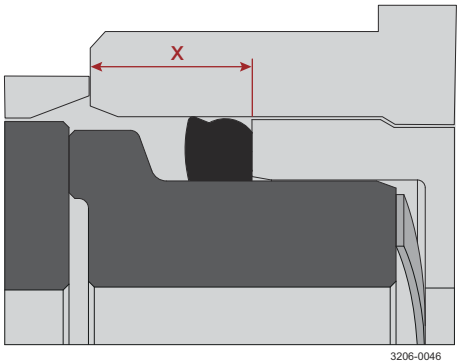
d) Remove the static assembly from the rotorcase (2) if replacement is required.

Seal fitting

NOTE

Ensure all screws and nuts are torqued to the values stated in *Tool Requirements* on page 74.

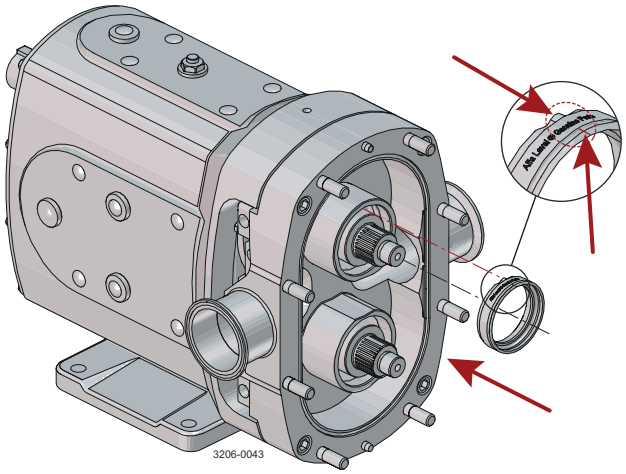
Model	Dimension X mm / in.
32/33/34	5.5 / 0.216
42/43	8.0 / 0.314
52/53/54	6.5 / 0.256
62/63	9.0 / 0.354
72/73/74	9.5 / 0.374



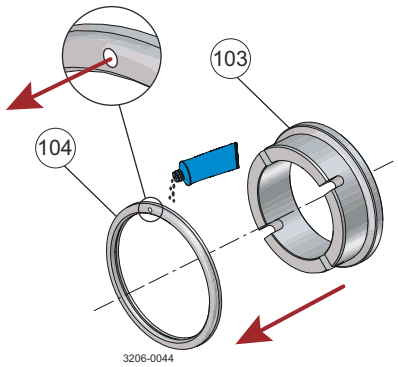
3

a) If the static assembly (105) was removed, align the line mark on front face of with the lugs in the bore of the rotorcase (2) and press back ensuring the drive ring is kept square to the bore until fully engaged.

b) Ensure the static assembly is fully seated by checking dimension shown below against the table. If not remove the static assembly, refit and check.

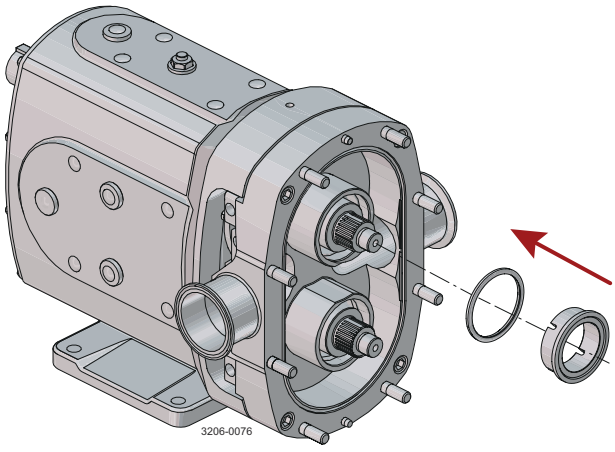


c) Lubricate the squad ring (104) and fit to the static seal face (103) ensuring the lip of the elastomer is towards the seal face (larger diameter) as shown in the diagram. Note: the coloured mark should be facing away from the static seal face.



d) Align the slots in the static seal face (103) with the pins in the static assembly (105) and press back gently until fully engaged.

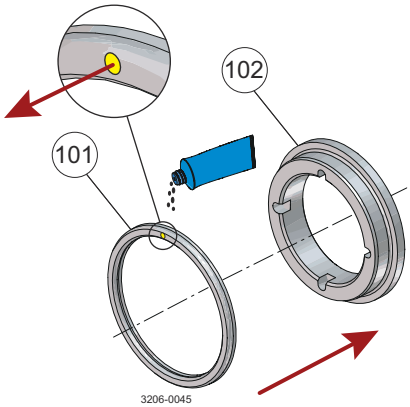
e) Wipe clean the stationary seal faces with solvent.



f) Lubricate the square ring elastomer (101) and fit to the rotary seal face (102) ensuring the rounded edge is fitted in to the radius of the seal face part as shown in the diagram.

NOTE

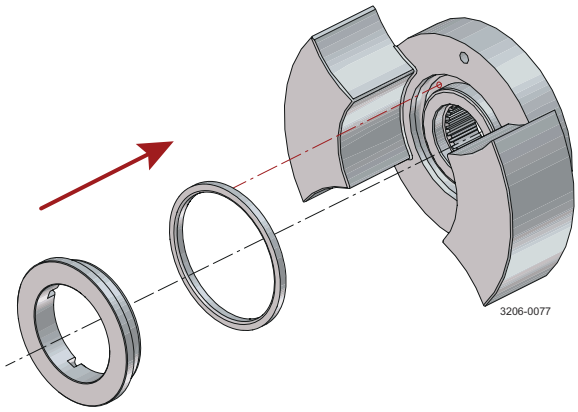
The coloured dot should be facing away from the rotary seal face.



g) Align the cut out on the rotary seal face (102) with the pins in the bore of the rotor (3) and press back gently until fully seated.

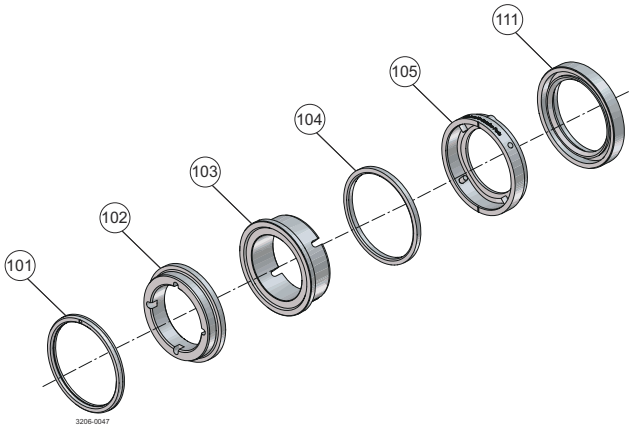
h) Wipe clean the rotary seal faces with solvent.

i) Refit the rotors (3), rotor nuts (4) and rotorcase cover (1) as per the main assembly instructions in *Assembly* on page 41.



4 Single flushed mechanical seal

Item	Description
101	Square Ring (Yellow ID Mark)
102	Rotary Seal Face
103	Static Seal Face
104	Squad Ring (White ID Mark)
105	Static Assembly
111	Lip Seal



Seal removal

NOTE

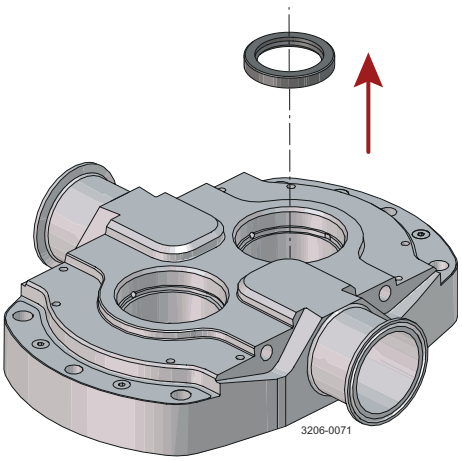
It is recommended to mark the positions of the rotors and rotorcase (e.g. Top/ Bottom or Left/Right) prior to removal of the parts are refitted in the same position. Ensure the flush system has been de-pressurized and is isolated before continuing.

5 Single flushed mechanical seal

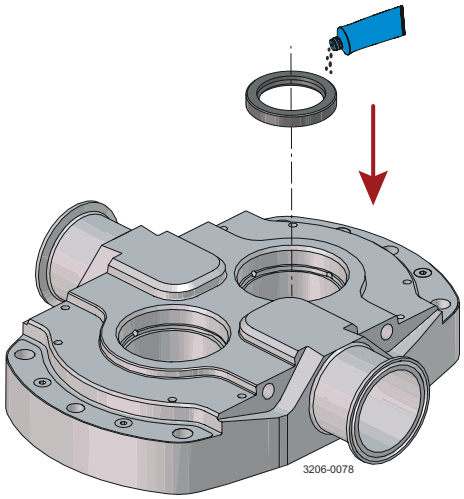
a) Follow instructions 1. to 4. as for the single seal disassembly.

b) Remove the flush pipework to the rotorcase (2) and then remove the rotorcase placing it face down on a suitable surface.

c) Remove the lip seal (111) from the rear seal bore of the rotorcase.



6 Seal fitting



NOTE

Ensure all screws and nuts are torqued to the values stated in *Tool Requirements* on page 74.

a) Apply a small amount of suitable lubrication to the new lip seal (111) and press fit to the rear seal bore of the rotorcase (2) until flush with end of bore.

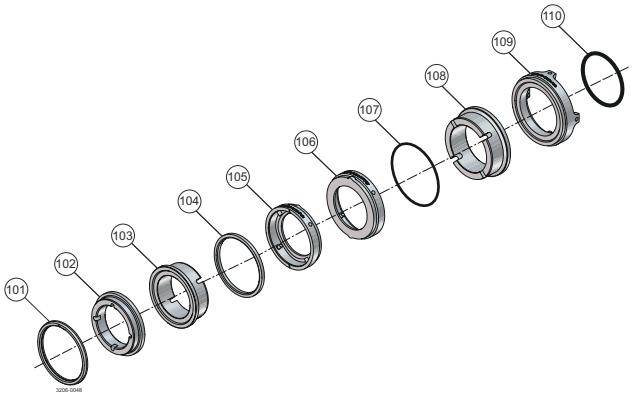
b) Refit the rotorcase ensuring the rotor case screws (11) are torques to tightening the rotorscrews to the required torque setting as shown in *Technical Data* on page 71.

c) Follow instructions 1. to 9. as for the single seal assembly.

d) Refit the flush pipework and refill, checking for any leaks and correct operation before restarting the pump.

7 Double flushed mechanical seal

Item	Description
101	Square Ring (Yellow ID Mark)
102	Rotary Seal Face
103	Static Seal Face
104	Squad Ring (White ID Mark)
105	Static Assembly
106	Static Assembly (Outboard)
107	Static O-ring (Outboard)
108	Static Seal Face (Outboard)
109	Rotary Assembly (Outboard)
110	Rotary O-ring (Outboard)



Seal removal

NOTE

It is recommended to mark the positions of the rotors and rotorcase (e.g. Top/ Bottom or Left/Right) prior to removal to the parts are refitted in the same position.

Ensure the flush system has been de-pressurised and is isolated before continuing.

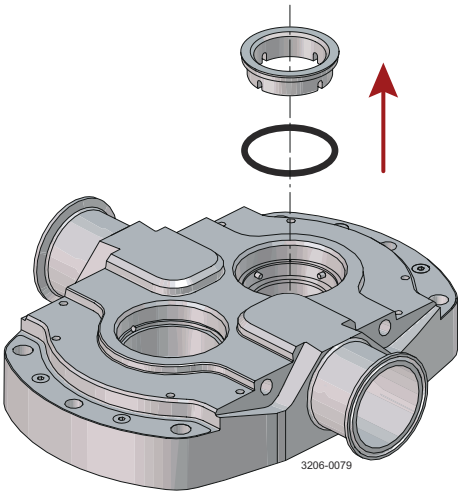
8

a) Follow instructions 1. to 4. as for the single seal disassembly.

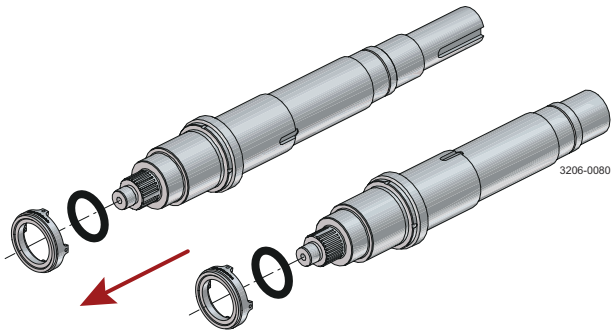
b) Remove the flush pipework to the rotorcase (2) and then remove the rotorcase placing it face down on a suitable surface.

c) Extract the outboard static seal face (108) and static O-ring (107) from the outboard static assembly (106).

d) Remove the outboard static seal assembly (106) from the rear of the rotorcase if replacement is required.



e) Remove the outboard rotary assembly (109) and rotary O-ring (110) from the shafts (51 and 52).



Seal fitting

NOTE

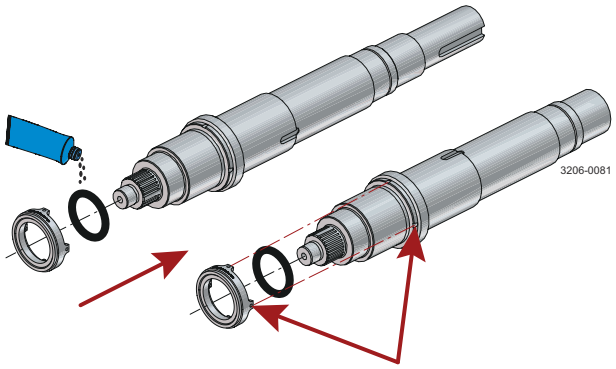
Ensure all screws and nuts are torqued to the values stated in *Tool Requirements* on page 74.

9

a) Lightly lubricate the outboard rotary O-ring (110) with a suitable lubricant and fit on to shaft (51 and 52).

b) Align the pins of the outboard rotary assembly (109) with the slots in the shaft and push back until fully engaged on shaft.

c) If the outboard static assembly (106) was removed, align the marks on the face of the outboard static assembly with the lugs in the rear seal bore of the rotorcase (2) and press back ensuring the static assembly is kept square to the bore until fully engaged.



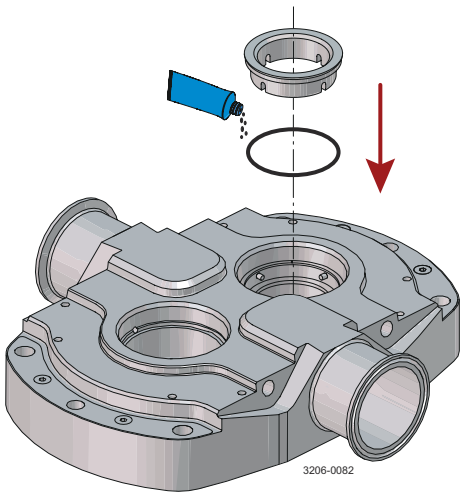
d) Lubricate the outboard static O-ring (107) with appropriate grease and fit to the outboard static seal face (108).

e) Align the slots in the outboard static seal face with the pins in the outboard static assembly and press back gently until fully engaged.

f) Refit the rotorcase to the gearcase (31), ensuring the shafts do not contact the fitted seal components, refit the rotorcase screws and tighten.

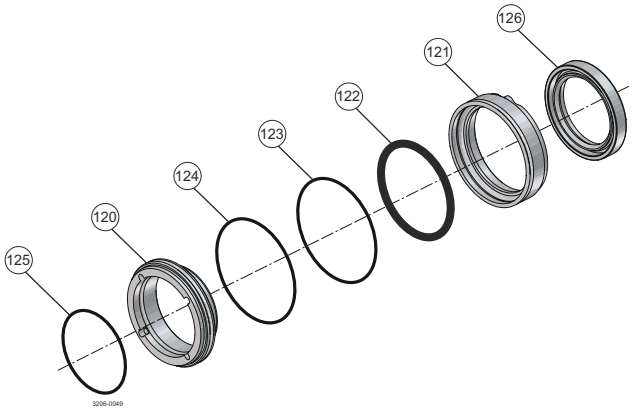
g) Follow instructions 1. To 9. as for the single seal assembly.

h) Refit the flush pipework, refill and pressurise, checking for any leaks and correct operation before restarting the pump.



10 O-ring Seal (Single and Flush)

Item	Description
120	Sleeve
121	Static Assembly, O-ring seal
122	O-Ring, Primary
123	O-Ring, Static
124	O-Ring, Sleeve Outer
125	O-Ring, Sleeve Inner
126	*Lipseal (flush version only)



O-ring seal removal:

NOTE

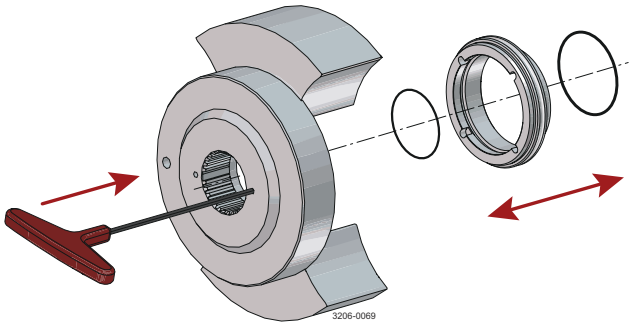
It is recommended to mark the positions of the rotors and rotorcase (e.g. Top/ Bottom or Left/Right) prior to removal to the parts are refitted in the same position.

11

a) Remove rotorcase cover (1) and rotors (3).

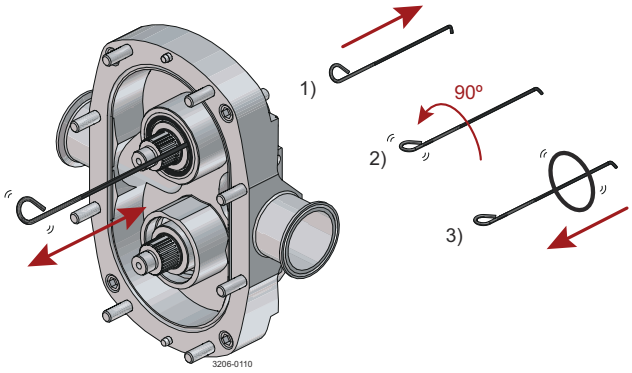
b) Extract the sleeve (120) and from the rotor then remove the inner sleeve o-ring (124) and outer sleeve o-ring (125) from the sleeve. Check sleeve for grooves and deep scratches and replace as necessary.

- A small diameter tool can be passed through the holes in the front of the rotor to aid removal if required.

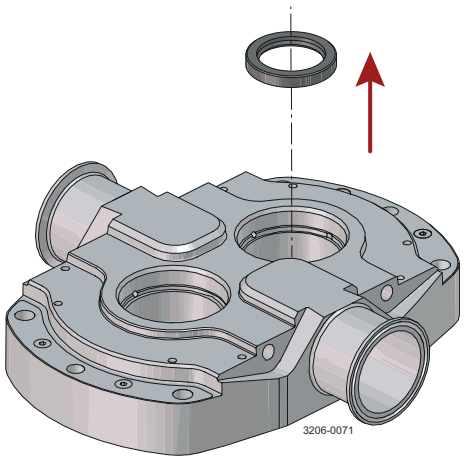


c) Remove the primary o-ring (122) from the static assembly using the tool provided.

d) Remove the static assembly (121) from the rotorcase using the tool provided if replacement is required and then remove static o-ring (123).



e) Flushed seals only - Remove the flush pipework to the rotorcase (2) and then remove the rotorcase placing it face down on a suitable surface. Remove the lip seal (126) from the rear seal bore of the rotorcase.

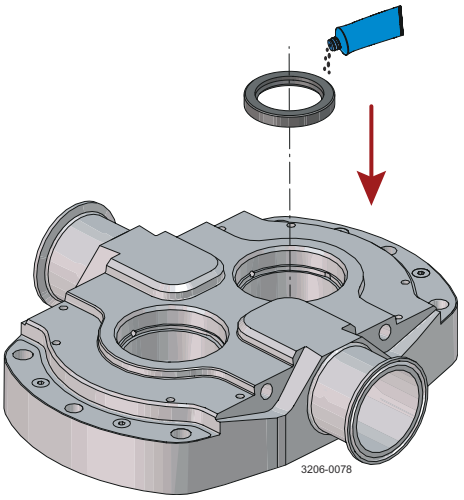


(12) O-ring seal fitting:

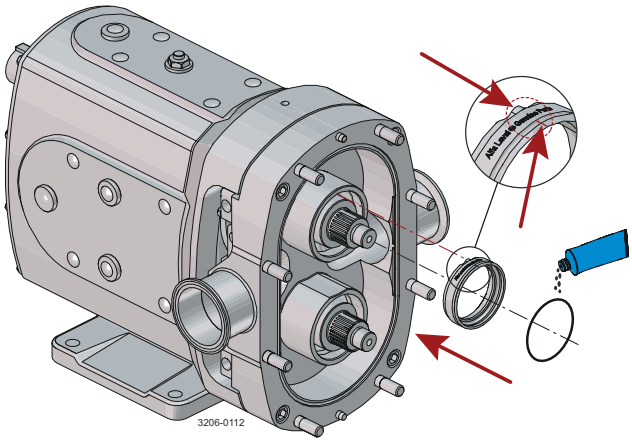
NOTE

Ensure all screws and nuts are torqued to the values stated in *Tool Requirements* on page 74.

a) Flushed seal only: Apply a small amount of suitable lubrication to the new lip seal (126) and press fit to the rear seal bore of the rotorcase (2) until flush with end of bore. Refit the rotorcase ensuring the rotor case screws (11) are tightened correctly.

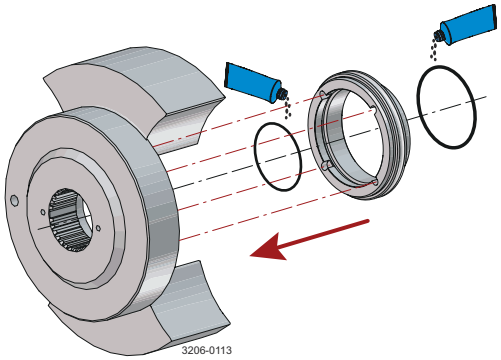


b) If the static assembly was removed lightly lubricate the static o-ring (123) and fit to the static assembly (121). Align the mark on the front face of the static assembly with the lugs in the bore of the rotorcase (2) and push back ensuring the static assembly is kept square to the bore until fully engaged.



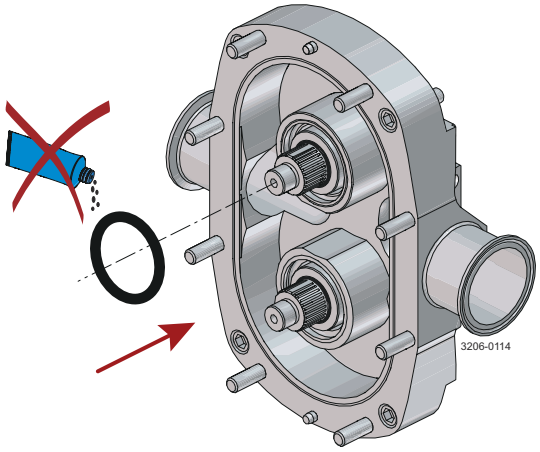
c) Lightly lubricate the outer sleeve O-ring (124) and inner sleeve O-ring (125) and fit to the sleeve (120).

d) Align the slots in the sleeve with the pins in the rotor (3) and push until fully seated.



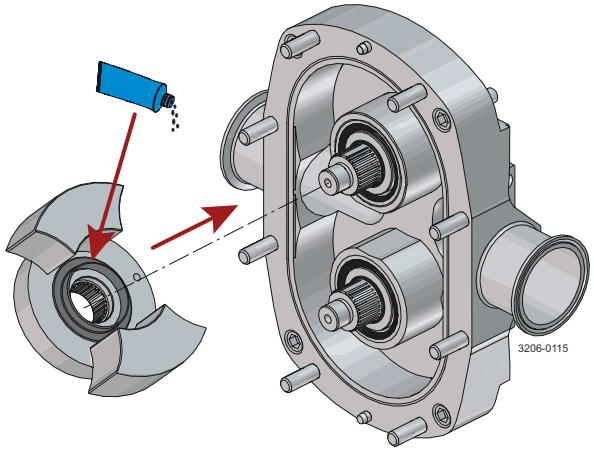
e) **Without** lubricating, fit primary O-ring (122) in to the static assembly ensuring it is pushed firmly and evenly in to position.

f) Lightly lubricate the outside diameter of the sleeve.



g) Refit the rotors (3), rotor nuts (4) and rotorcase cover (1) as per the main assembly instructions in *Assembly* on page 41.

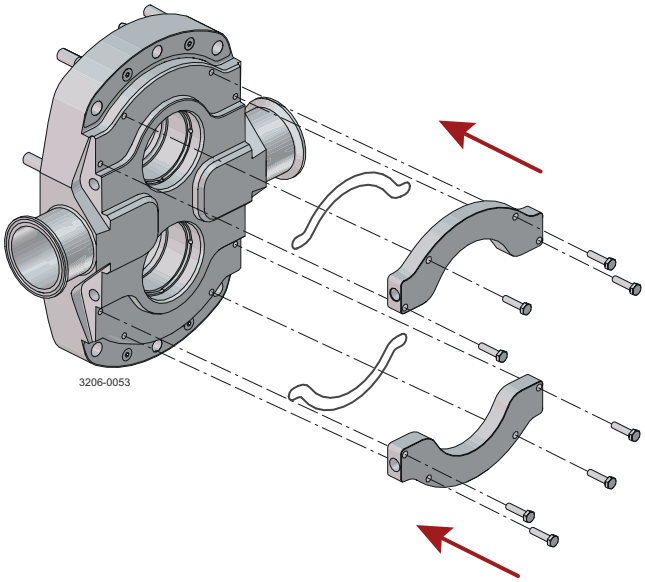
h) Flushed seals only - Refit the flush pipework and refill, checking for any leaks and correct operation before restarting the pump.



5.6 Heating/Cooling Devices

The DuraCirc pumps have the option of being fitted with a heating/cooling jacket fitted on the rear of the rotorcase.

These are to be used for heating the pump head to maintain the pumped media viscosity and reduce risk of any crystallisation/solidification of the pumped product occurring. They may also be used for cooling purposes.



The maximum pressure and temperature of heating/cooling fluid is 3.5 bar (50 psi) and 150° C / 302° F respectively. Heating/cooling jackets should be in operation approximately 15 minutes prior to pump start up and remain in operation 15 minutes after pump shut down.

5.6.1 Disassembly

> **NOTE**
>
> It is recommended to mark the positions of the rotors and rotorcase (e.g. Top/ Bottom or Left/Right) prior to removal to the parts are refitted in the same position.

Ensure pump has been allowed to reach ambient temperature before continuing and that any heating / cooling media has been drained.

1. Remove rotorcase cover (1) and rotors (3).
2. Remove the jacket connection pipes.
3. Remove the rotorcase (2) and place face down on a suitable surface.
4. Remove the jacket screws (19) and the jackets (17) using a soft mallet to gently tap free if required.
5. Remove the o-ring (18) and replace.
6. Clean the jacket and the mating face of the rotor case of any debris or residue and ensure the port connections are not blocked.

5.6.2 Reassembly

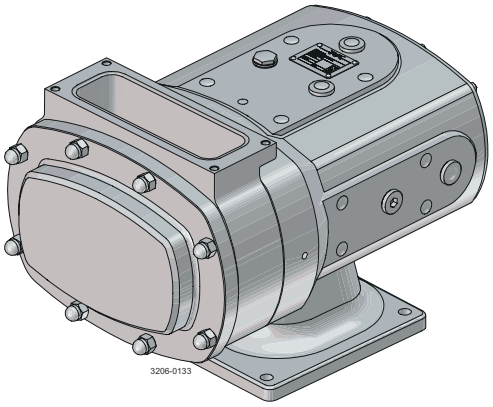
1. Wipe the mating surfaces of the rotorcase (2) and jacket (17) with a solvent and ensure the O-ring groove is clean and free of debris and damage (replace jacket if required).
2. Lightly lubricate new o-rings (18) and push firmly in the jacket O-ring groove.
3. Position the jacket on the rotorcase (2), fit screws (19) and tighten to the values given in the table below.
4. Refit the rotorcase (2), rotors (3), rotor nuts (4) and rotorcase cover (1) as per the main assembly instructions in *Assembly* on page 41.
5. Refit jacket connection pipes, refill and check for leaks.

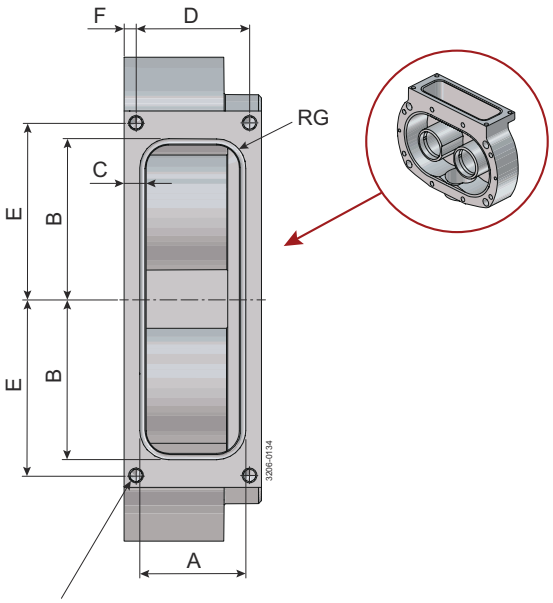
	32/33/34	42/43	52/53/54	62/63	72/73/74
Screw Size / Torque	M5	M5	M6	M8	M8
Torque Setting	5 Nm	5 Nm	10 Nm	20 Nm	20 Nm
	4 lbft	4 lbft	7 lbft	15 lbft	15 lbft
Flush connection BSP(G) NPT with Adaptor	⅛"	⅛"	¼"	¼"	¼"

All flush connections are Female.

5.7 Rectangular Inlet

For handling extremely viscous products and/or large solids that would normally bridge a smaller port, Alfa Laval Duracirc circumferential piston pumps can be supplied with an optional rectangular inlet. Normally the pump will be in the vertical port orientation to allow pumped media to flow in to the pumping chamber under gravity from a hopper mounted directly above or mounted with an adaptor (by others) to facilitate connection to larger diameter pipework.





H holes Tap, J Thread x K full thread depth, max drill depth L

Dimensions for Rectangular Inlet

Pump Model	Unit	A	B	C	D	E	F	G	H	J	K	L
33	mm	20	60	6	20	71	6	10	4	M8	12	19
	inch	0.787	2.362	0.236	0.787	2.795	0.236	0.394	0.157		0.472	0.748
42	mm	30	72.5	12	42	82	6	15	4	M8	12	19
	inch	1.181	2.854	0.472	1.654	3.228	0.236	0.591	0.157		0.472	0.748
53	mm	40	103	15	54	118	8	15	4	M10	15	18
	inch	1.575	4.055	0.591	2.126	4.646	0.315	0.591	0.157		0.591	0.709
54	mm	62	103	15	76	118	8	15	4	M10	15	17
	inch	2.441	4.055	0.591	2.992	4.646	0.315	0.591	0.157		0.591	0.669
62	mm	50	124	27	88	140	8	19	4	M10	15	20
	inch	1.969	4.882	1.063	3.465	5.512	0.315	0.748	0.157		0.591	0.787
63	mm	70	124	27	108	140	8	19	6	M10	15	20
	inch	2.756	4.882	1.063	4.252	5.512	0.315	0.748	0.236		0.591	0.787
72	mm	48	142	30	92	160	8	20	6	M12	18	22
	inch	1.890	5.591	1.181	3.622	6.299	0.315	0.787	0.236		0.709	0.866
73	mm	70	142	30	114	160	8	20	6	M12	18	22
	inch	2.756	5.591	1.181	4.488	6.299	0.315	0.787	0.236		0.709	0.866

5.8 Troubleshooting

Problem															Probable Causes	Solutions
No flow	Under capacity	Irregular discharge	Low discharge pressure	Pump will not prime	Prime lost after starting	Pump stall when starting	Pump overheats	Motor overheats	Excessive power absorbed	Noise and Vibration	Pump element wear	Syphoning	Seizure	Mechanical seal leakage	Mechanical seal leakage		
x				x												Incorrect direction of rotation	Reverse motor
x																Pump not primed	Expel gas from suction line and pumping chamber and introduce fluid
x	x		x		x					x						Insulficient NPSH available	Increase suction line diameter
																	Increase suction head
																	Simplify suction line configuration and reduce length
																	Reduce pump speed
	x		x		x					x						Fluid vaporising in suction line	Increase suction line diameter
																	Increase suction head
																	Simplify suction line configuration and reduce length
																	Reduce pump speed
x		x		x	x								x			Air entering suction line	Remake pipework joints
	x			x						x						Strainer or filter blocked	Service fittings
	x				x	x	x		x	x				x		Fluid viscosity above rated figure	Increase fluid temperature
																	Descrease pump speed
																	Check seal face viscosity limitations
x			x													Fluid viscosity below rated figure	Decrease fluid temperature
																	Increase pump speed
						x			x	x			x	x		Fluid temp. above rated figure	Cool the pump casing
																	Reduce fluid temperature
																	Check seal face and elastomer temp. limitations
					x		x	x								Fluid temp. below rated figure	Heat the pump casing
																	Increase fluid temperature
										x				x		Unexpected solids in fluid	Clean the system
																	Fit strainer to suction line
																	If solids cannot be eliminated consider fitting double mechanical seals
x	x	x			x	x	x		x	x			x		x	Discharge pressure above rated figure	Checks for obstructions i.e. closed valve
																	Service system and change to prevent problem recurring
																	Simplify discharge line to decrease pressure
														x		Seal flushing inadequate	Increase flush flow rate
																	Check that flush fluid flows freely into seal area

Problem																Probable Causes	Solutions
No flow	Under capacity	Irregular discharge	Low discharge pressure	Pump will not prime	Prime lost after starting	Pump stall when starting	Pump overheats	Motor overheats	Excessive power absorbed	Noise and Vibration	Pump element wear	Syphoning	Seizure	Mechanical seal leakage	Mechanical seal leakage		
	x							x	x	x						Pump speed above rated figure	Decrease pump speed
x																Pump speed below figure	Increase pump speed
	x						x		x	x			x			Pump casing strained by pipework	Check alignment of pipes
																	Fit flexible pipes or expansion fittings.
																	Support pipework
							x		x	x			x			Flexible coupling misaligned	Check alignment and adjust mounting accordingly
							x		x	x			x			Insecure pump driver mountings	Fit look washers to slack fasteners and retighten
							x		x	x			x		x	Shaft bearing wear or faliure	Refer to pump maker for advice and replacement parts
							x		x	x			x			Insufficient oil lubrication	Refer to pump maker´s instructions
x	x							x				x		x		Metal to metal contact of pumping element	Check rated and duty pressure.
																	Refer to pump maker
x			x													Wam pumping element	Fit new components
x					x											Suction lift too high	Lower pump or raise liquid level
												x				No barrier in system to prevent flow passing	Ensure discharge pipework higher than suction tank
																Pump allowed to run dry	Ensure system operation prevent this
														x			Fit single or double flushed mechanical selas.
																	Fit flushed packed gland
									x							Faulty motor	Check and replace motor bearings
x																Pumping element missing	Fit pumping element

6 Technical Data

> **NOTE**
>
> Technical data must be observed during installation, operation and maintenance.
>
> All personnel should be informed about the technical data.

6.1 Technical data

Standard specification	
Piston rotors:	DuraCirc Hi-Life, Non-Galling Alloy
Other product wetted steel parts:	W. 1.4404 (316L)
Inside surface finish:	Mech Ra ≤ 0.8
Shafts:	Duplex 1.4460 (329)
Gear box:	Stainless steel
Base plate:	Stainless steel
Coupling guard:	Stainless steel
Product wetted elastomers:	EPDM
Other elastomers:	FPM
Shaft seal:	Single mechanical
Rotary seal face:	Silicon Carbide
Stationary seal face:	Carbon

Shaft seals	
Single mechanical, single mechanical with flush, double mechanical and single and flushed O-ring seal available.	
Max process pressure, mechanical seal, SiC/Car:	15 bar / 217 psi
Max process pressure, mechanical seal, SiC/SiC:	Max pressure of pump
Max flush pressure, single flush:	0.5 bar / 7.25 psi
Max flush pressure, double mechanical seal, SiC/Car:	16 bar / 232 psi
Max flush pressure, double mechanical seal, SiC/SiC:	20 bar / 290 psi
Max process pressure, O-ring seal:	7 bar / 102 psi
Max flush pressure, O-ring seal:	0.5 bar / 7.25 psi
Flush water consumption:	30 l/hr / 7 gallon/hour
Flush connections, DuraCirc 32-43:	BSP/G 1/8" or NPT 1/8"
Flush connections, DuraCirc 52-74:	BSP/G 1/4" or NPT 1/4"

Temperature	
Max process and CIP temperature:	150 °C / 302 °F

Motors
Gear motor, 4 poles, to IEC metric standard, 50/60 Hz, suitable for frequency conversion, IP55, insulation class F.
Gear motor, 4 poles, to Nema standard, premium efficiency, suitable for frequency conversion.

Warranty
Extended 3-years warranty on DuraCirc pumps. The warranty covers all non wear parts on the condition that genuine Alfa Laval Spare Parts are used.

6.2 Process Data

Pump Model	Displacement			Inlet/Outlet		Diff. Pressure		Max speed
	Litres/rev	Imp gal/100 rev	US gal/100 rev	mm	inch	bar	psi	rpm
32	0.03	0.66	0.79	25	1	25	362	1000
33	0.06	1.32	1.58	40	1½	25	362	1000
34	0.12	2.64	3.17	50	2	16	232	1000
42	0.23	5.06	6.07	50	2	20	290	750
43	0.29	6.38	7.66	50	2	13	188	750
52	0.38	8.36	10.03	50	2	37	536	750
53	0.59	12.97	15.57	65	2½	25	362	750
54	0.96	21.12	25.3	80	3	16	232	750
62	1.44	31.67	38.04	80	3	37	536	600
63	1.97	43.33	52.03	100	4	25	362	600
72	1.92	42.23	50.7	100	4	40	580	600
73	2.86	62.91	75.55	150	6	25	362	600
74	4.14	91.1	109.4	150	6	16	232	600

6.3 Approximate Oil Capacities

Pump model	Horizontal Ports		Vertical Ports	
	litres	US gal	litres	US gal
32/33/34	0.9	0.13	0.5	0.24
42/43	1.5	0.26	1	0.40
52/53/54	3.5	0.61	2.3	0.92
62/63	6.6	1.22	4.6	1.74
72/73/74	10.3	1.82	6.9	2.72

6.4 Weights

Pump model	Typical Bare Shaft Pump kg (lb) Port Orientation		Typical Pump with Drive Unit kg (lb) Port Orientation	
	Horizontal ports	Vertical ports	Horizontal ports	Vertical ports
32	32 (70)	33 (72)	73 (160)	74 (163)
33	33 (72)	34 (74)	81 (178)	82 (180)
34	36 (79)	37 (81)	88 (194)	89 (196)
42	60 (132)	63 (138)	151 (332)	154 (339)
43	63 (138)	66 (145)	157 (346)	160 (352)
52	110 (242)	113 (249)	274 (604)	277 (610)
53	114 (251)	117 (257)	294 (648)	297 (654)
54	122 (269)	125 (275)	330 (727)	333 (734)
62	203 (447)	208 (458)	444 (979)	449 (990)
63	210 (463)	214 (471)	447 (1051)	481 (1060)
72	327 (721)	334 (736)	607 (1338)	614 (1353)
73	345 (760)	352 (776)	661 (1457)	668 (1472)
74	366 (807)	373 (822)	685 (1510)	692 (1525)

The above weights are for guidance purposes only and will vary dependent upon specification of pump, baseplate and drive unit.

6.5 Tool Requirements

Description	Tool Required	Pump Model				
		32/33/34	42/43	52/53/54	62/63	72/73/74
Nut, Rotorcase Cover (8)	Socket Size (mm)	13	17	19	19	19
	Torque Setting (Nm)	20	40	65	65	65
	Torque Setting (lbft)	15	29	48	48	48
Nut, Rotor (4)	Socket Size (mm)	24	30	36	41	55
	Torque Setting (Nm)	60	120	220	300	360
	Torque Setting (lbft)	44	88	162	221	265
Screw, Rotor (11)	Socket Size (mm)	13	17	19	19	24
	Torque Setting (Nm)	20	40	65	65	120
	Torque Setting (lbft)	15	29	48	48	88
Screw, Seal Retainer (40)	Socket Size (mm)	10	10	13	13	13
	Torque Setting (Nm)	10	10	20	20	20
	Torque Setting (lbft)	7	7	15	15	15
Screw, Gearcase Cover (42)	Socket Size (mm)	8	10	10	13	13
	Torque Setting (Nm)	5	10	10	20	20
	Torque Setting (lbft)	4	7	7	15	15
Screw, Torque Lock Assembly (62)	Socket Size (mm)	5	5	6	6	6
	Torque Setting (Nm)	17	17	41	41	41
	Torque Setting (lbft)	13	13	30	30	30
Plug, Drain (46)	Key Size (mm)	⅜"	⅜"	⅜"	⅜"	⅜"
	Torque Setting (Nm)	30	30	30	30	30
	Torque Setting (lbft)	22	22	22	22	22
Screw, Foot (41)	Key Size (mm)	6	8	10	10	14
	Torque Setting (Nm)	20	40	65	65	95
	Torque Setting (lbft)	15	29	48	48	70
Screw, Shim Retainer (14)	Socket Size (mm)	8	10	10	10	10
	Torque Setting (Nm)	5	10	10	10	10
	Torque Setting (lbft)	4	7	7	7	7
Screw, Jacket (19)	Socket Size (mm)	8	8	10	13	13
	Torque Setting (Nm)	5	5	10	20	20
	Torque Setting (lbft)	4	4	7	15	15
Plug, Vent (43)	Socket Size (mm)	22	22	22	22	22
	Torque Setting (Nm)	80	80	80	80	80
	Torque Setting (lbft)	59	59	59	59	59
Sight Glass (44)	Socket Size (mm)	22	22	22	22	22
	Torque Setting (Nm)	2	2	2	2	2
	Torque Setting (lbft)	1	1	1	1	1

6.6 Pump Data Table

Pump Model	Displacement			Port size		Max. Working Pressure		Max Speed
	litres/rev	Imp gal /100 rev	US gal /100 rev	mm	inch	bar	psi	rev /min
32	0.03	0.66	0.79	25	1	25	362	1000
33	0.05	1.10	1.32	40	1.5	25	362	1000
34	0.12	2.64	3.17	50	2	16	232	1000
42	0.23	5.06	6.08	50	2	20	290	750
43	0.29	6.38	7.66	50	2	13	188	750
52	0.37	8.14	9.78	50	2	37	536	750
53	0.58	12.8	15.3	65	2.5	25	362	750
54	0.96	21.1	25.4	80	3	16	232	750
62	1.44	31.7	38.0	80	3	37	537	600
63	1.98	43.6	52.3	100	4	25	362	600
72	1.92	42.2	50.8	100	4	40	580	600
73	2.86	62.7	75.3	150	6	25	362	600
74	4.14	91.5	110	150	6	16	232	600

NOTE

Maximum pump differential pressure may be limited based on the connection type used as below:

- DIN11851 – 40 bar / 580 psi (25-40 mm), 25 bar / 362 psi (50-100 mm), 16 bar / 232 psi (150 mm)
- ISO (IDF) – 16 bar / 232 psi (1 in.-2 in), 10 bar / 145 psi (2.5 in.-4 in.), providing provision for support ring is to be made
- SMS – 10 bar / 145 psi (all sizes)
- RJT – 10 bar / 145 psi (all sizes)
- Tri-clamp (BS4825) – Pressure rating is dictated by the clamp band used (Refer to clamp band supplier)
- DIN11864-1 – 40 bar / 580 psi (25-40 mm), 25 bar / 362 psi (50-100 mm)
- DIN11864-2 – 25 bar / 362 psi (25-40 mm), 16 bar / 232 psi (50-100 mm)
- For size 150 mm on DuraCirc 73 and 74 pumps, only DIN11851, SRJT or Tri-clamp connections are available.

For units covered under EHEDG certification only the follwoing process connection type and gasket (supplied by others) combinations are EHEDG approved:

- DIN11851 with ASEPTO-STAR k-flex or SKS EHEDG gasket system
- Triclamp (BS4825 part 3) with Combifit T-Ring Gasket
- DIN11864-1
- DIN11864-2

6.7 Seal Operating Limits

Seal Type	Maximum Speed	Maximum Process Pressure	
	rpm	bar	psi
Mechanical Seal (Sic/Carbon)	Max. Pump Speed	15	218
Mechanical Seal (Sic/Sic)	Max. Pump Speed	Max. Pump Pressure	
O-ring Seal	300	7	102

Maximum Flush Pressures	
Mechanical Seal – Single Flush	0.5 bar / 7 psi
Mechanical Seal – Double (Sic/Carbon)	1 bar above pump discharge upto 16 bar / 232 psi
Mechanical Seal – Double (Sic/Sic)	1 bar above pump discharge upto 20 bar / 290 psi
O-ring Seal – Flushed	0.5 bar / 7 psi

6.8 Pumphead Clearance Information

6.8.1 Rotor Identification

The Duracirc pump range is available with different rotor types (depending on ordered specification and region availability):

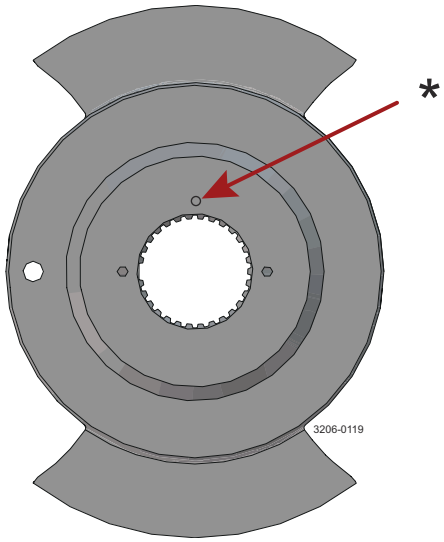
- Hi-Flow rotor
- Hi-Life rotor

It is important to correctly identify the rotor type when checking the rotor clearance.

To assist in identifying the rotor type, the Hi-Life rotors have a dimple on the front face (as shown in the below diagram).

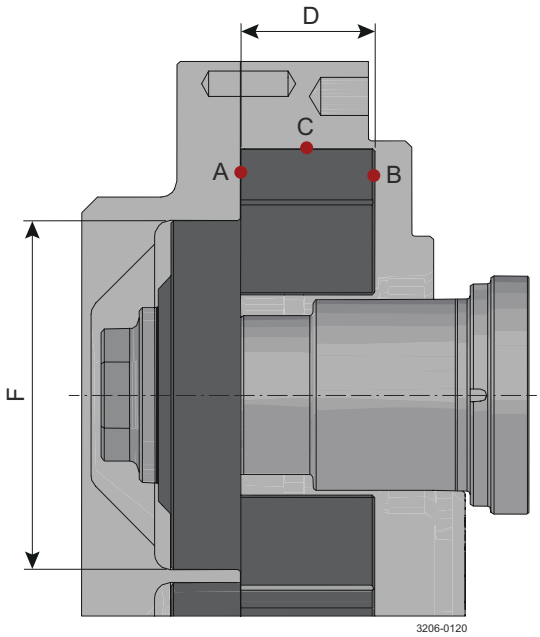
Hi-flow rotors do not have a dimple on the front face.

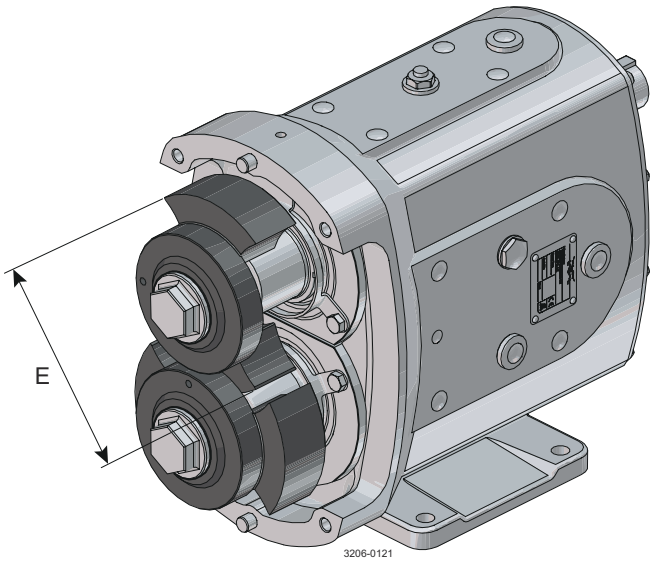
(*) = Hi-Life



6.8.2 Clearance Data – Hi-Flow Rotors

Models 32–52

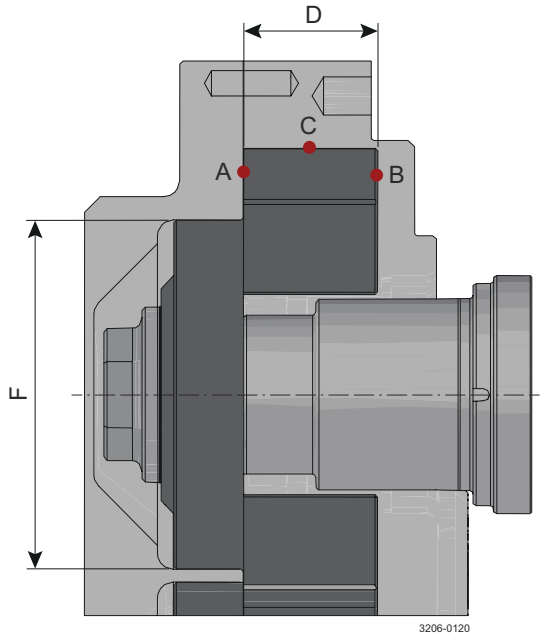


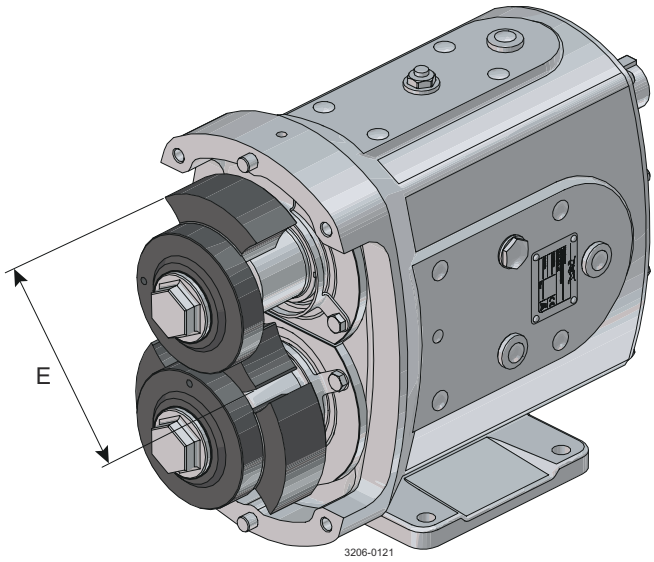


All measurements in mm

Model	A Front Clearance	B Back Clearance	C Radial Clearance	D Rotor Length	E Rotor Diameter	F Hub Diameter
32	0.07	0.06	0.06	8.92	85.91	65.92
	(min)	0.08	(min)	8.95	85.94	65.95
33	0.04	0.04	0.04	15.97	85.95	65.98
	(min)	0.06	(min)	16.00	85.98	66.01
34	0.06	0.04	0.05	32.95	85.93	65.95
	(min)	0.06	(min)	32.98	85.96	65.98
42	0.04	0.04	0.06	31.07	117.81	85.43
	(min)	0.06	(min)	31.10	117.84	85.46
43	0.05	0.04	0.07	40.06	117.79	85.41
	(min)	0.06	(min)	40.09	117.82	85.44
52	0.08	0.08	0.08	26.97	154.71	109.83
	(min)	0.10	(min)	27.00	154.74	109.86

Models 53–74



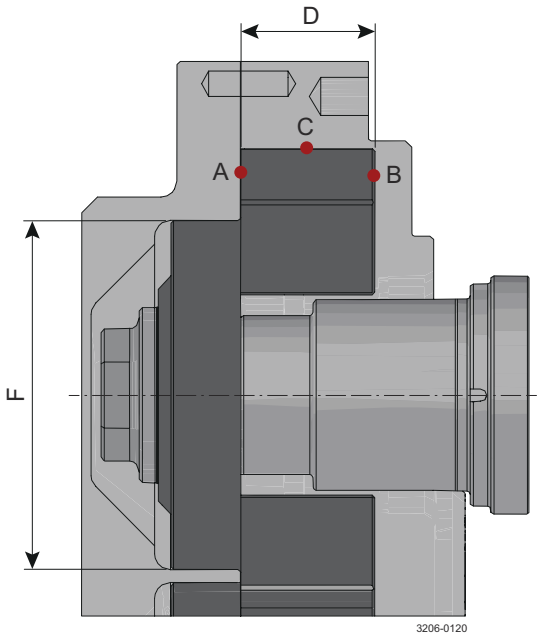


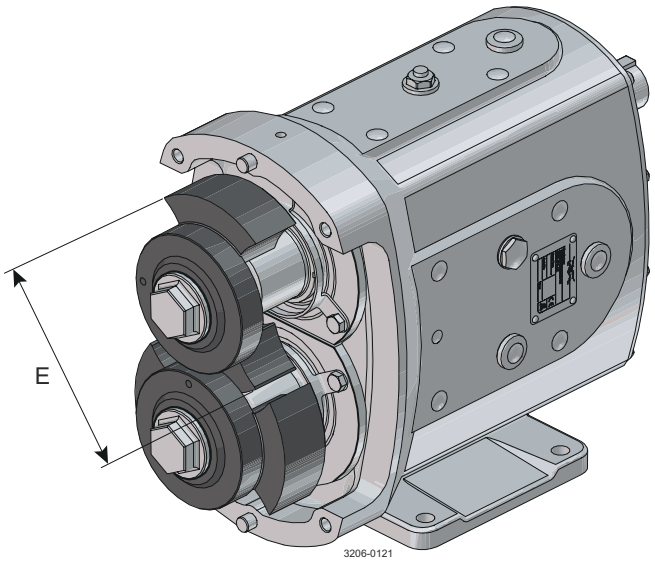
All measurements in mm

Model	A Front Clearance	B Back Clearance	C Radial Clearance	D Rotor Length	E Rotor Diameter	F Hub Diameter
53	0.10	0.08	0.09	42.67	154.69	109.81
	(min)	0.10	(min)	42.70	154.72	109.84
54	0.09	0.08	0.13	68.98	154.67	109.79
	(min)	0.10	(min)	69.01	154.70	109.82
62	0.15	0.13	0.15	54.87	207.60	145.68
	(min)	0.15	(min)	54.90	207.63	145.71
63	0.15	0.13	0.15	74.87	207.60	145.72
	(min)	0.15	(min)	74.90	207.63	145.75
72	0.15	0.12	0.12	50.88	247.63	173.76
	(min)	0.14	(min)	50.91	247.66	173.79
73	0.17	0.12	0.14	75.86	247.59	173.72
	(min)	0.14	(min)	75.89	247.62	173.75
74	0.17	0.18	0.20	109.80	247.45	173.60
	(min)	0.20	(min)	109.83	247.50	173.63

6.8.3 Clearance Data – Hi-Life Rotors

Models 32–52

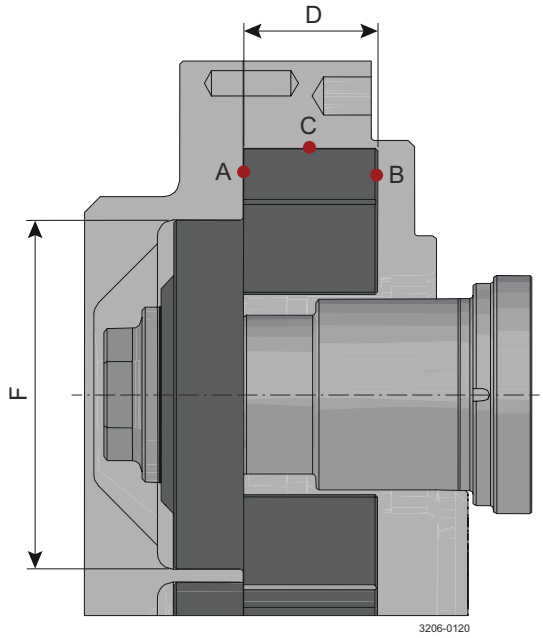


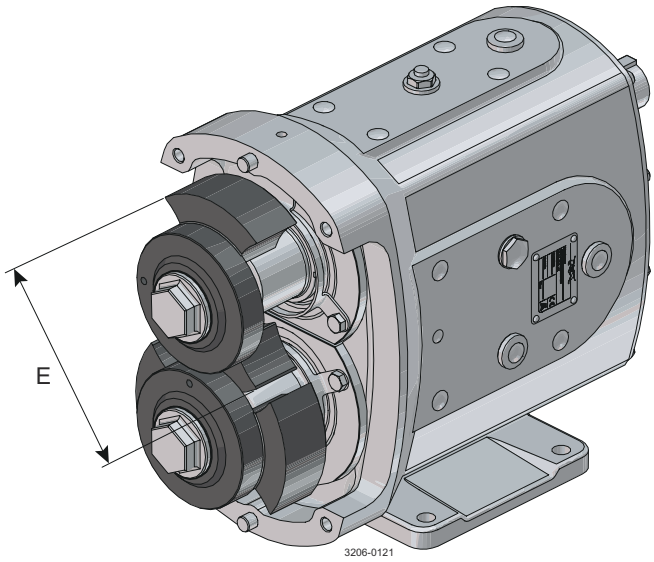


All measurements in mm

Model	A Front Clearance	B Back Clearance	C Radial Clearance	D Rotor Length	E Rotor Diameter	F Hub Diameter
32	0.07	0.06	0.06	8.92	85.91	65.92
	(min)	0.08	(min)	8.95	85.94	65.95
33	0.06	0.05	0.08	15.93	85.84	65.85
	(min)	0.07	(min)	15.96	85.87	65.88
34	0.06	0.05	0.08	32.92	85.82	65.85
	(min)	0.07	(min)	32.95	85.85	65.88
42	0.05	0.07	0.08	31.01	117.71	85.28
	(min)	0.09	(min)	31.04	117.74	85.31
43	0.05	0.05	0.12	40.03	117.62	85.25
	(min)	0.07	(min)	40.06	117.65	85.28
52	0.12	0.12	0.12	26.86	154.60	109.65
	(min)	0.14	(min)	26.89	154.63	109.68

Models 53–74





All measurements in mm

Model	A Front Clearance	B Back Clearance	C Radial Clearance	D Rotor Length	E Rotor Diameter	F Hub Diameter
53	0.11	0.10	0.12	42.12	154.60	109.73
	(min)	0.12	(min)	42.15	154.63	109.76
54	0.10	0.10	0.25	68.93	154.34	109.47
	(min)	0.12	(min)	68.96	154.37	109.50
62	0.14	0.17	0.20	54.82	207.33	145.21
	(min)	0.19	(min)	54.85	207.36	145.24
63	0.15	0.22	0.26	74.76	207.23	145.04
	(min)	0.24	(min)	74.79	207.26	145.07
72	0.12	0.20	0.20	50.81	247.33	173.37
	(min)	0.22	(min)	50.84	247.36	173.40
73	0.17	0.16	0.23	75.80	247.27	172.75
	(min)	0.18	(min)	75.83	247.30	172.78
74	0.20	0.20	0.32	109.73	247.07	173.15
	(min)	0.22	(min)	109.76	247.12	173.18

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7 Spare Parts

For every delivered Alfa Laval Product, a spare part list is available.

This spare part list contains a range of the most common wear parts for the machinery. If any component not mentioned is required, please contact your local Alfa Laval representative for availability.

You can find our spare part catalogue at *https://hygienicfluidhandling-catalogue.alfalaval.com*.

Always use Alfa Laval genuine spare parts. The warranty of Alfa Laval products is dependent on use of Alfa Laval genuine spare parts.

7.1 Ordering Spare Parts

When ordering spare parts, please always state:

1. Serial number (if available)
2. Item number/spare part number (if available)
3. Capacity or other relevant identification

7.2 Alfa Laval Service

Alfa Laval is represented in all larger countries of the world.

Do not hesitate to contact your local Alfa Laval representative, with any questions or requirement of spare parts for Alfa Laval equipment.

7.3 Warranty - Definition

WARNING

The rules of Intended use are absolute. Use of the supplied Alfa Laval product is allowed only when in compliance with the technical data supplied with the Intended use.

Differing utilisation, other than agreed with Alfa Laval Kolding A/S, exclude any liability and warranty.

No modification or alteration of the supplied Alfa Laval product is allowed, unless explicit permission is granted by Alfa Laval Kolding A/S.

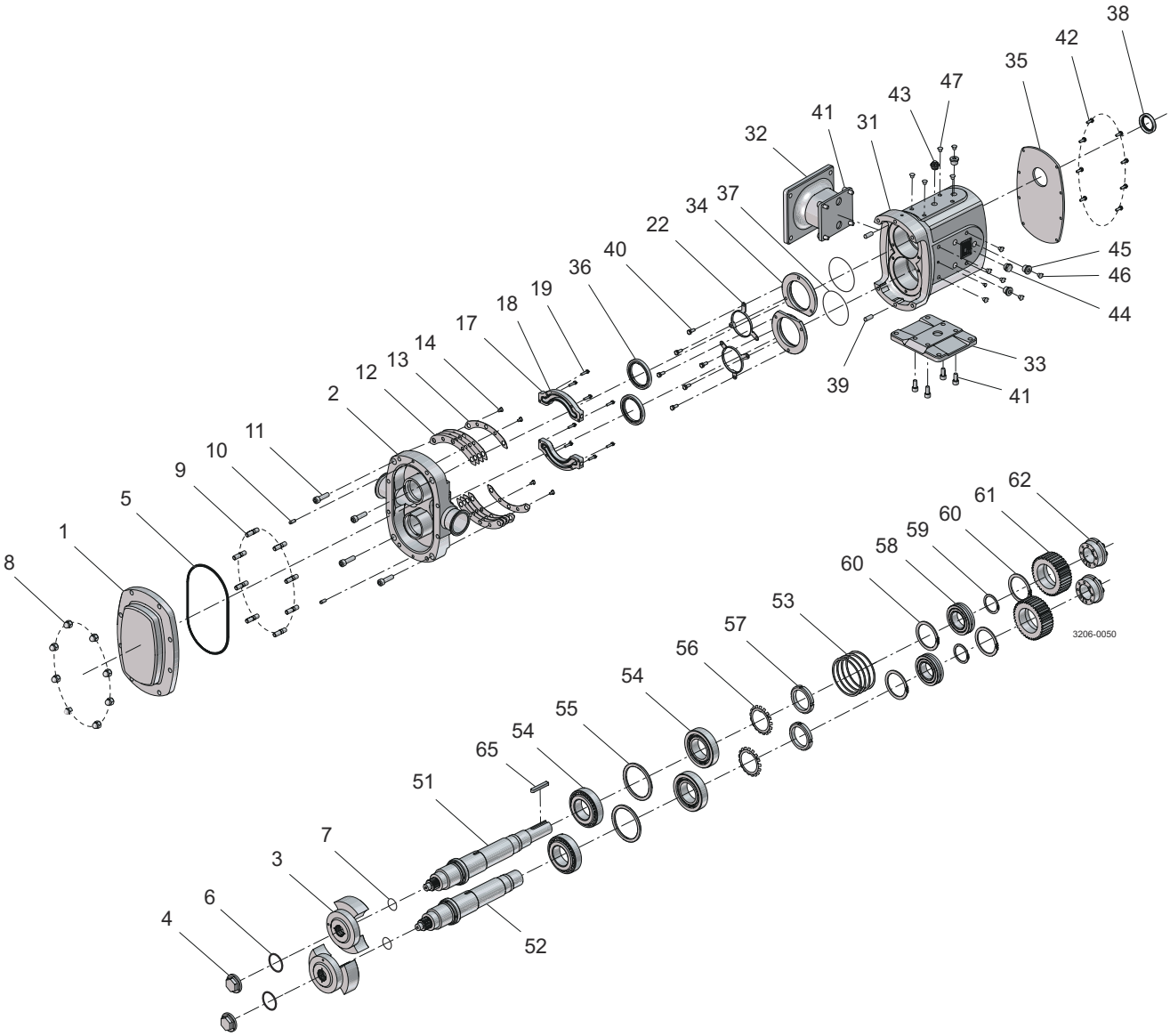
Liability and warranty are excluded:

- If advice and instruction of operating instructions are ignored
- For incorrect operation or for insufficient maintenance of the supplied Alfa Laval product
- For any kind of change of function of the supplied Alfa Laval product without prior written agreement by Alfa Laval Kolding A/S
- If supplied Alfa Laval product is modified by non-authorised persons
- If using the supplied Alfa Laval product without attention of appropriate safety regulations, (see *Safety* on page 7)
- If protection equipment is not used and vessel process / ancillary equipment is not brought to a standstill
- If the supplied Alfa Laval product and ancillary parts are not properly maintained (to be executed in intervals and including fitting of prescribed replacement parts)

When exchanging parts, only original replacement parts, released from the manufacturer, must be used.

8 Parts Lists and Exploded Views

8.1 DuraCirc



Pos.	Qty.	Denomination
1	1	Cover, Rotorcase
2	1	Rotorcase
3	2	Rotor
4	2	Nut, Rotor
5	1	P-ring, Cover
6	2	P-ring, Roter nut
7	2	O-ring, Rotor shaft
8	8	Nut, Dome
9	8	Stud, Rotorcase
10	2	Dowel, Rotorcase
11	4	Screw, Rotorcase
12	2	Shim, Rotorcase
13	2	Retainer, Shim
14	4	Screw, Shim retainer
17	2	Heating jackets
18	2	O-ring, Heating jacket
19	8	Screw, Heating jacket
22	2	Guard, gland
31	1	Gearcase
32	1	Foot, Vertical port
33	1	Foot, Horizontal port
34	2	Retainer, Seal
35	1	Cover, Gearcase
36	2	Lip seal, Gland end

Pos.	Qty.	Denomination
37	2	O-ring, Seal retainer
38	1	Lip seal, Drive end
39	2	Dowel, Gearcase
40	2	Screw, Seal ratainer
41	1	Screw, Foot
42	2	Screw, Gearcase cover
43	6	Plug, Breather
44	4	Sight glass
45	8	Plug, Gearcase
46	1	Plug, Blanking
47	2	Plug, Blanking
51	1	Shaft, Drive
52	1	Shaft, Auxillary
53	1	Shim, Gearbox
54	4	Bearing, Front
55	2	Spacer, Bearing
56	2	Washer, tab lock
57	2	Nut, Shaft
58	2	Bearing, Rear
59	2	Circlip, Shaft
60	4	Circlip, Bearing *(DuraCirc 32 to 43 Only)
61	2	Timing Gear
62	2	Torque Locking Assembly (TLA)
65	1	Key, Drive

9 Addendum - DuraCirc Aseptic Pump Model

9.1 General Information

This Addendum contains additional information relating to the DuraCirc Aseptic pump models only and is in supplement to the full Installation and Operating instructions which should be referred to in parallel, see *Installation* on page 88 and *Maintenance* on page 90.

The DuraCirc Aseptic pump model takes all the benefits of the DuraCirc pump range but provides the ability to use an aseptic barrier to areas of the pump with a pumped media to atmosphere interface (front cover, connection ports and mechanical seal).

To allow the use of an aseptic barrier additional channels are provided in the rotor case O-ring area and connection ports through which either steam or a sterile flush media can be passed reducing the risk of any contamination of the pumped product from the atmosphere.

9.2 General Safety Information

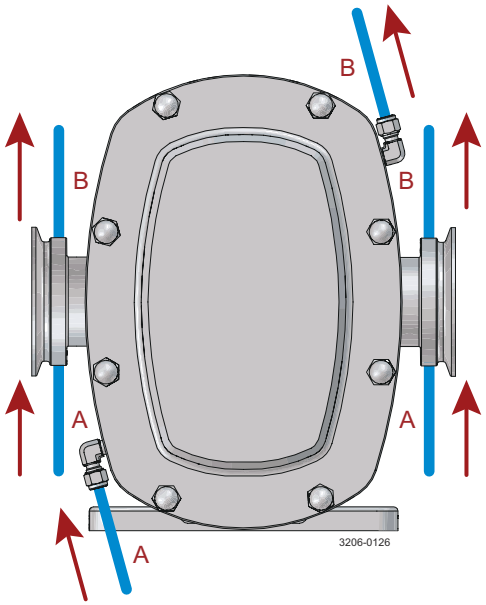
Before undertaking any installation, commissioning, maintainance or removal operations ensure to fully read and understand section *Safety* on page 7.

9.3 Installation

9.3.1 Aseptic Barrier Flush arrangement and pre-start up checks

1 It is important that:

- The barrier flush is correctly connected to both connection ports and the rotorcase (see diagram).
- A compatible barrier fluid is used and supplied at the correct pressure and temperature (see Flush Pressure and Temperature Limits section below)
- The barrier flush is turned on before starting the pump to ensure a fully established aseptic barrier before pumping of product.
- A Flush inlet
- B Flush outlet



2 **Connecting the flush.** The following equipment is strongly recommended when using a flushing system:

- Control valve and pressure gauge, to enable the correct flushing pressure to be obtained and monitored.
- Isolation valve and check valve, so that the flush can be turned off, and to stop any unwanted substances flowing in the wrong direction.
- A method of visibly indicating flushing fluid flow.

Flush Connection Size (Female)

Model	Size BSP(G) / NPT w/Adapter
42	1/8"
53/54	1/8"
63	1/8"
73	1/8"

3 **Barrier flush fluid.** The choice of barrier fluid is dependent upon the fluid being pumped. Usually, to ensure an aseptic barrier, wet steam is used.

4 **Barrier Flush Pressure & Temperature Limits:**

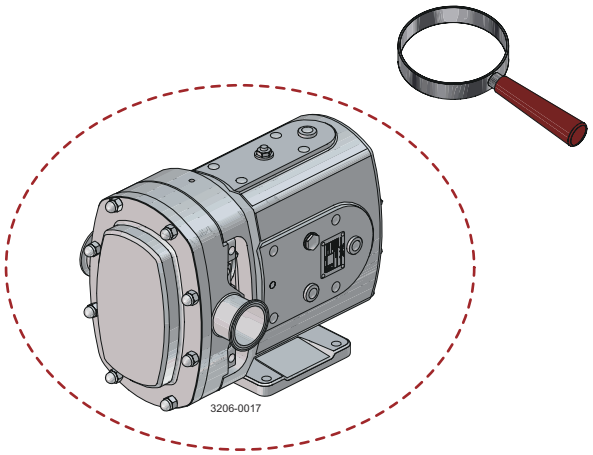
Front Cover and Connections

Maximum Pressure:	4 barg
Maximum Temperature:	135ºC
Recommend barrier fluid:	Wet Steam

5 **Pre-start up checks**

In addition to the checks stated in the Installation and Operation manual:

- Check barrier flush connections are fitted correctly and are tight.
- Check the connection gaskets are correctly seated during installation.
- Slowly start the barrier flush and check for leaks.
- Check for barrier flush flow through all connections.



9.4 Maintenance

9.4.1 Dismantling

The instructions below only refer to those that are different to those shown in *Dismantling* on page 35.

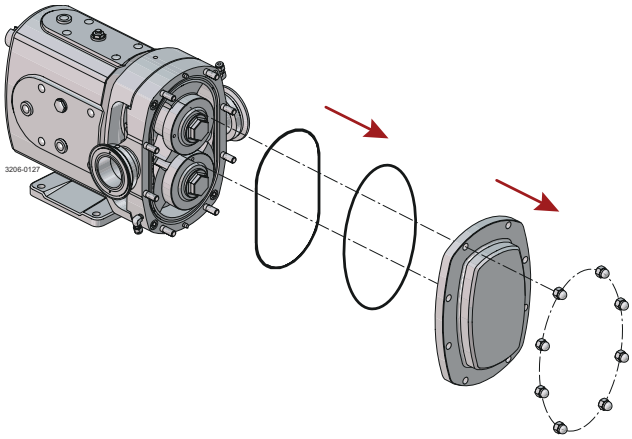
Before dismantling the pump refer to safety precautions, see *Safety Precautions* on page 10

Refer to the exploded diagram and parts list in *Parts Lists and Exploded Views* on page 85.

> **NOTE**
>
> It is recommended to mark the positions of the rotors and rotorcase (e.g. Top/Bottom or Left/Right) prior to removal to ensure parts are refitted in the same position.

1 Removing rotorcase cover

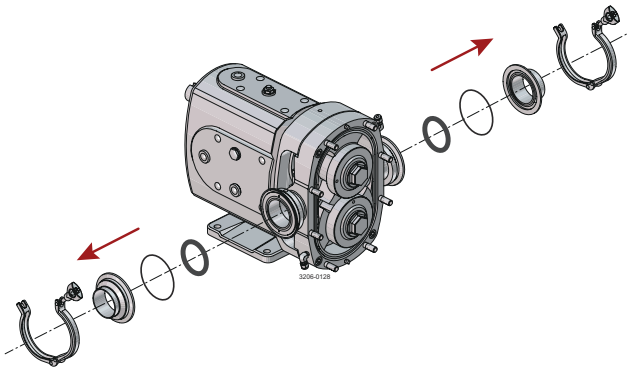
1. Remove rotorcase cover nuts (8) and cover (1).
2. Remove front cover P-ring (5).
3. Remove front cover outer O-ring (131).



> **NOTE**
>
> ***) Pump models 63 and 73 are supplied with a M6 tapped hole in the front cover for use with a lifting eye (not supplied) to aid lifting**

2 Remove clamp and connection gaskets

1. Remove the connection clamps (134)
2. Separate the pipe connection (135) from the pump connection.
3. Remove both the inner Triclamp type gasket (132) and outer O-ring (133). It is recommended to replace these parts during re-assembly.
4. Inspect the barrier flush holes and connections for debris and clean if necessary.

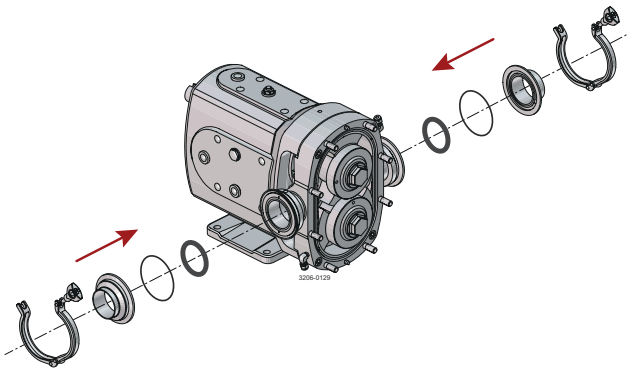


9.4.2 Assembly

NOTE: Ensure all screws and nuts are torqued to the values stated in *Technical Data* on page 71 of the instruction manual.

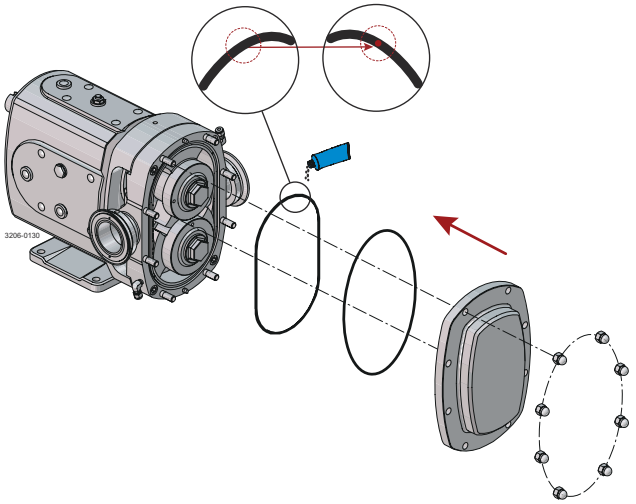
1 Fitting connection gaskets and clamps

1. Ensure the elastomer grooves are clean and free from any damage or debris.
2. Lubricate and fit new O-ring (133) to outer groove of the ports on the rotorcase (2).
3. Lubricate and fit new Triclamp gasket (132) to the inner groove of the ports on the rotorcase.
4. Replace the pipe connections (135) to the pump port connections ensuring the port elastomers remain in the correct position.
5. Replace clamps (134) and tighten.



2 Fitting rotorcase cover

1. Ensure the elastomer grooves are clean and free from any damage or debris.
2. Lubricate and fit new O-ring (131) to outer groove of the rotorcase (2).
3. Lubricate and fit new P-ring elastomer (11) (Red ID mark) to the rotorcase (2) ensuring the coloured mark is towards the rotorcase and fully seated in the groove.
4. Fit rotorcase cover (1) on to rotorcase, ensuring both elastomers remain in postion, and tighten rotorcase cover nuts (8).
5. Refer to pump start up checks prior to operation.



9.5 Technical Data

> **NOTE**
>
> Technical data must be observed during installation, operation and maintenance.
>
> All personnel should be informed about the technical data.

9.5.1 Pump Data Table

Pump Model	Displacement			Port Size*		Max. Working Pressure		Max. Speed
	litres/rev	Imp gal/ 100 rev	US gal/ 100 rev	mm	inch	bar	psi	rev/min
42	0.23	5.06	6.08	50	2	20	290	750
53	0.58	12.76	15.32	65	2.5	25	363	750
54	0.96	21.12	25.36	80	3	16	232	750
63	1.98	43.55	52.31	100	4	20	290	600
73	2.85	62.69	75.30	150	6	20	290	600

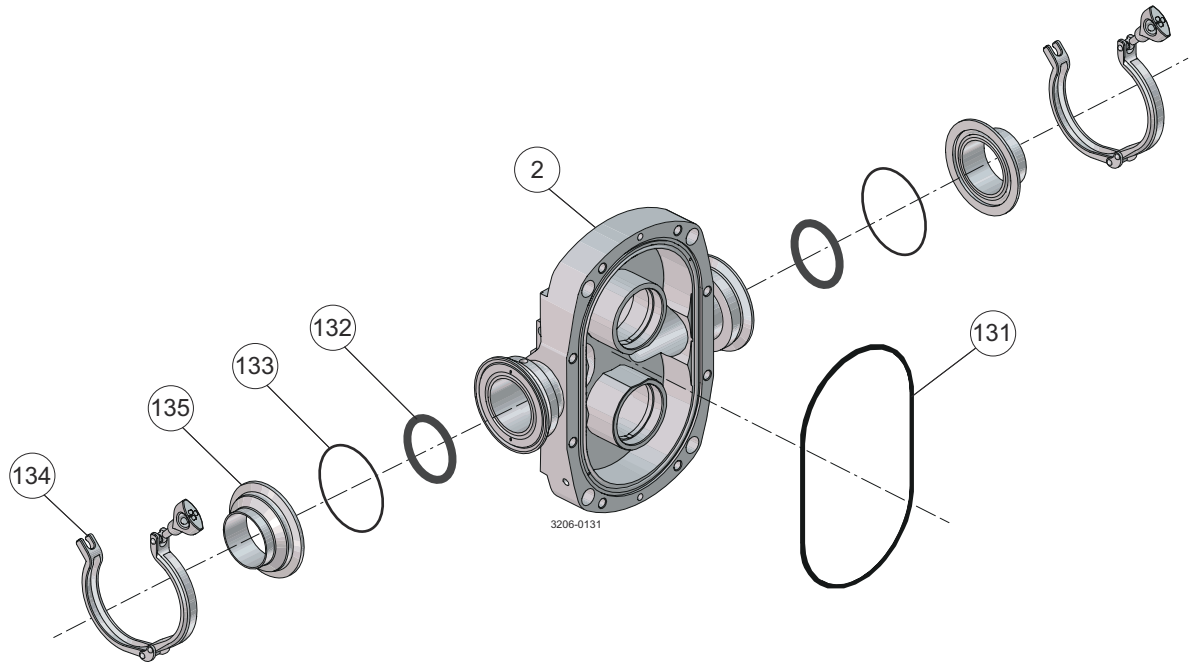
NOTE

Pump connections are a propitiatory Triclamp type design which includes the barrier flush. Counter connections, clamps and elastomers are supplied with the pump to allow connection to end user pipework. Counter connections are supplied suitable for ISO2037 pipe to the size shown above.

Tightening Torque - Clamp: 2.8 Nm / 2.1 ft.lbs

9.6 Parts Lists and Exploded Views

9.6.1 DuraCirc Aseptic Pump Range



Pos.	Qty.	Denomination
2	1	Rotorcase
131	1	O-Ring, Rotorcase
132	2	Seal Ring
133	2	O-Ring, Clamp
134	2	Clamp
135	2	Counter Connection