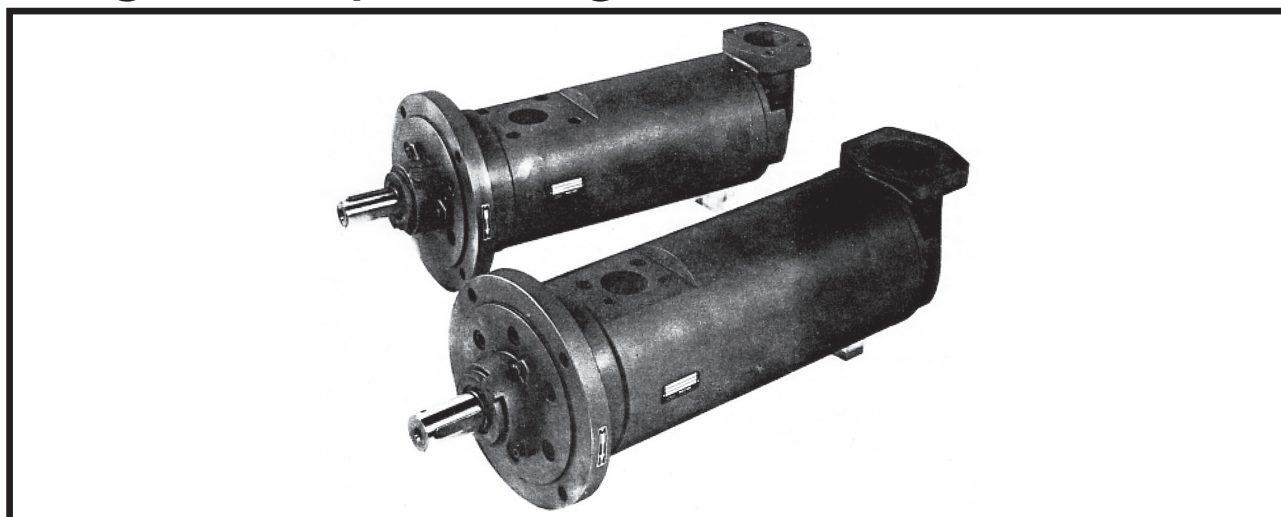


Original Operating Manual



Contents	Page
Introduction	2
Safety	2
Pump identification	5
Installation	6
Start-up	11
Trouble shooting	13
Maintenance and Service	16
List of components	16
Exploded View	17
Ordering code/Service intervals	18
Sectional view	19
Shaft seal-assembly drawing	20
Internal ball bearing – Dismantling	21
Internal ball bearing – Reassembly	23
External ball bearing – Dismantling	26
External ball bearing – Reassembly	27
Replacing gasket 556	29



Before commencing any work, read this instruction carefully! Failure to comply with these instructions may cause damage and personal injury!

Introduction

Other applicable documents

Document	Purpose
ATEX additional instructions	Operation in explosion-hazard areas
Order data sheet	Technical specifications, conditions of operation
Technical description	Technical specifications, operating limits
Supplier documentation	Technical documentation for parts supplied by subcontractors, e.g. drive system, coupling or auxiliary operating system.
Spare parts list	Ordering spare parts
Declaration of conformity	Conformity with standards, Content of the declaration of conformity

Safety

ATTENTION

The manufacturer accepts no liability for damages caused by disregarding any of the documentation.

Intended use

- Only use the pump to pump the agreed pumped liquids (→ order data sheet).
- Adhere to the operating limits.
- Avoid dry running:
 - Make sure the pump is only operated with, and never without, pumped liquid.
- Avoid cavitation:
 - Open the pressure-side fitting completely.
- Avoid damage to the motor:
 - Do not switch on the motor more than the maximum permissible number of times per hour (→ manufacturer's specifications).
- Consult the manufacturer about any other use of the pump.
- Pumps delivered without a motor must be assembled into a pump unit according to the provisions of EC Machine Directive 2006/42/EC.

Prevention of obvious misuse (examples)

- Note the operating limits of the pump with regard to temperature, pressure, viscosity, flow rate and motor speed (→ order data sheet).
- When using auxiliary systems, ensure there is a continuous supply of the appropriate operating medium.
- Do not operate the pump while the pressure-side fitting is closed.
- Only select the setup type according to this operating manual. For example, the following are not allowed:
 - Hanging pumps in the pipe
 - Overhead installation
 - Installation in the immediate vicinity of extreme heat or cold sources

General safety instructions

ATTENTION

Observe the following regulations before carrying out any work.

Product safety

The pump has been constructed according to the latest technology and recognized technical safety rules. Nevertheless, operation of the pump can still put the life and health of the user or third parties at risk or damage the pump or other property.

- Only operate the pump if it is in perfect technical condition and only use it as intended, remaining aware of safety and risks, and adhere to the instructions in this manual.

- Keep this manual and all other applicable documents complete, legible and accessible to personnel at all times.
- Refrain from any procedures and actions that would pose a risk to personnel or third parties.
- In the event of any safety-relevant malfunctions, shut down the pump immediately and have the malfunction corrected by the personnel responsible.
- In addition to the entire documentation for the product, comply with statutory or other safety and accident-prevention regulations and the applicable standards and guidelines in the country where the system is operated.

Obligations of the operating company

Safety-conscious operation

- Ensure that the following safety aspects are observed and monitored:
 - Intended use
 - Statutory or other safety and accident-prevention regulations
 - Safety regulations governing the handling of hazardous substances
 - Applicable standards and guidelines in the country where the pump is operated
- Make personal protective equipment available.

Qualified personnel

- Make sure all personnel tasked with work on the pump have read and understood this manual and all other applicable documents, especially the safety, maintenance and repair information, before they start any work.
- Organize responsibilities, areas of competence and the supervision of personnel.
- Ensure that all work is carried out by specialist technicians only:
 - Fitting, repair and maintenance work
 - Work on the electrical system
- Make sure that trainee personnel only work on the pump under the supervision of specialist technicians.

Safety equipment

- Provide the following safety equipment and verify its functionality:
 - For hot, cold and moving parts: on-site safety guards for the pump
 - For possible electrostatic charges: provide the necessary grounding
 - If there is no pressure relief valve in the pump: Provide an appropriate safety valve on the pressure side between the pump and the first shut-off device

Warranty

- Obtain the manufacturer's approval prior to carrying out any modifications, repairs or alterations during the warranty period.
- Only use genuine parts or parts that have been approved by the manufacturer.

Drive system

For pumps delivered without a drive system, comply with the following requirements for the drive system:

- When using three-phase asynchronous motors, observe IEC 60034-30-1.
- Power of the drive according to EN ISO 5199 is recommended (EN ISO 5199 also applicable for drives of screw pumps).
- Use elastic coupling according to DIN 740-2.
- Use coupling guard with the following requirements:
 - Fastening elements must be connected to the pump unit in undetachable design (cannot get lost).
 - Safety distances against the reaching of hazardous areas according to EN ISO 13857 must be complied with.

Obligations of the operating company

- All directions given on the pump must be followed (and kept legible), e.g. the arrow indicating the sense of rotation and the markings for fluid connections.
- Pump, coupling guard and components:
 - Do not step on them or use as a climbing aid
 - Do not use them to support boards, ramps or beams
 - Do not use them as a fixing point for winches or supports
 - Do not use them for storing paper or similar materials
 - Do not use hot pump or motor components as a heating point
 - Do not de-ice using gas burners or similar tools
- Do not remove the safety guards for hot, cold or moving parts during operation.
- Use personal protective equipment whenever necessary.
- Only carry out work on the pump while it is not running.
- Isolate the motor from its supply voltage and secure it against being switched back on again when carrying out any fitting or maintenance work.
- Reinstall the safety equipment on the pump as required by regulations after any work on the pump.

Specific hazards

Explosion-hazard area

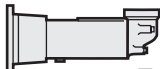
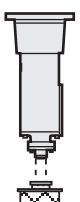
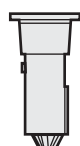
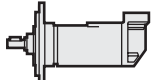


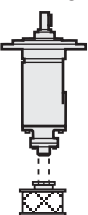

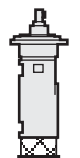
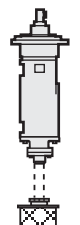

- (→ ATEX additional instructions).

Hazardous pumped liquids

- Observe the safety regulations for handling hazardous substances (e.g. hot, flammable, poisonous or potentially harmful) when handling hazardous pumped liquids.
- Use personal protective equipment when carrying out any work on the pump.
- Noise level:
 - Check individual pump series noise level in respective Product Description

These instructions are valid for all medium and high pressure pumps as specified in the Pump identification chart below.

Pump identification

Pump name	Size (1)	Rotor lead (1)	Design modification (1)	Material pump casing (1)	Shaft seal design (1)	Mounting (2)	Valve/other (3)	Also valid for option	Comments
 E4 xxBE  E4 xxJE  E4 xxTE	025 032 038 045 052 060 070	K L N	1 4	L Y	E R V	B J T	E	A101 A141 A259 A260 A314 A337 G067 G101 G259 G260 G314	
 D4 xxBE  D4 xxBP  D4 xxTE  D4 xxJE	025 032 038 045 052 060 070	K L N	2	I L N*	R T V	B J T	E P	A056 A101 A117 A246 A434 G056 G101 G117 G246 G333	
 D6 xxBx  D6 xxTx  D6 xxJx  D6 xxFx	038 045 052 060 070	K N	3	S	R T V	B F J T	Y Z	A101 A309	

(1) See Product Description or Maintenance Instruction

T = For vertical tank mounting with mounted strainer

(2) B = Flange mounting
F = Foot mounting
J = For vertical tank mounting with prolonged inlet pipe

(3) E = Without valve
P = With Valve
Y = External ball bearing
Z = Internal ball bearing

Option

A101/G101

A246/G246

A337

} Pumps with CCW-rotation

* Only sizes 025-038

Identification of safety instructions

Non compliance of safety instructions identified by the following symbol - could affect safety for persons.



Safety instructions where electrical safety is involved, are identified by:



Safety instructions which shall be considered for reasons of safe operation of the pump or pump unit and/or protection of the pump or pump unit itself are marked by the sign:

ATTENTION

Installation

BEFORE COMMENCING ANY WORK, READ THIS INSTRUCTION CAREFULLY!

Design limitations and technical data for each pump are found in the **Product description**.

Installation of IMO AB medium and high pressure pumps does not require special skills. However, these instructions presume that the work is carried out by experienced fitters.

Maintenance and service instructions, which are specific for each pump are presented after the installation instructions.



Failure to comply with these instructions may cause damage and personal injury!

Transport and storage

The pump shall always be protected against ingress of water and other impurities. The pump shall always be stored in a clean, dry and warm environment. The pump is delivered with the internals oiled and with protective covers. These covers should remain in place for as long as possible during the mounting and installation procedure but must be removed before start up.

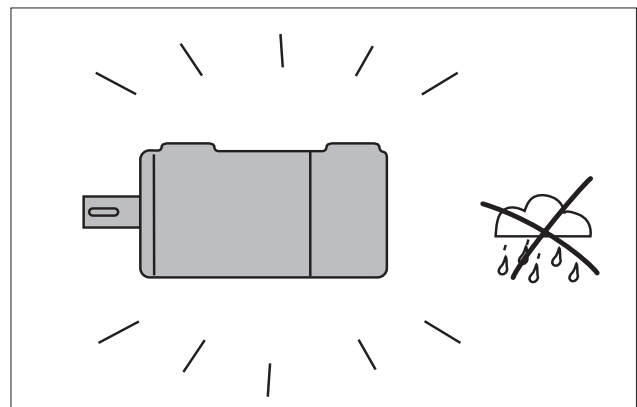


Fig. 1 Clean and dry environment



All work carried out on the pump has to be performed in such a manner that risks for personal injury are observed!

Lifting of pump



All pumps should be lifted with straps securely attached to the pump or pump unit, so that the centre of gravity is located between the straps in order to avoid tipping of the pump.

Lifting of the complete pump unit with the lifting device attached to the motor, should be avoided as the motor's lifting provisions may not be able to carry the combined weight of the pump and motor.



When lifting a complete pump unit, using slings or hooks attached to the pump or connecting frame make sure that the centre of gravity is located below the points of attachment or that sufficient protection against tipping is provided otherwise.

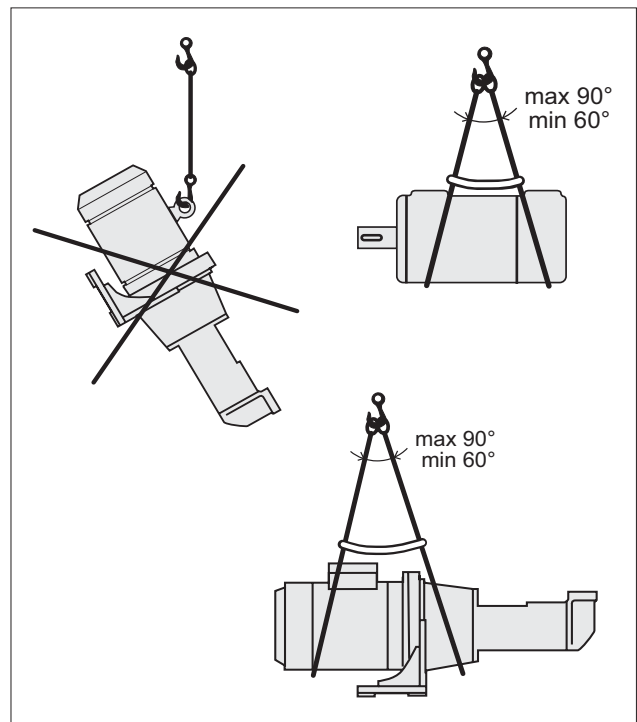


Fig. 2 Lifting of pump

Mounting

**For pumps in explosion-hazard areas
(→ ATEX additional instructions).**

The pump must be securely mounted on a firm stable foundation and positioned so that it is easily accessible for inspection and servicing. Provisions for collecting oil spillage when servicing the pump are to be installed.

ATTENTION

The installation must always be designed to minimise damage should an operational or functional failure occur.

Provisions should be installed to collect oil spillage if a functional failure results in a broken pipe or pump housing.

The pump installation should be provided with an emergency shutdown to avoid damages due to overheating or if the oil volume is below a minimum tank level.

Alignment and shaft couplings

The pump shall be connected to its driver via a flexible shaft coupling. The pump may also be driven via gears or pulleys as specified in the Product Description, provided the radial forces are kept within the specified range. We recommend that the pump is connected via our standard connecting frame and IMO AB standard coupling. The coupling and alignment shall be selected not to exert any axial or radial loads on the shaft ends. IMO AB standard couplings shall have a distance between the coupling halves as per table, fig. 4 the coupling halves shall be secured by lock screws. For other types of couplings, please refer to respective maker's instructions.

For direct driven pumps the alignment between pump and motor shafts must be kept within the limits according to fig. 3 and 4.



Measures shall be provided to avoid accidental contact with the rotating shaft coupling. Any installed coupling guard shall permit easy access to the pump shaft for maintenance and inspection of the pump bearing and seal housing.



When handling liquids that may harm skin use gloves and/or protective clothing.



When handling liquids which may involve fire hazards appropriate precautions to avoid danger are to be taken.

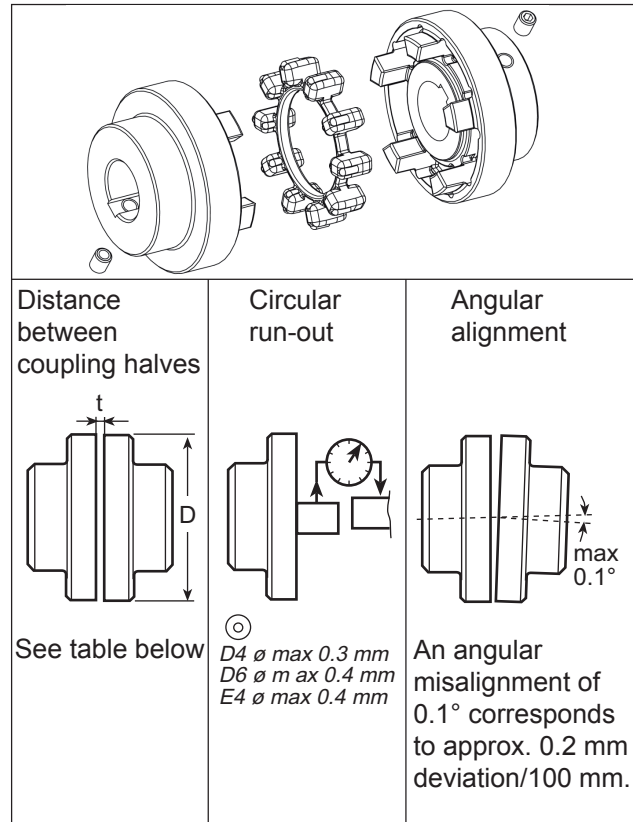


Fig. 3 Alignment of the IMO AB standard coupling

Outer diameter of coupling (D mm)	Distance between coupling halves (t mm)	Outer diameter of coupling (D mm)	Distance between coupling halves (t mm)
69	3	129	5
78	4	140	5
87	4	158	5
96	4	182	5
106	5		
118	5		

Fig. 4 Distance between coupling halves (IMO AB standard coupling)



In case of failure for a system with elevating pressure fluid jets may cause injury and/or damage.

Pipe connections

The pipe work should be installed and supported so as not to exceed any permitted loads and transfer to the pump casing.

The pipe work should be tight in order to avoid leakage and ingress of foreign particles and/or air.

Shut off valves should be installed in the discharge line and when appropriate in the suction line (not tank mounted version), so that the pump can be hydraulically isolated.

Welding of counter flanges must be performed in such a way that no weld slag etc. can enter into the pump. Pumps delivered with counter flanges from IMO AB have a protection plate which shall be removed after that welding is completed.

Suction line

The suction line should be designed so that the total pressure drop, measured at the pump inlet flange, does not exceed the suction capability of the pump. Make a proper calculation of the suction line including components such as valves, strainer, pipe bends etc.

Generally, the pressure drop in the suction line should be as low as possible, which is achieved if the suction pipe is short, straight and has a suitable diameter.

The velocity in the suction line should be kept in the range 0.5 - 1.2 m/s.

The suction line must be equipped with a port that allows filling the pump before start.

Discharge line

The discharge line should be dimensioned to keep the velocity in the range 1 - 3 m/s.

De-aeration

In installations with negative suction head, where the pump might be started against a pressurized system, a de-aeration pipe with a suitable dimensioned orifice has to be installed, see fig. 7. The de-aeration pipe should be connected to the highest point of the outlet pipe.

This must also be installed when the pump is used as an stand-by pump.

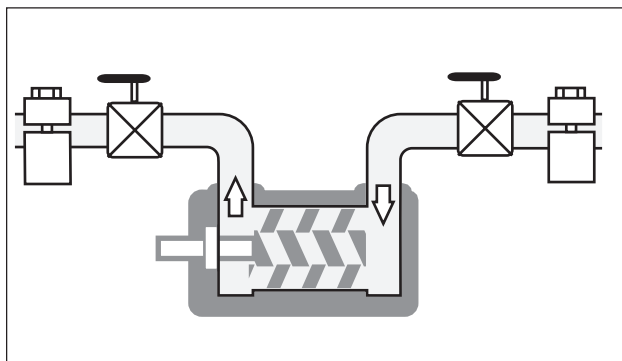


Fig. 5 Pipe connections

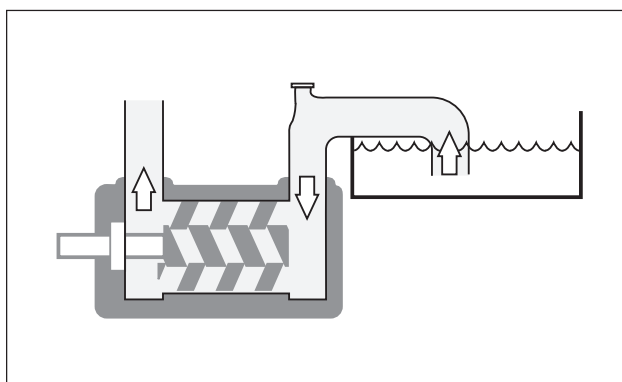


Fig. 6 Suction line

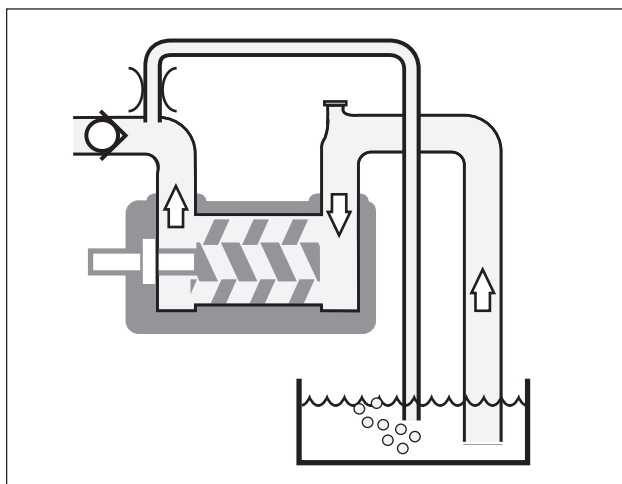


Fig. 7 De-aeration

Cleanliness

The pump has to be protected from foreign matter, such as weld slag, pipe scale, etc., that could enter the pump via the suction line. If the cleanliness of the system cannot be guaranteed, a strainer must be installed in the inlet pipe near the pump.

The size of the strainer should be selected so that it is large enough to allow adequate pressure at the pump inlet. The pressure drop across the strainer should preferably not exceed 0.1 bar at max. flow rate and operating viscosity. A vacuum gauge between the strainer and the pump inlet is recommended to indicate when the strainer needs cleaning. Some pumps are equipped with inlet strainers in standard design, mesh size 0.5 mm. For other pumps, strainers with the same mesh size are recommended.

To further extend the service life of the pump improved cleanliness is recommended.

For hydraulic oils a cleanliness of at least 19/16 according to ISO 4406 at pressure > 16 bar and at least 20/16 at lower pressure is recommended.

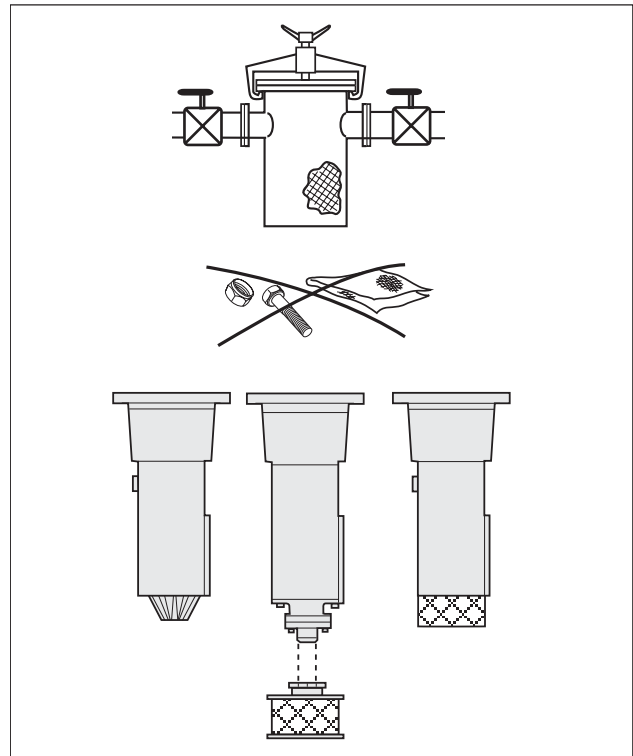


Fig. 8 Cleanliness

Liquid trap

In some mounting arrangements (xxBx and xxFx) the pump may not retain the liquid at stand still. In such installations the suction pipe should be arranged so it forms a liquid trap together with the pump. See fig. 9.

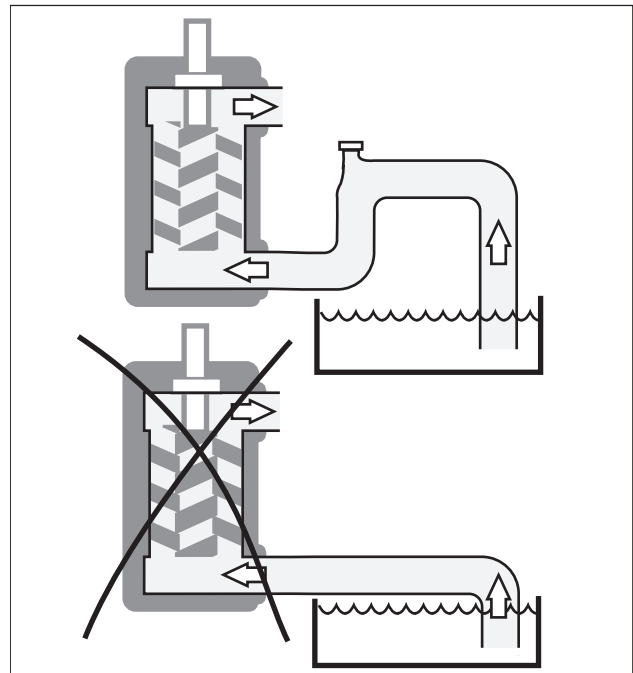


Fig. 9 Liquid trap

Safety valve

Pumps not equipped with an internal valve require a separate relief valve connected to the delivery pipe to limit fluid pressure. Locate the pressure relief valve as close to the pump outlet port as possible, preferably upstream of a check valve, where so equipped. The return line from the valve should be run back to a suitable position in the tank to limit the temperature rise in the pump when overflow takes place.

Set the valve opening pressure as low as corresponding to satisfactory system performance. Do not choose an opening pressure in excess of the maximum operating pressure of the pump.

The D4 xxBP pump is supplied from IMO AB with an integrated pressure relief valve designed for external overflow. The return line from the pressure relief valve should be run back to the tank to limit the temperature rise in the pump when overflow takes place.

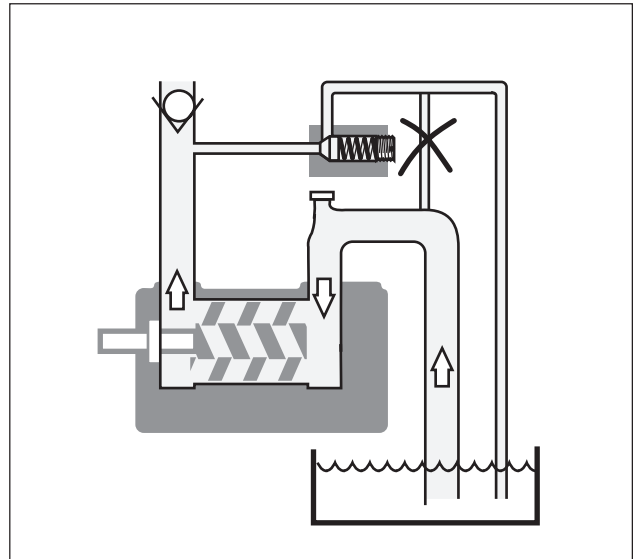


Fig. 10 External pressure relief valve

Pressure testing and flushing

The system must be flushed with the pump replaced by a dummy pipe and pressure tested before connecting the pump.

If corrosive liquid, such as water is used, the system must be thoroughly drained, dried and protected against corrosion before the pump is reinstalled as otherwise the pump might be damaged before start-up due to internal corrosion.



Oil leakage may make the floor slippery and cause personal injury.

Pressure gauge

There should be a tap point for connecting a pressure gauge to the delivery pipe to adjust and check the setting of the pressure relief valve.

Some pumps are equipped with pressure taps.

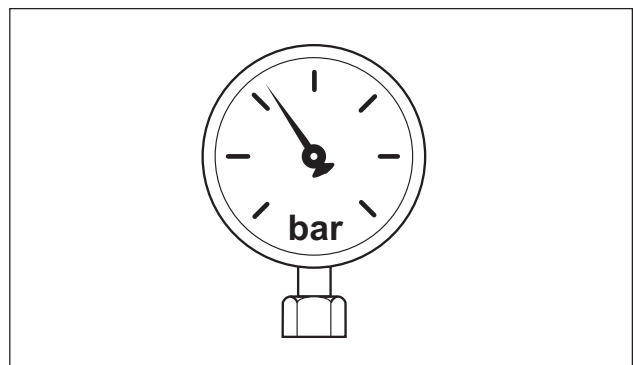



Fig. 11 Pressure gauges

Start-up


**For pumps in explosion-hazard areas
(→ ATEX additional instructions).**

Before starting

After installation or whenever it can be assumed that the pump has been emptied, the pump must be thoroughly filled with liquid. See chapter "Suction Line", page 5.

 Make sure the prime mover is disconnected and can not be started accidentally.

While filling the pump rotate the shaft by hand. If the shaft is not accessible, rotation can be performed from the motor fan, to ensure that the rotor bores and the shaft seal compartment is filled.

 Do not forget to fit the motor fan cover again before making start of motor possible.

Open the shut-off valves in the inlet and delivery pipes to the full extent. Set pump pressure relief valve at the lowest opening pressure. The pump is now ready for starting.

If the suction pipe cannot be completely filled, it is important to ensure that the trapped air is evacuated without any pressure build up. (See fig. 7 Deaeration).

ATTENTION

Starting a dry pump is likely to cause damage to the pump.

Direction of rotation

When the pump is ready to be started, switch the motor briefly on and off and check that the drive motor rotates in the correct direction as indicated by the rotation arrow.

Check the direction of rotation by watching the fan on the electric motor.

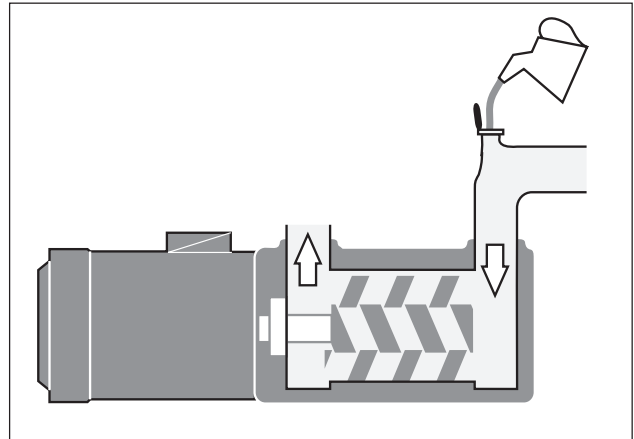


Fig. 12 Filling the pump before starting

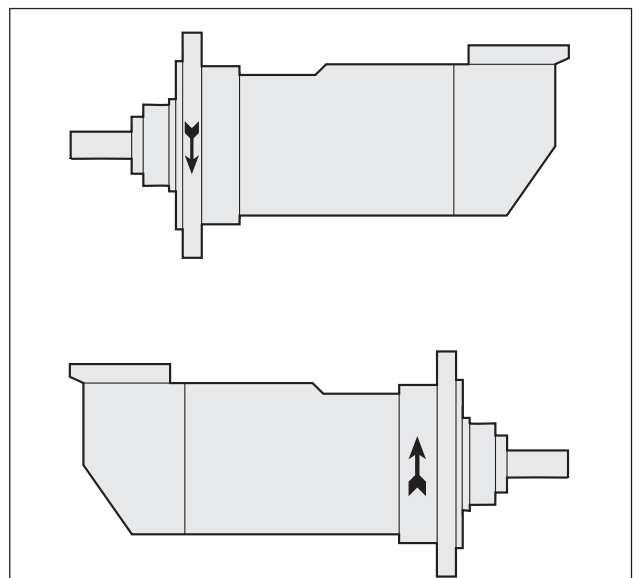


Fig. 13 Direction of rotation

Starting

Set the pumps pressure relief valve to low pressure and start the pump with the valves in the inlet and delivery pipes fully open. When the pump begins discharging fluid, "has primed", raise the pressure to 1.0-1.5 bar or slightly below the system pressure if this is lower. Allow the pump to run for a few minutes until air has been evacuated from the system and the fluid is free of bubbles, adjust the pump pressure for the rated value of the system.

If the pump fails to prime, do not run it for more than a few seconds. Repeat the start procedure a few times at intervals of a few minutes. If this proves unsuccessful, there is a fault condition in the system. See "Trouble shooting".

ATTENTION

Because of design principle the D4 pump must reach a minimum of discharge pressure (as per fig. 14) immediately after start to prevent failure.



If operating temperature exceeds 60°C, appropriate measures to avoid burn injury shall be provided.



Use hearing protections whenever high noise can be expected from pump, motor and/or environment.

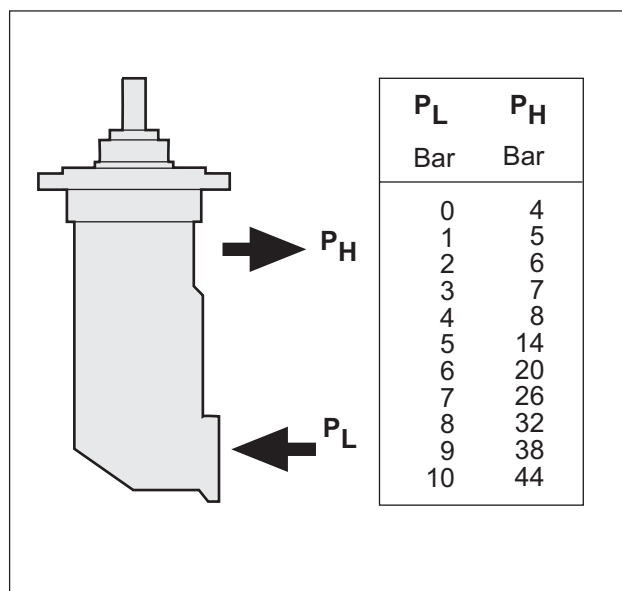






Fig. 14 Minimum discharge pressure at given inlet pressure for D4 pump

Trouble shooting

Disturbance	Cause	What to do
<p>1. The pump cannot be primed.</p> <div>  <p>Connecting and disconnecting of electric cables must be done only by personnel authorized to do such work.</p> </div>	<ul style="list-style-type: none"> - Wrong direction of rotation. - Suction line is not open or pressure drop in the suction line is too high. - Major air leakage into the suction line. - The pump cannot evacuate the air through the discharge line due to excessive counter pressure. 	<p>Reverse the terminal connection on electric motor.</p> <p>Check all components in suction line. The inlet condition should be checked with a vacuum gauge at the pump inlet.</p> <p>Check the suction line.</p> <p>See de-aeration (page 5).</p>
2. No flow.	<ul style="list-style-type: none"> - The pump is not primed. - The pressure relief valve is set below the counter pressure. 	<p>See above.</p> <p>Re-adjust the pressure relief valve to a value above counter pressure.</p>
3. Flow too low.	<ul style="list-style-type: none"> - The pressure relief valve is set too low (Discharge pressure also low). - Something is restricting the flow in the suction line. (This would usually cause noise). - The pumped liquid contains a significant amount of compressible gas, such as free air. (This would usually cause noise). 	<p>Re-adjust the pressure relief valve.</p> <p>Check all components in the suction line.</p> <p>See the chapter on Noise and Vibrations. (Page 11).</p>
4. Pressure too low.	<ul style="list-style-type: none"> - The pressure relief valve is set too low. - System open for unintended bypass or malfunctioning or wrongly operated components in the system. - A too small pump has been chosen. 	<p>Re-adjust the pressure relief valve.</p> <p>Check the components in the discharge line.</p> <p>Check the valve. See the Maintenance and Service instruction for the pump.</p>
5. Pressure too high.	<ul style="list-style-type: none"> - The pressure relief valve is set too high. - The oil is too cold (or has higher viscosity than anticipated). - Counter pressure in the discharge line is too high. 	<p>Re-adjust the pressure relief valve.</p> <p>Reduce the pressure setting until operational temperature has been reached.</p> <p>Check the dimensioning of the discharge line.</p>

Disturbance	Cause	What to do
<p>6. Drive motor difficult to start or tends to stop by tripping the motor overload relay.</p> <div>  <p>Connecting and disconnecting of electric cables must be done only by personnel authorized to do such work.</p> </div>	<ul style="list-style-type: none"> - Counter pressure too high. - Liquid too cold. - Motor is undersized for the prevailing conditions. - Electrical power supply faulty. - Motor overload relay set too low or is faulty. - Incorrect setting of Y/D starter. 	<p>See above: Pressure too high.</p> <p>Re-adjust the pressure relief valve to a lower value. Thus the power consumption for the pumping is relieved and overloading due to the high viscosity may be avoided. When the liquid has reached normal temperature and thus flows easily, the pressure relief valve is reset to normal pressure.</p> <p>Check the motor.</p> <p>Check the power supply, the motor and motor connection.</p> <p>Re-adjust or replace the relay.</p> <p>Re-adjust the setting of the starting sequence.</p>
<p>7. Noise and vibrations.</p> <div>  <p>Monitor the pump function and shut down if any sign of malfunction is noticed.</p> </div> <div>  <p>Connecting and disconnecting of electric cables must be done only by personnel authorized to do such work.</p> </div>	<ul style="list-style-type: none"> - The flow to the pump is insufficient. - Insufficient support of pipe work. - Wrong alignment. - Air leakage into the suction line. - Free air in the liquid or gas cavitation. - Faulty electrical supply. 	<p>Check the liquid level in the tank. See also chapter: The flow is too low.</p> <p>Check for pipe vibrations in the pump connections. Check that the pipes are sufficiently clamped.</p> <p>Check alignment, see page 4.</p> <p>Check the suction line for air leakage.</p> <p>Contact your IMO representative.</p> <p>Check all three phases of the supply.</p>

Maintenance and Service

For pumps in explosion-hazard areas (→ ATEX additional instructions).

List of components

Valid for all D6 pumps in sizes 038/045/052/060/070. Rotor diameter and generation: K3/N3

With version codes: s

$\left. \begin{matrix} R \\ T \\ V \end{matrix} \right\}$
 $\left. \begin{matrix} B \\ F \\ J \end{matrix} \right\}$
 $\left. \begin{matrix} Y \\ Z \end{matrix} \right\}$

The version code is composed of the letters in the 4 columns. Also valid for: Pump option A101, A309.

Example of pump designation std: D6 038 N3 STBZ

Option: D6045K3 STBZ A101

Pos no	Denomination	Qty	G012	G050	G053	G054	057	Note
102	Power rotor	1	x			x		
1030	Return valve	1	x			x		
120	Distance washer	1	x		x	x	x	1
122	Ball bearing	1			x	x	x	
123	Locking washer	1			x	x	x	2
124	Bearing nut	1			x	x	x	2
124	Retaining ring	2			x	x	x	1
124A	Support ring	1			x	x	x	1
139	Balancing ring	1	x			x		
139A	Shaft nut	1	x			x		1
139B	Washer	1	x			x		1
202	Idler rotor	2	x			x		
376	Balancing bush	2	x			x		
382	Screw	4						4
391	Plate	1						4
395	Supporting plate	1						
395A	Screw	1						
401	Pump body	1						
423	O-ring	1						3
427	Split flange	2						3
427A	Pipe weld	1						3
428	Screw	4						3
428A	Washer	4						3
451	Screw	6						
451A	Washer	6						
453	Screw	4						
453A	Washer	4						
463	Plug	1						
463A	T-ring	1			x	x	x	
489	Strainer	1						3, 4
491	Nut	1						3
501	Front cover	1						
506	O-ring	1			x	x	x	
507	Support ring	1						
507A	Locking washer	1						
507B	Washer	1						2
509	Mechanical shaft seal	1		x	x	x		
514	Retaining ring	1						1
514A	Support ring	1						1
520	Cover	1				x		
520A	O-ring	1			x	x	x	
521	Screw	3						
521A	Washer	3						
521B	Shims	1						1
523	Distance washer	1						

Explanations:

G012 = Rotor set
CW-rotation

G050 = Shaft seal

G057 = Joint kit

Note:

1 Valid for xxxY

2 Valid for xxxZ

3 Valid for xxJx

4 Valid for xxTx

Ordering code

Pos no	Spare parts sets	Part numbers, sizes				
		038	045	052	060	070
G012	N-lead/I-lead xxxZ	162958	162974	162990	163014	163030
	K-lead xxxZ	162941	162966	162982	163006	163022
	N-lead xxxY	163055	163071	163097	163113	163139
	K-lead xxxY	163048	163063	163089	163105	163121
G050	xRxZ	120873	124610	134908	128728	164921
	xTxZ	172726	172049		168914	173047
	xVxY	159988	159855	159749	159541	159467
	xTxY				189455	
	xVxZ	121780	190338	190340	142299	168211
G057	xRxZ	185959	185967	185975	185983	185991
	xVxZ	189036				189037
	xxxY	186007	186015	186023	186031	186049

Recommendation for maintenance

Every shut down for service of a plant is costly. The time for repair should therefore be limited to a minimum which can be accomplished by keeping a spare pump. The changed pump can later be repaired at a suitable place and can then be used as a spare pump.

For maintenance the following spare parts kits are recommended:

Kit	Contents	To be used for
G057	Gasket, ball bearings, etc.	Dismantling of the pump.
G053	Minor kit G057 + shaft seal G050.	Normal scheduled inspection.
G054	Major kit, pump element G102 (CW)	Repair after damage or greater wear
Ordering Example		For IMO-pump D6 038N3 STBZ
Rotor set G012		Part no 162958
Shaft seal G050		Part no 172726

Fig. 2

Service intervals


The intervals for inspection and replacement of wear parts vary greatly with the properties of the pumped liquid and can only be determined by experience. All internal parts of the D6-pump are lubricated by the pumped liquid. Pumping a liquid containing abrasive materials, or a liquid that is corrosive, will significantly reduce service life and call for shorter service intervals.


Wear in the pump may be indicated by:


- Vibration
- Noise
- Loss of capacity
- Reduction in flow or pressure
- Leakage


In installations where unplanned shut downs must be avoided, it is advisable to have a complete pump available for replacement, should any malfunction occur. Furthermore we recommend planned inspection and overhaul at regular intervals, not exceeding 3 years.


It is recommended always to have the spares included in the minor spare part kit available.


 Before any maintenance work, ensure that the driver is deenergized and the pump hydraulically isolated.


 Connecting and disconnecting of electric cables must be done only by personnel authorized to do such work.


 If the operating temperature exceeds 60°C let the pump cool off before any service, maintenance or dismantling work is commenced to avoid burn injury.

 All work carried out on the pump has to be performed in such a manner that risks for personal injury are observed!

 When handling liquids that may harm skin use gloves and/or protective clothing.

 When handling liquids which may involve fire hazards appropriate precautions to avoid danger are to be taken.

 In case of failure for a system with elevated pressure, fluid jets may cause injury and/or damage.

 Oil leakage may make the floor slippery and cause personal injury.

Sectional view

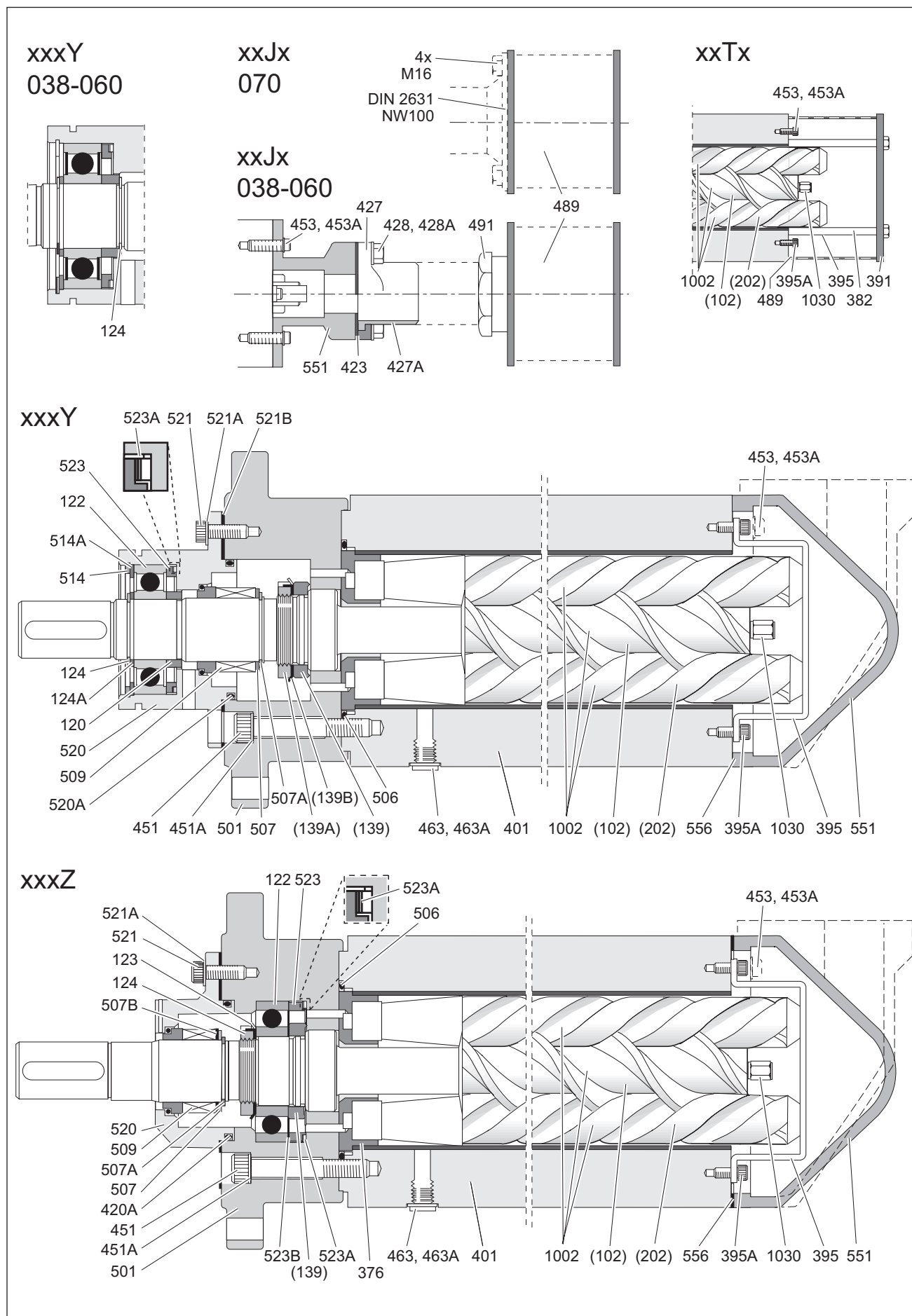


Fig. 3

Inspection of rotors

If the pump is not able to maintain the pressure inspect the rotor parts by following the instructions in fig. 13.

Acceptable clearances can be determined only by experience of the actual application. As a rule of thumb the following values may apply:

- Between rotor and bores or bushings: 0.2 mm
- Between rotor flanks: 0.2 mm

For light duties (low pressure, medium viscosity) even bigger clearances may be acceptable but for low visc./ high pressure duties the limit will be lower. Also watch if there are major scratches on these parts.

Useful tools

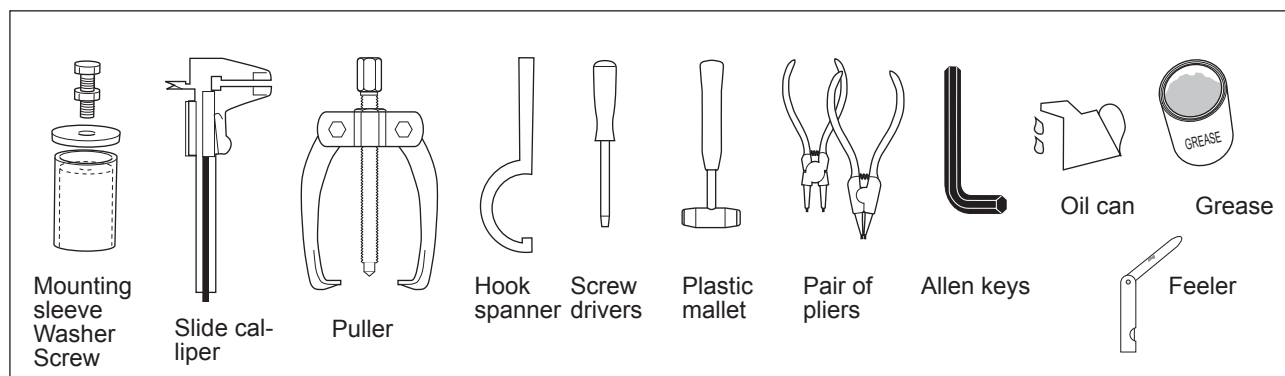


Fig. 4

Inspection of shaft seal

As the seal faces of a mechanical shaft seal are lubricated by the fluid, a certain leakage will always be present. Up to ten drops per hour can be considered as acceptable.

An external visual inspection of the pump is advisable at least every two days to assure that the shaft seal is not leaking too much. Excessively leaking shaft seals should be changed without delay, as the leakage normally will grow worse and cause additional damage.

Follow the instructions in the dismantling/mounting session.

When working with a shaft seal, cleanliness is of utmost importance. Avoid touching the seal faces. If necessary, the seal faces should be cleaned immediately prior to assembly, using a dustfree cloth and clean solvent.

Never use grease on the seal faces.

Shaft seal – assembly drawing

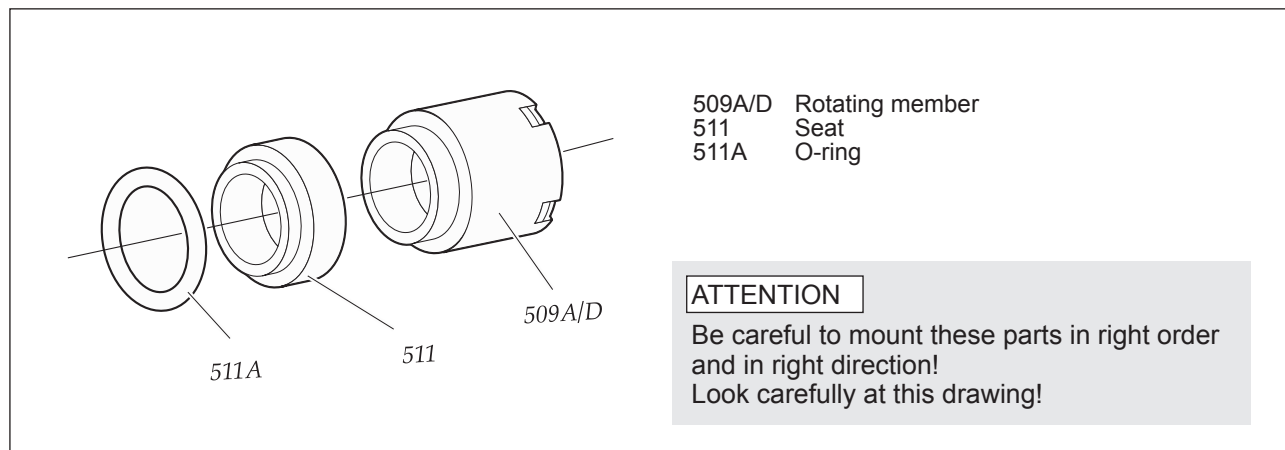


Fig. 5

Internal ball bearing – Dismantling

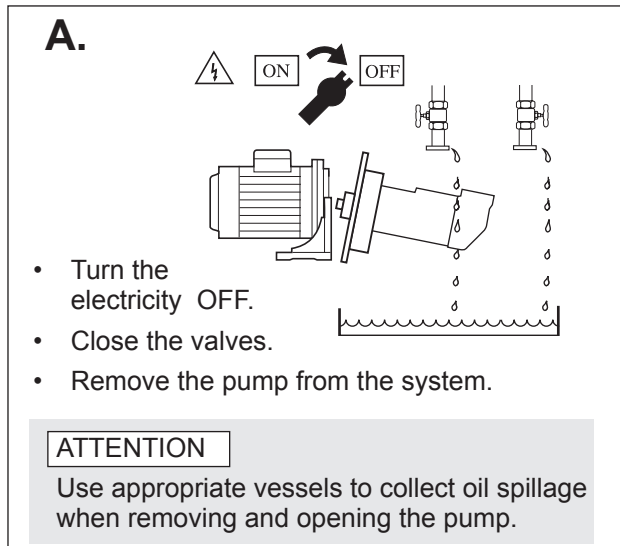


Fig. 6

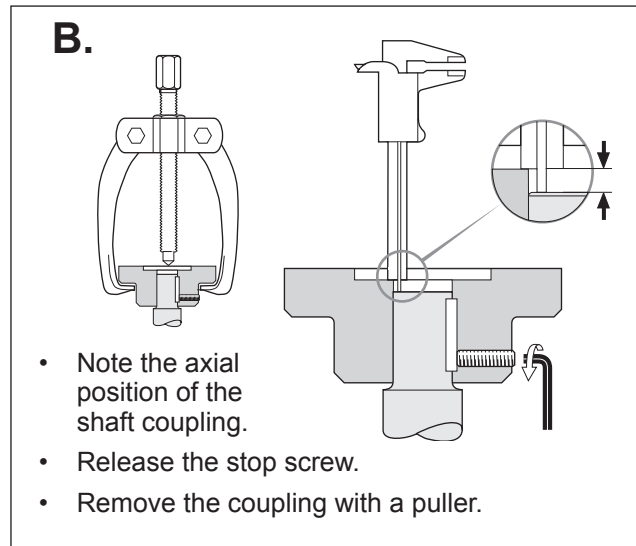


Fig. 7

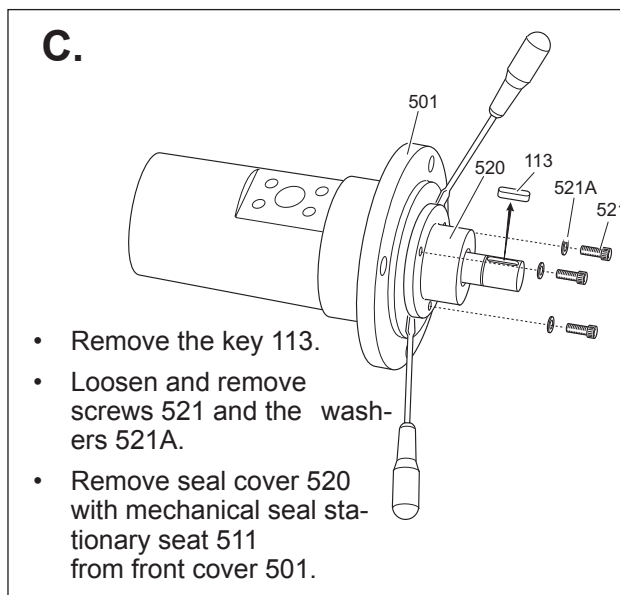


Fig. 8

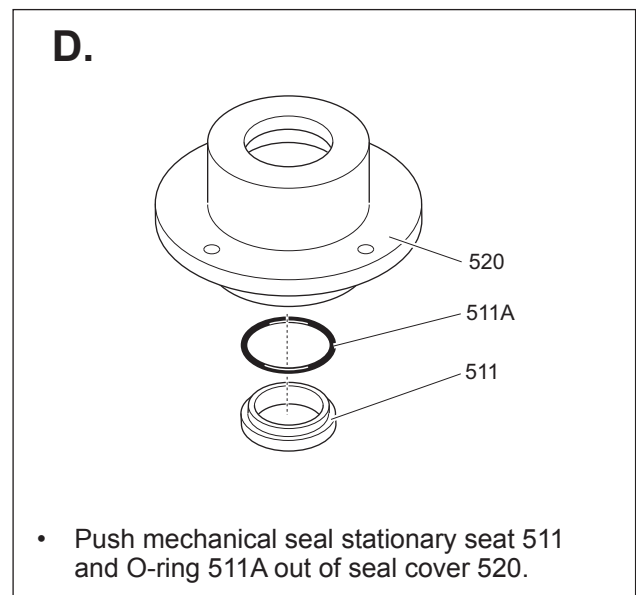


Fig. 9

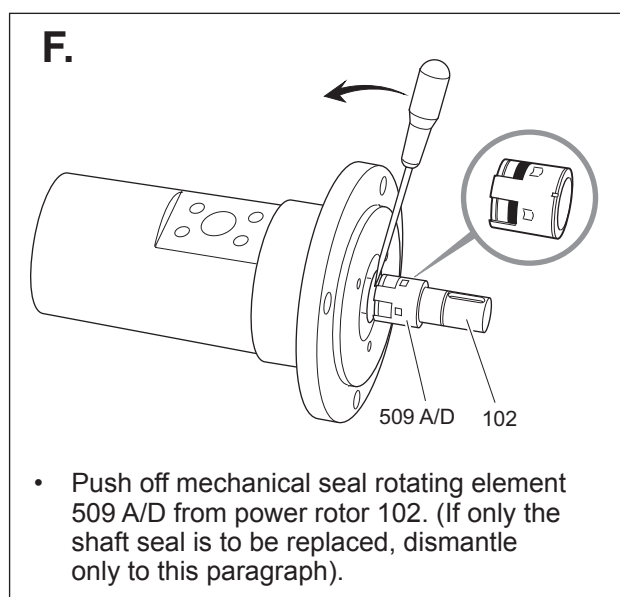


Fig. 10

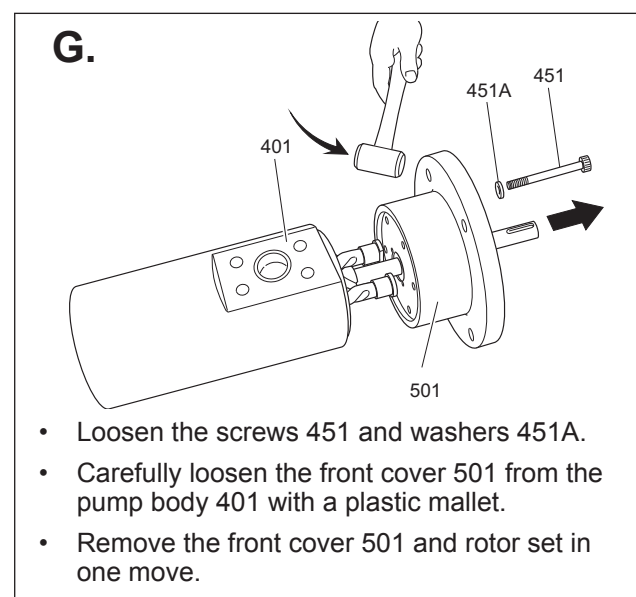


Fig. 11

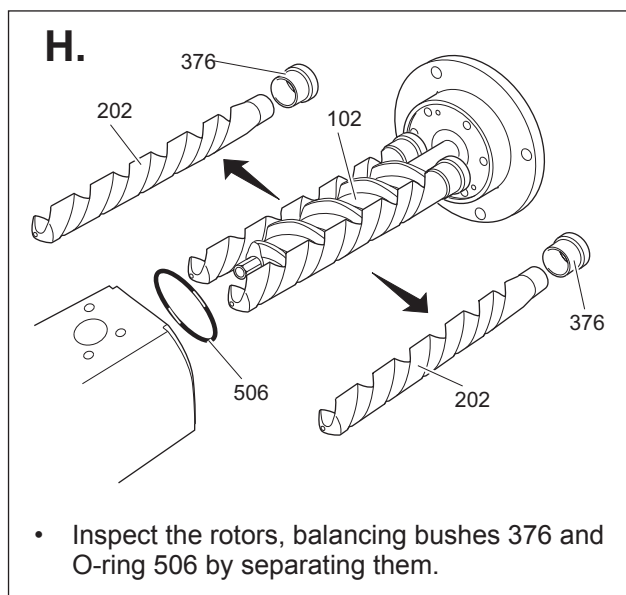


Fig. 12

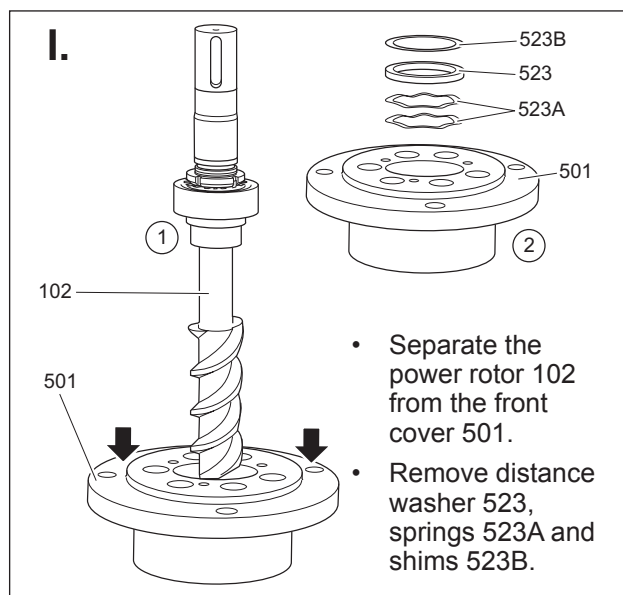


Fig. 13

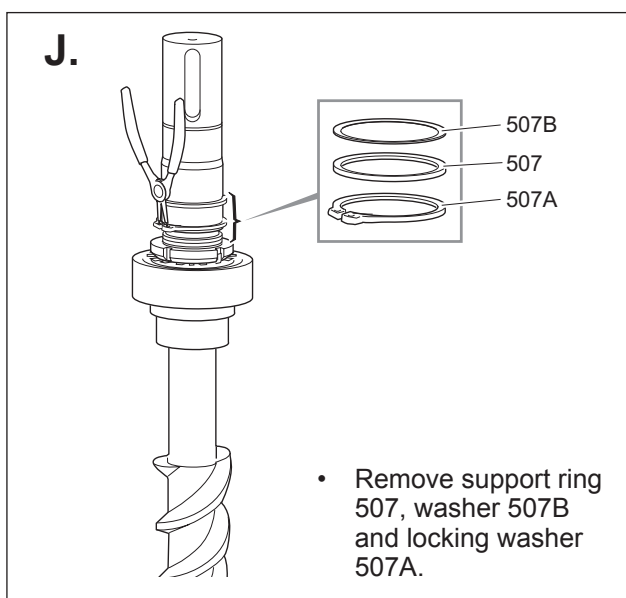


Fig. 14

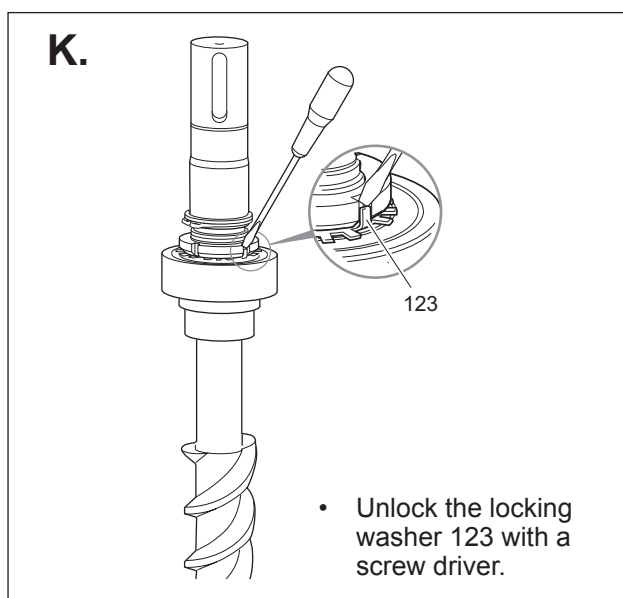


Fig. 15

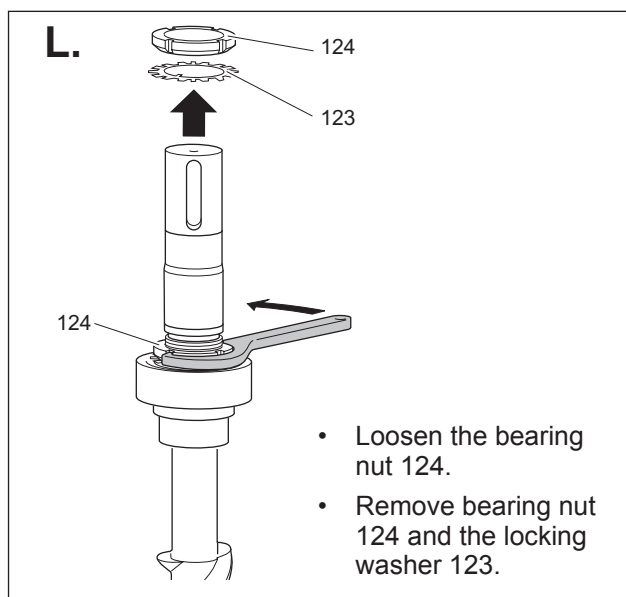


Fig. 16

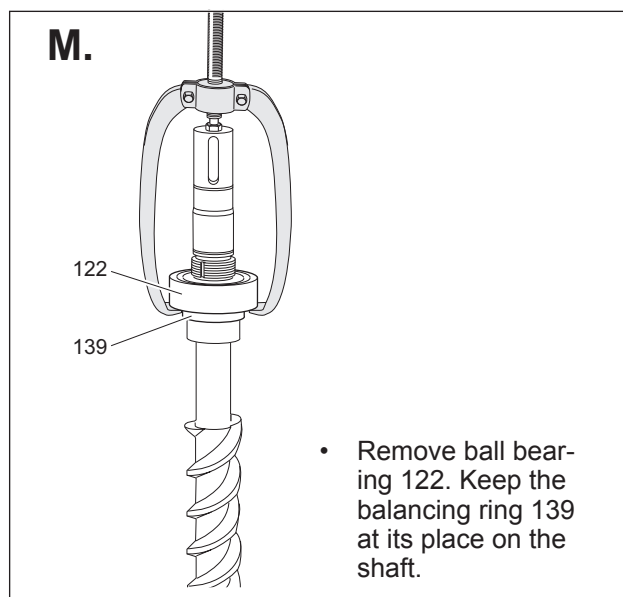


Fig. 17

Reassembly

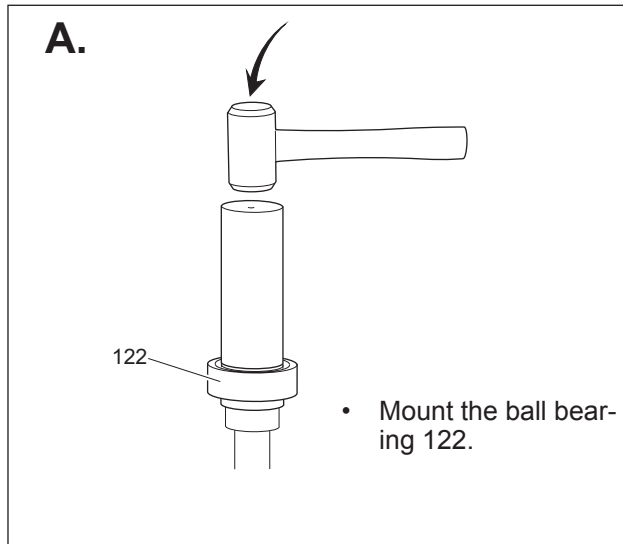


Fig. 1

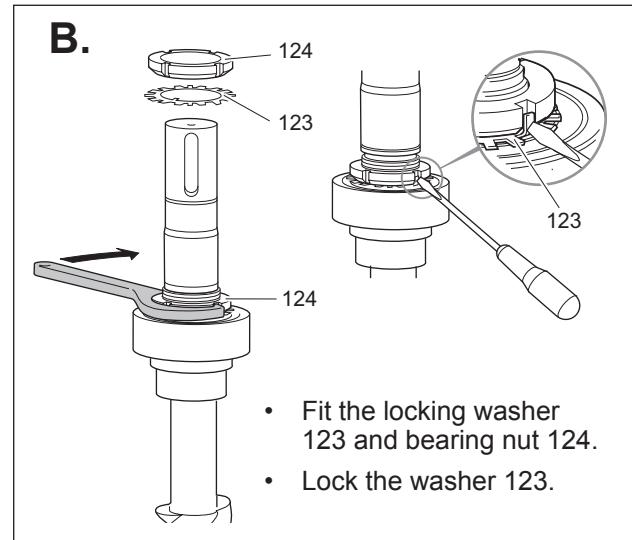


Fig. 19

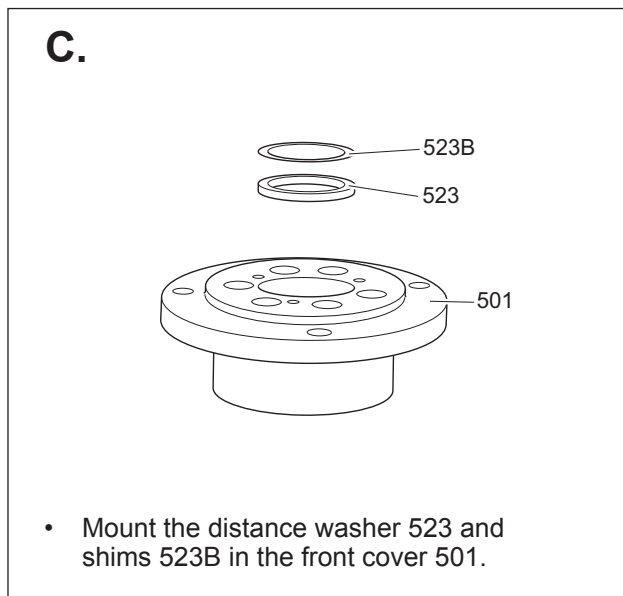


Fig. 20

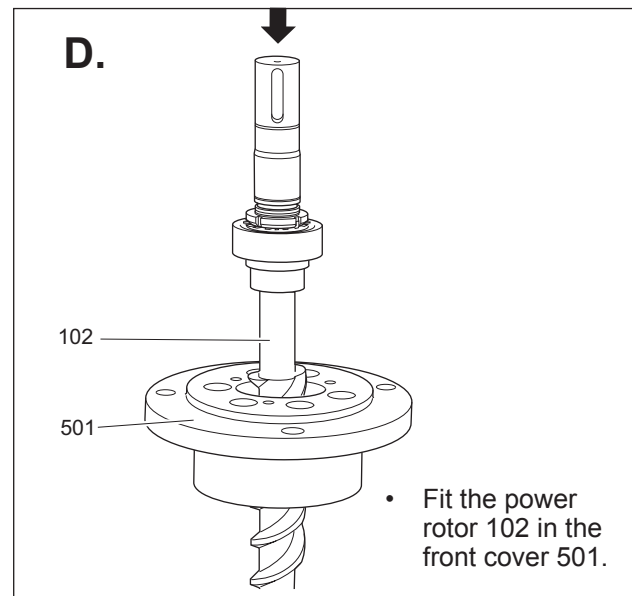


Fig. 21

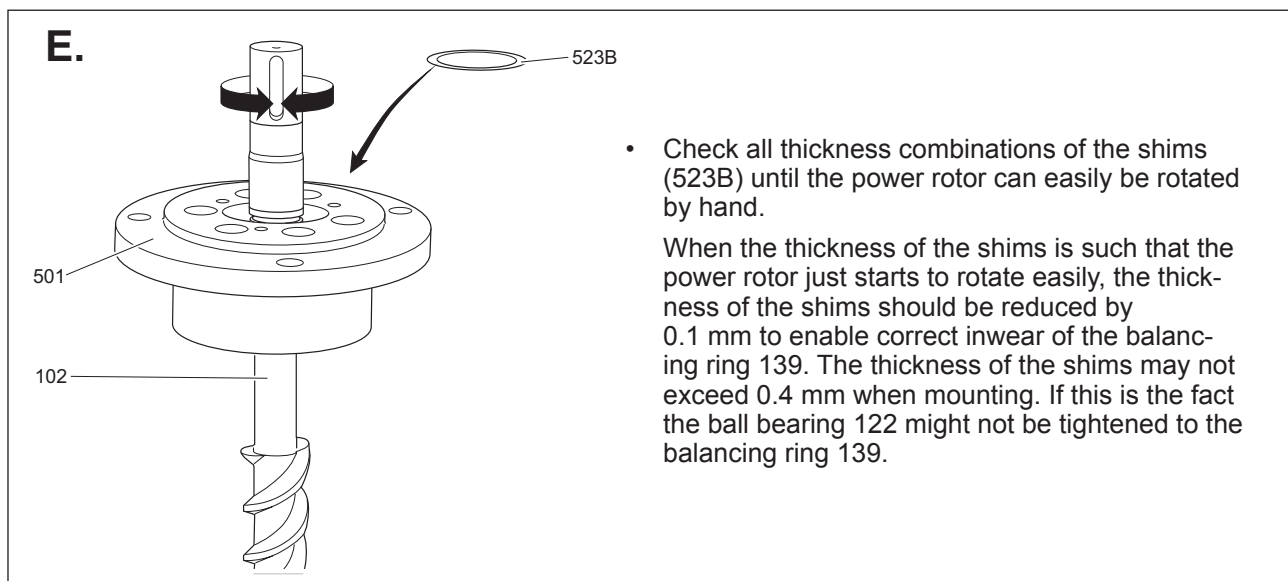
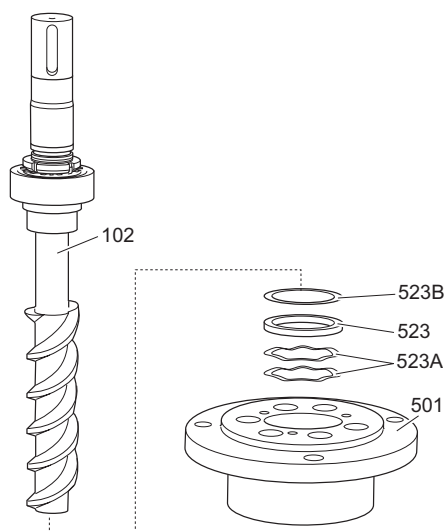


Fig. 22

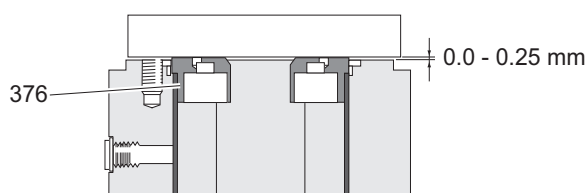
F.



- Lift the power rotor with ball bearing, the chosen shims set as well as distance washer 523 out of the front cover and mount the springs 523A in place. Put distance washer 523 and shims set 523B back in the front cover and push the power rotor carefully in its position.

Fig. 23

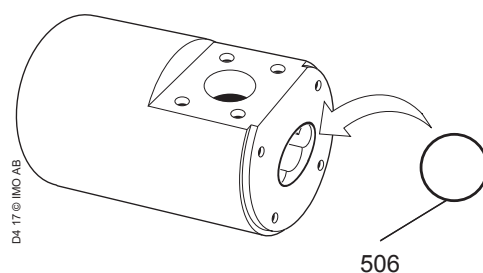
G.



- Check prior to assembly-by mounting the balancing bushes 376 in the pump body 401 and by placing a ruler over their end faces that the balancing bushes extend 0.0- 0.25 mm above the end face on the pump body. If not, replace the balancing bushes.

Fig. 24

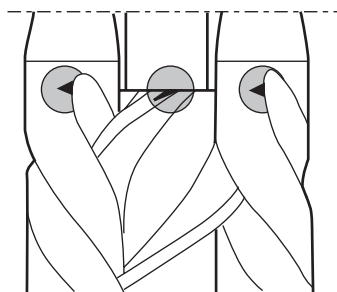
H.



- Fit the O-ring 506.
- Lubricate it with bearing grease if it is difficult to keep it in place.

Fig. 25

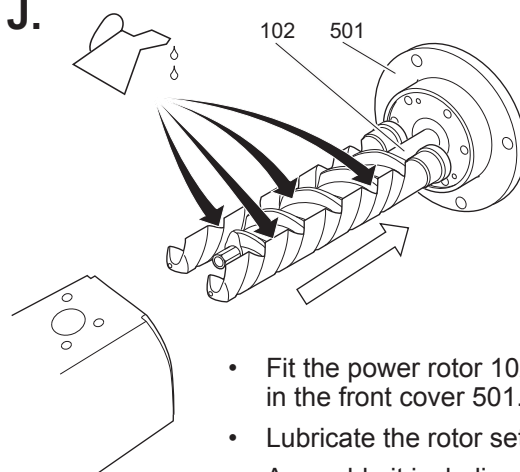
I.



- A nick has been filed on the power rotor thread on the outer diameter at the discharge end. This marked power rotor thread should be fitted into the female thread on the idler rotors marked in the same manner.

Fig. 26

J.



- Fit the power rotor 102 in the front cover 501.
- Lubricate the rotor set.
- Assemble it including balancing bushes 376.

Fig. 27

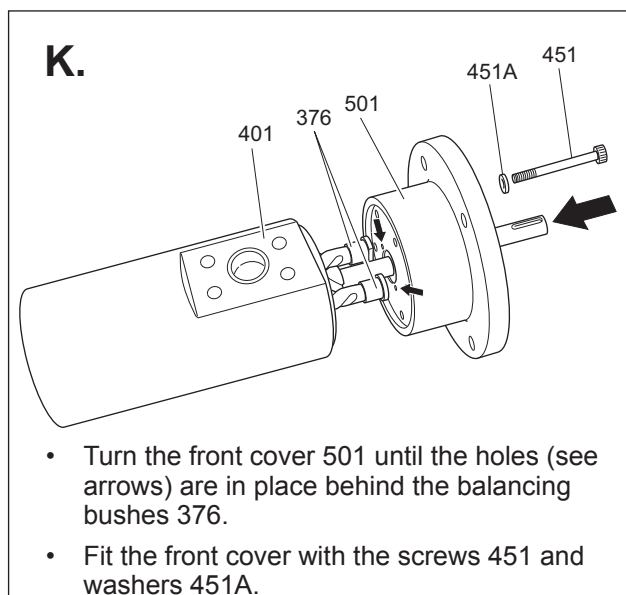


Fig. 28

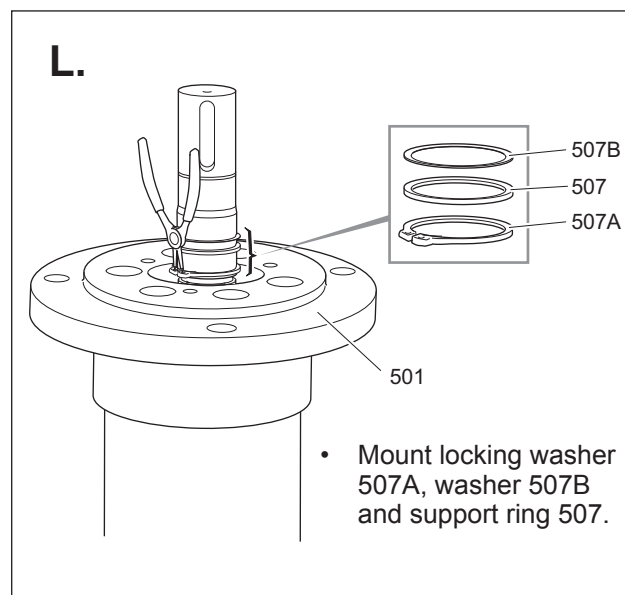


Fig. 29

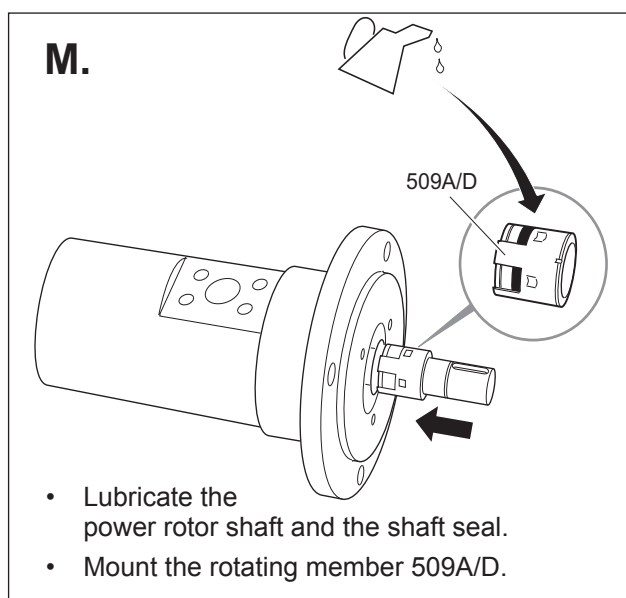


Fig. 30

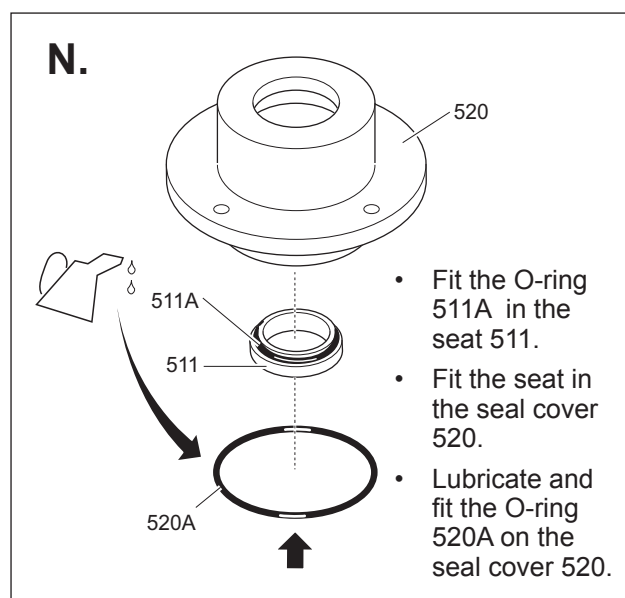


Fig. 31

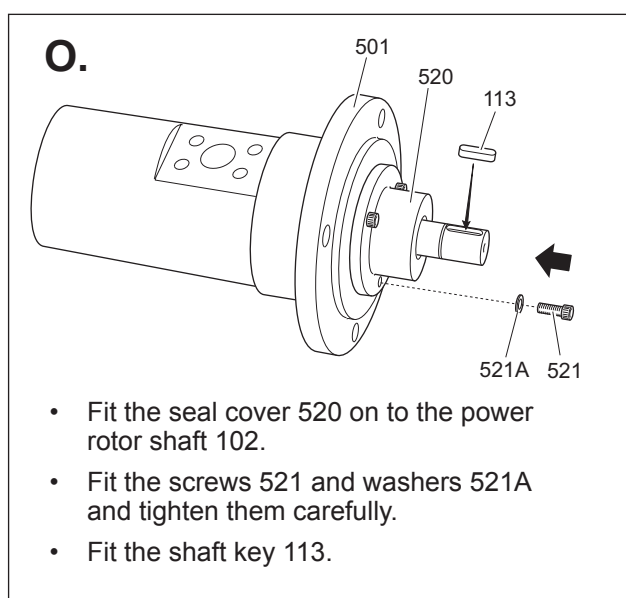


Fig. 32

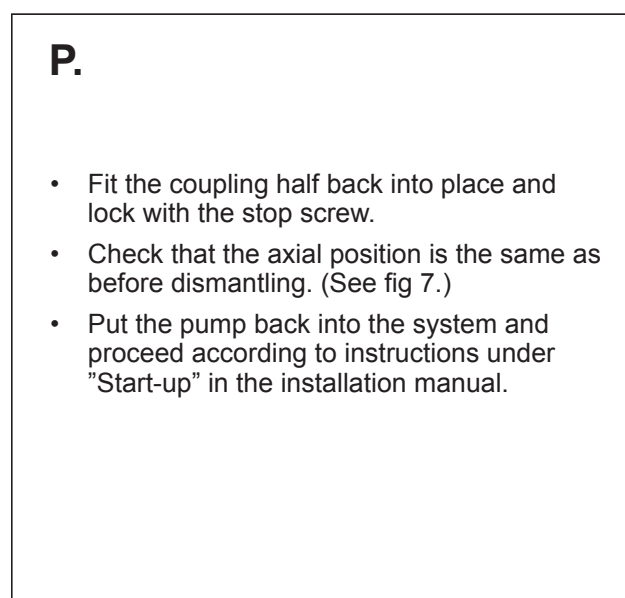


Fig. 33

External ball bearing – Dismantling

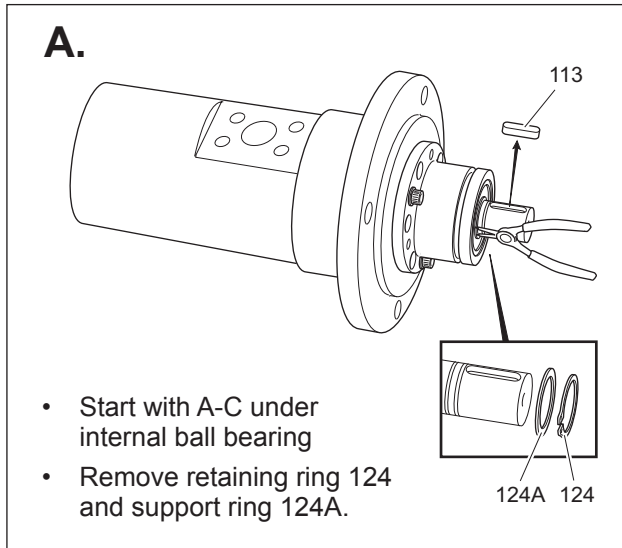


Fig. 354

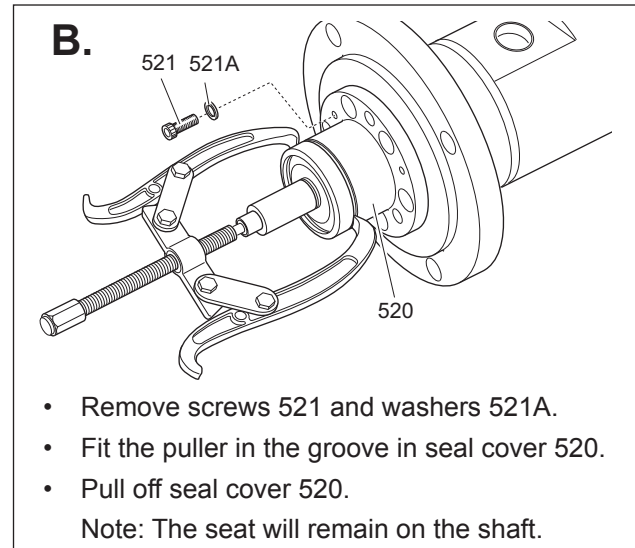


Fig. 365

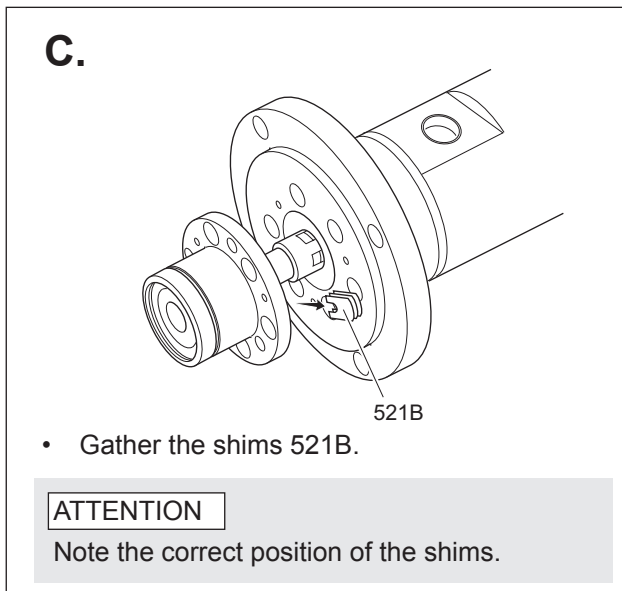


Fig. 36

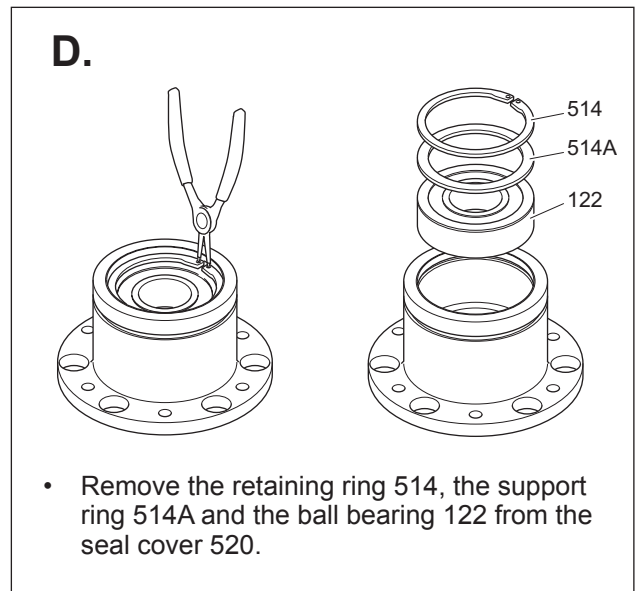


Fig. 37

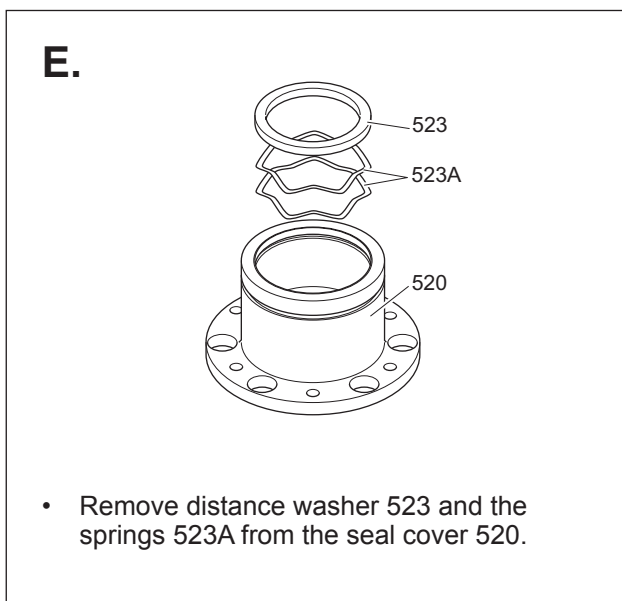


Fig. 38

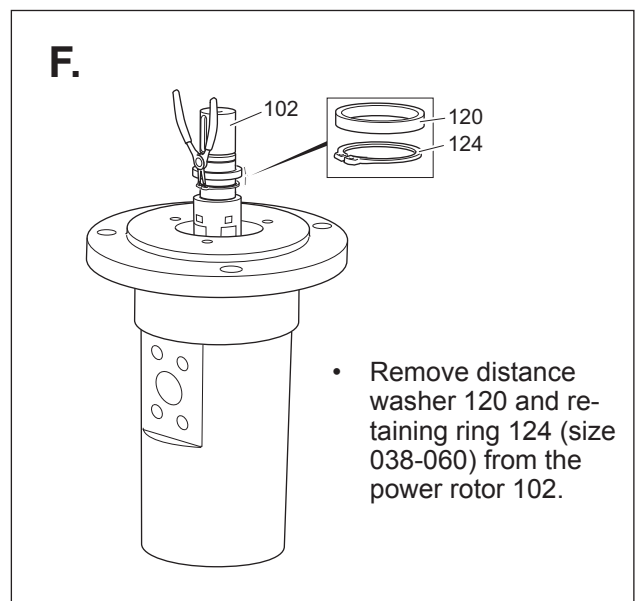
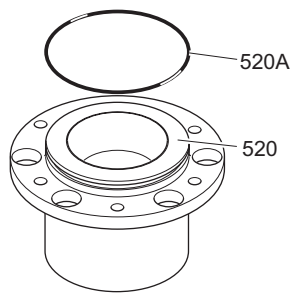
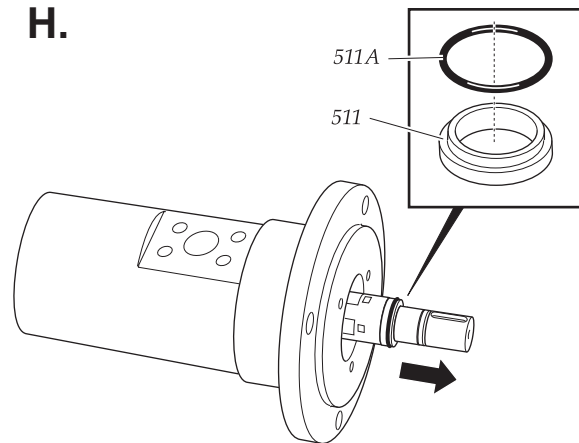


Fig. 39

G.

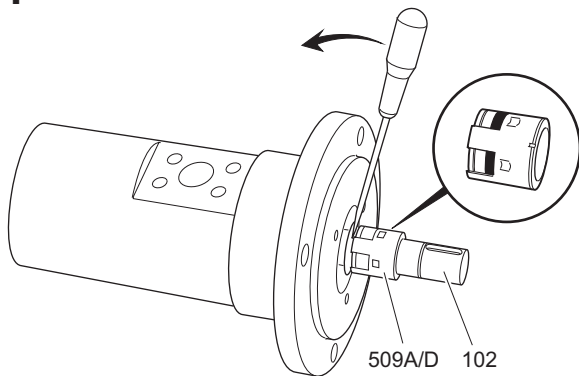
- Remove O-ring 520A from the seal cover 520.

Fig. 40

H.

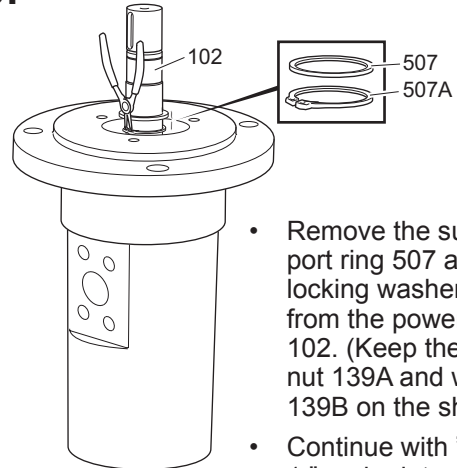
- Remove the seat 511 from the power rotor 102.
- Separate the O-ring 511A from the seat 511.

Fig. 41

I.

- Remove the rotating member 509A/D from the power rotor 102.

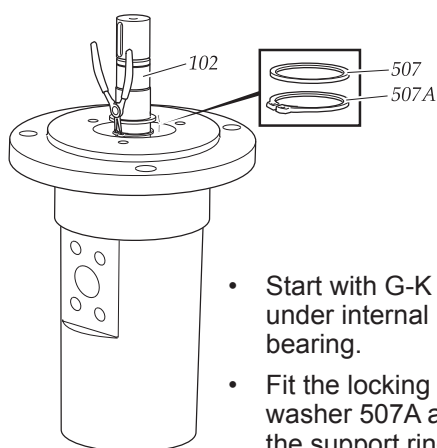
Fig. 42

J.

- Remove the support ring 507 and the locking washer 507A from the power rotor 102. (Keep the shaft nut 139A and washer 139B on the shaft).
- Continue with "G, H, I" under internal ball bearing.

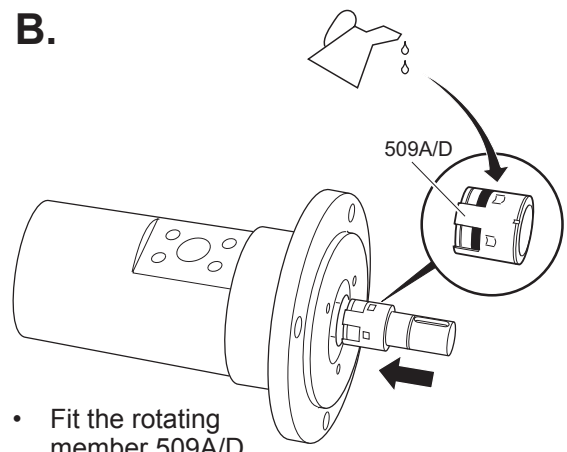
Fig. 43

Reassembly

A.

- Start with G-K under internal ball bearing.
- Fit the locking washer 507A and the support ring 507 on the shaft.

Fig. 44

B.

- Fit the rotating member 509A/D back on the shaft.

Fig. 45

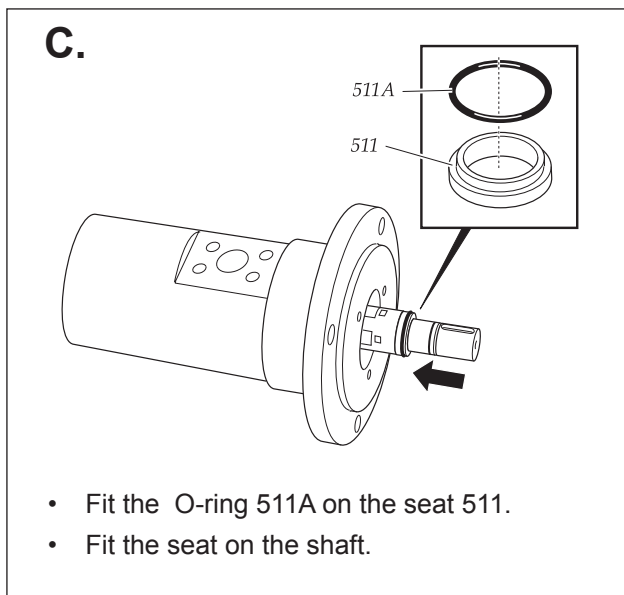


Fig. 46

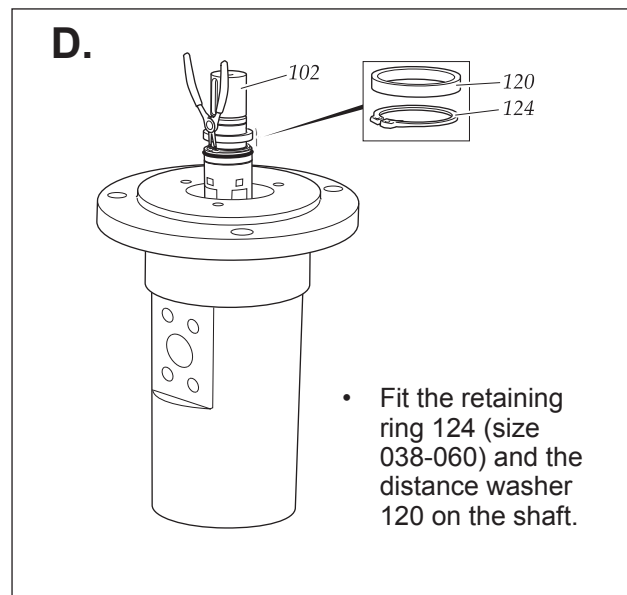


Fig. 47

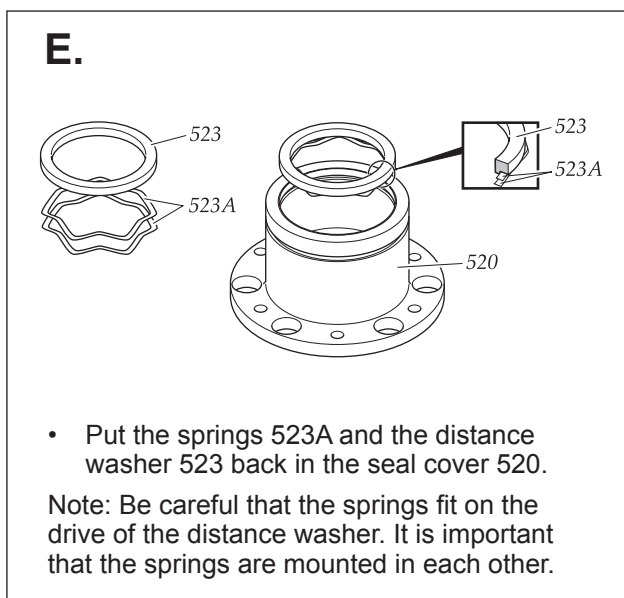


Fig. 48

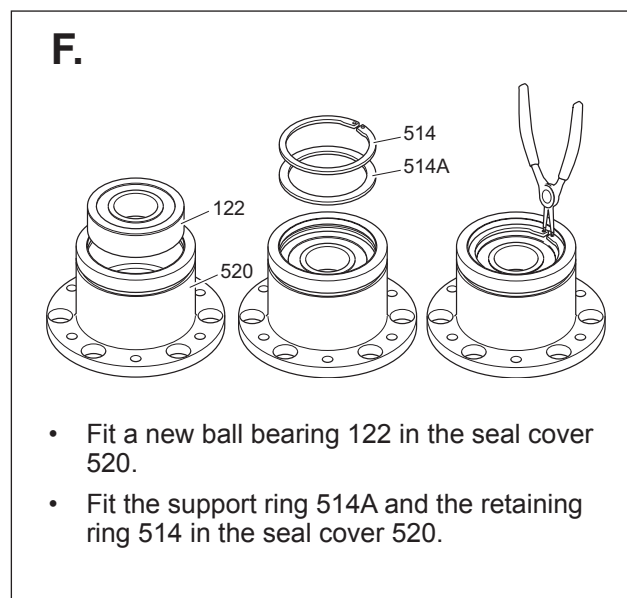


Fig. 49

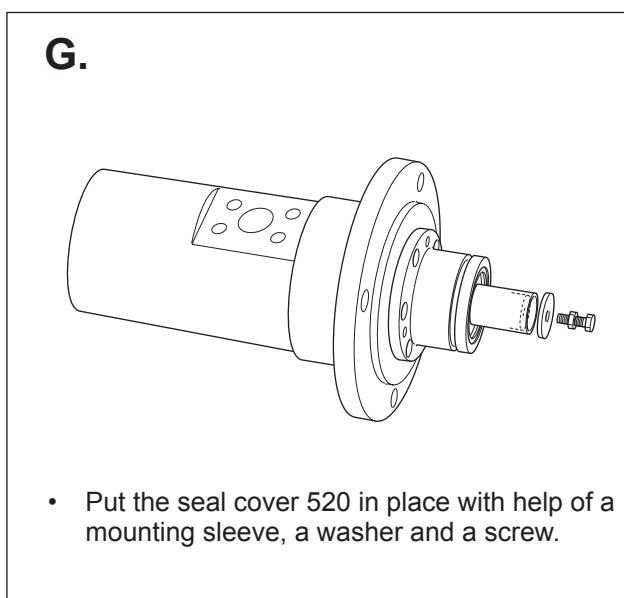


Fig. 50

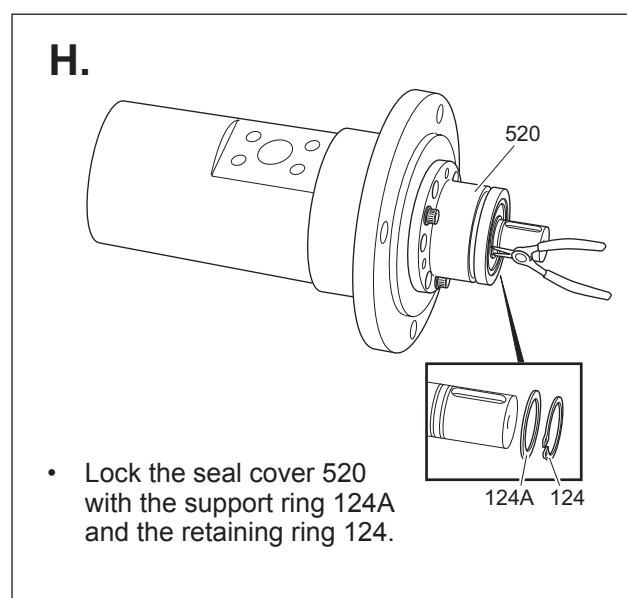
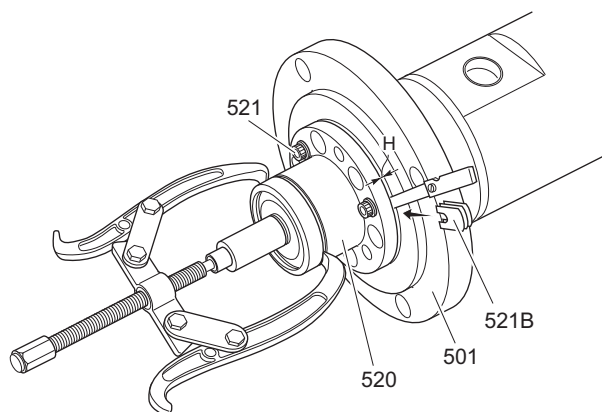


Fig. 51

I.



- Use a puller to eliminate clearance in ball bearing and the spring flexibility.
- Measure the clearance H between seal cover (520) and front cover (501) using a feeler. Measurements to be made at the three screws (521). Use the average figure of the three measurements and choose from shims table the suitable combination of shims set (521B).
- Put shims around each of the screws (521) between the cover (520) and front cover (501). Take away the puller and tighten the screws (521).
- Check that the shaft can be turned.

N.B. The shaft seal gives a certain turning resistance which is quite normal.

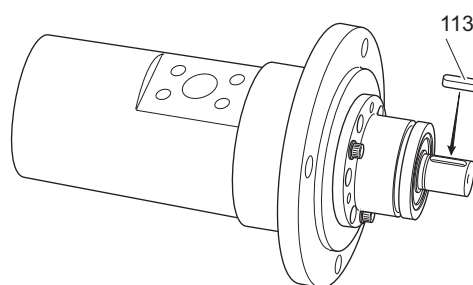
Check before and after tightening that the shaft can be turned.

Fig. 52

Measured average figure		Tot. thickness shims to	Thickness combination	
from	H(mm) to		mount (mm)	to be chosen (mm)
0	0.04	Support ring to be surface ground to 0.1 mm		
0.04	0.14	0		
0.14	0.24	0.1	0.1	
0.24	0.34	0.2	0.2	
0.34	0.44	0.3	0.1-0.2	
0.44	0.54	0.4	0.2-0.2	
0.54	0.64	0.5	0.5 alt.0.2-0.2-0.1	
0.64	0.74	0.6	0.5-0.1	
0.74	0.84	0.7	0.2-0.5	
0.84	0.94	0.8	0.1-0.2-0.5	
0.94	1.04	0.9	0.2-0.2-0.5	
1.04	1.14	1.0	0.5-0.5	
1.14	1.24	1.1	0.5-0.5-0.1	
1.24	1.34	1.2	0.2-0.5-0.5	

Shims table

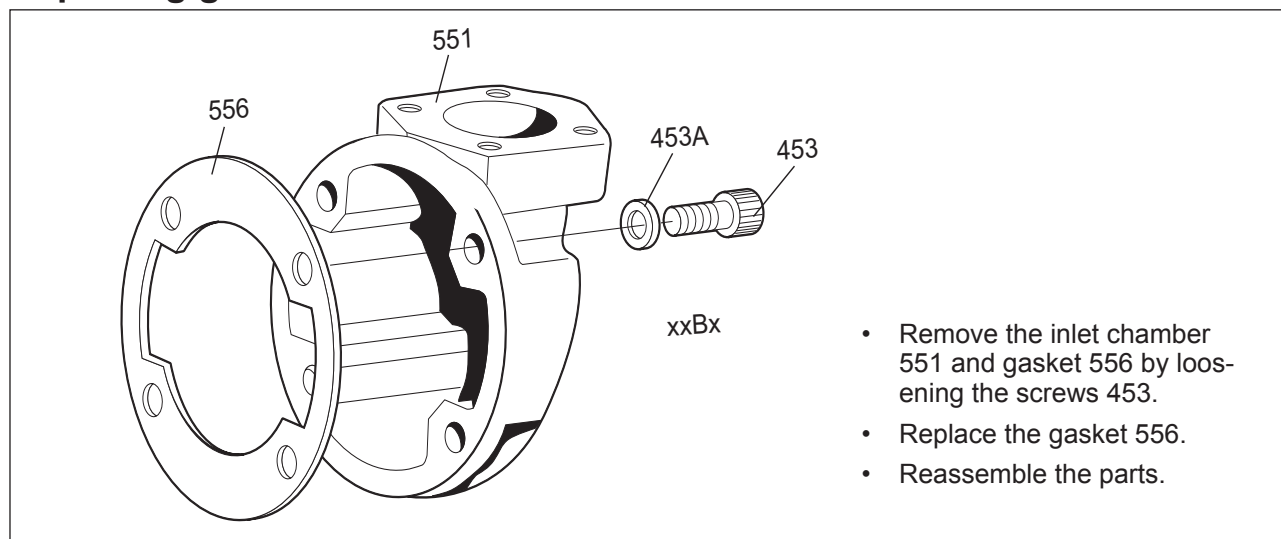
J.



- Fit the shaft key 113 and end up with "P" under internal ball bearing.

Fig. 53

Replacing gasket 556



- Remove the inlet chamber 551 and gasket 556 by loosening the screws 453.
- Replace the gasket 556.
- Reassemble the parts.

Fig. 54

Adress:

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