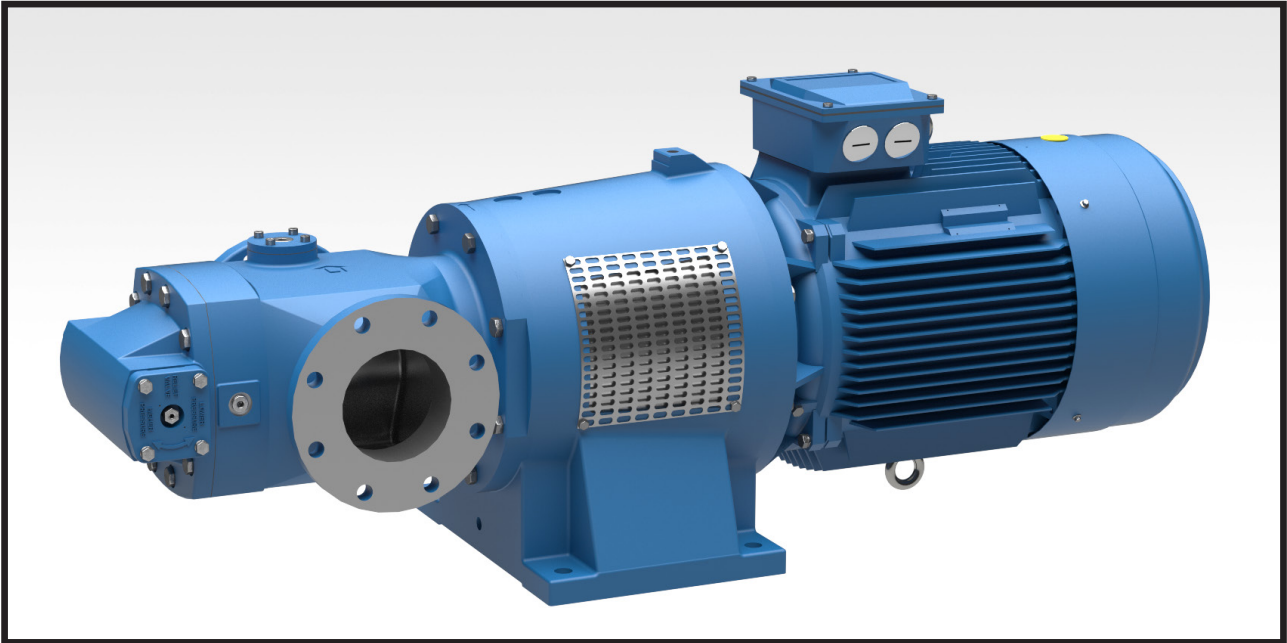


## Original Operating Manual



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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).
- For stub shaft coupled pumps (LPD and ACD) connect motor and stub shaft directly.
- For other series 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

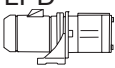



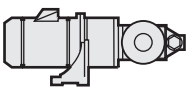
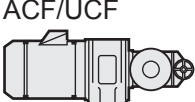
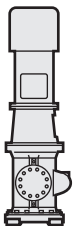
- (→ ATEX additional instructions).

## 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 low pressure pumps as specified in the Pump identification chart below.

# Pump identification

Pump name	Size (1)	Rotor lead (1)	Design modification	Material pump-body (1)	Shaft-seal design (1)	Mounting (2)	Valve (3)	Also valid for option	Comments
LPD 	015 } 020 }	N	1	I	V	B	P		Pumpunit without shaft coupling
ACD 	025	L } N }	6	N	V } T }	B	P		Pumpunit without shaft coupling
ACE 	025 } 032 } 038 }	D } K } L } N }	3	N	V } T }	B	P	A101	
LPE 	025 } 032 } 038 }	D } K } L } N }	3	N	V } T }	B } Y }	P	A101	
ACG/UCG 	045 } 052 } 060 } 070 }	D } K } N }	7	N	V } T }	B } F }	E } P }	A101 A327 A020 A385	
ACF/UCF 	080 } 090 } 100 } 110 } 125 }	K } L } N }	5	I } N }	T	B } <sup>(4)</sup> F } <sup>(4)</sup>	E } <sup>(4)</sup> P }	A020 A084 A087 A101	
LPQ 	100 } 110 } 125 } 140 }	L } N } P } J }	1	I } N }	R } T }	Y	P		

(1) See Product description or Service instruction for specified pump model

(2) B = Flange mounting  
F = Foot mounting  
Y = Vertical foot mounting

(3) E = Without valve  
G = Valve with external return  
P = Valve with internal return for total pressure range

(4) Valid for UCF

### Option

A020 Pump with surface treated casing(s)  
A084 Pump with lifetime greased ball bearing  
A087 Pump with CCW-rotation and lifetime greased ballbearing  
A101 Pump with CCW-rotation, when not standard  
A327 Pump with Tuning®  
A328 Pump with Tuning®  
A385 A101 + A327

#### 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 low 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

Always protect the pump against ingress of water and other impurities. Store the pump in a clean, dry and warm environment. The pump is delivered with the internals oiled and with protective covers over the pipe connections and drain openings. These covers should remain in place for as long as possible during the mounting and installation procedure but must be removed before start up.



**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 center of gravity is located between the straps in order to avoid tipping of the pump.**

Use two eye bolts (M 20) securely fastened to the front cover for pump LPQ. Pump and connecting frame are lifted together using two eye bolts securely fastened to the top of the connecting frame. (Thread dimension is M 16, except for frame size 600, where it is M 20).

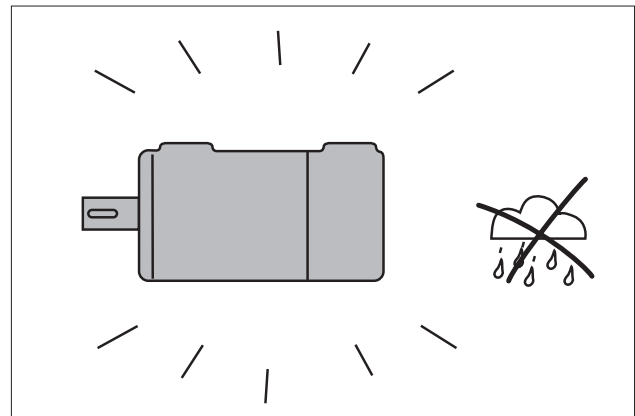


Fig. 1 Clean and dry environment.

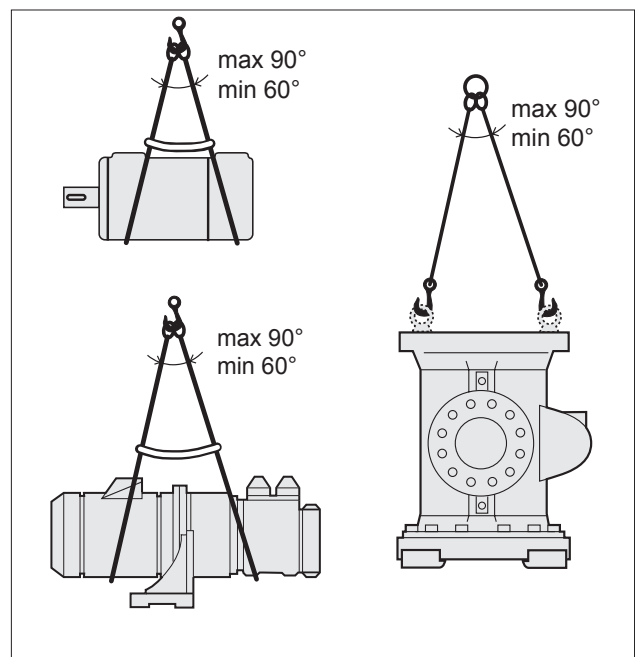


Fig. 2 Lifting of pump

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.

**!** Lifting a complete pump unit, using slings or hooks attached to the pump or connecting frame may be dangerous since the centre of gravity of the pump unit may be higher than the points of attachments.

## 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 should be considered.

### ATTENTION

**The installation must always be designed to minimise damage. Should an operational or functional failure occur. E.g. precautions should be considered to collect oil spillage due to a broken pipe or pump housing, to stop pump operation if overheating should occur 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. Pumps of type ACG/UCG and ACF/UCF may also be driven via gears or pulleys as specified in the Product Description, provided the radial forces are kept within the specified range.

The coupling and alignment shall be selected not to transmit 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 manual.

**!** When fitting the shaft coupling, do not use a hammer or similar as this may damage the ball bearing and shaft seal. Use some kind of press tool.

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

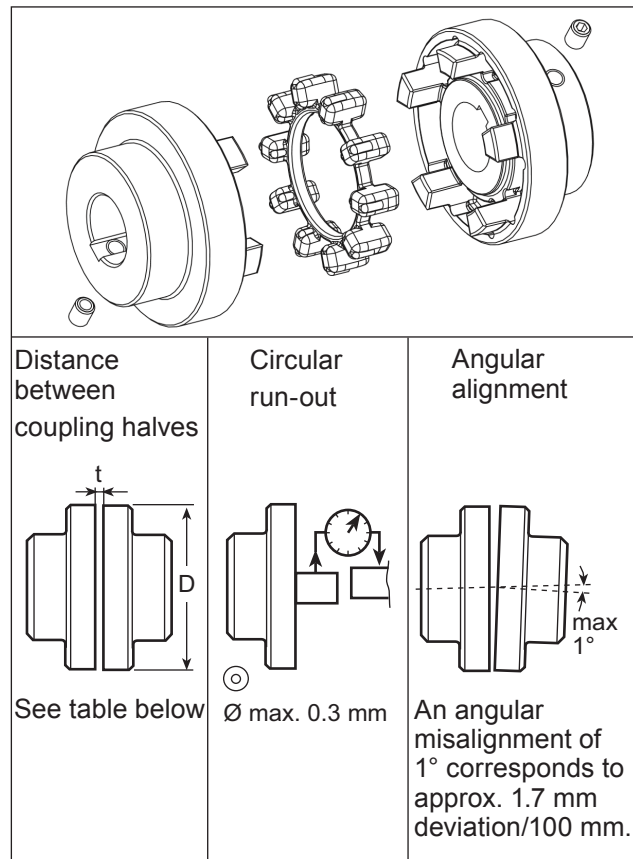


Fig. 3 Alignment of the IMO AB standard coupling

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	185	5
106	5		
118	5		

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



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



**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.**

## Pipe connections

The pipe work shall be installed and supported so that no pipe stresses are transferred to the pump body.

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

Shut off valves should be installed in both suction and discharge pipes, so that the pump can be hydraulically isolated.

## Suction line

The suction pipe 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. For L.O. circulating systems, we recommend to keep it as low as possible.

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.

## Deaeration

In installations with negative suction head, where the pump might be started against a pressurized system, a deaeration pipe with an orifice (2-3 mm recommended) has to be installed. The deaeration pipe should be connected to the outlet pipe's highest point.

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

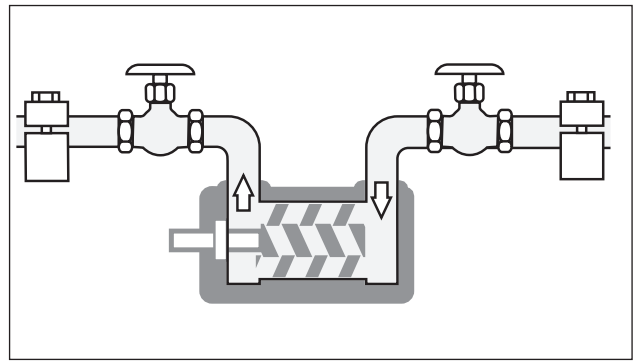


Fig. 6 Pipe connections

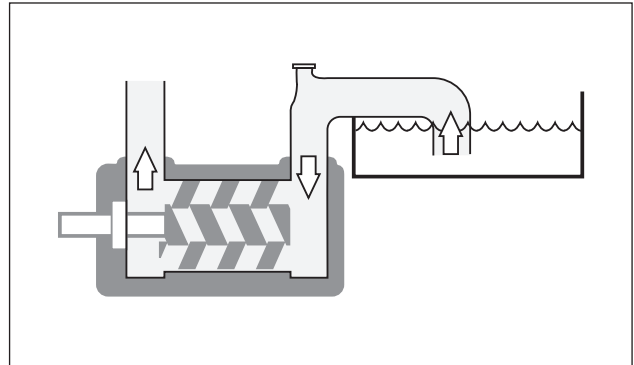


Fig.7 Suction line

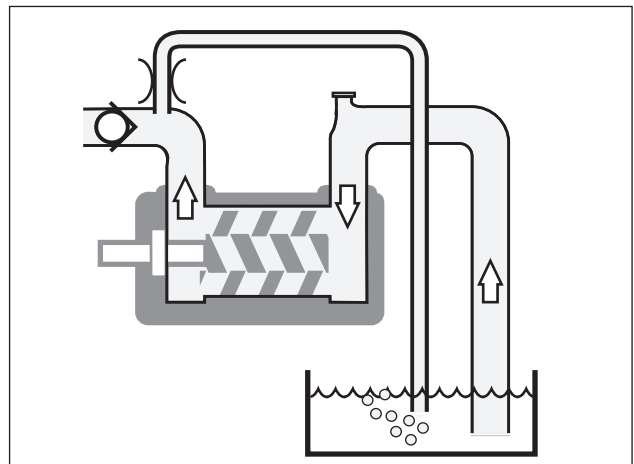


Fig. 8 Deaeration

## Strainer

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. For practical reasons a suction strainer with 0.6 mm mesh openings is recommended:

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 normal operating viscosity. A vacuum gauge between the strainer and the pump inlet is recommended to indicate when the strainer needs cleaning.

*Note: The service life of the pump is decisively influenced by the degree of contamination of the fluid being conveyed, that means, by the number, size and hardness of the abrasive components.*

## Shaft seal drain

The pump should be installed so that any leakage from the shaft seal does not become a hazard. As the shaft seal has to be lubricated a small amount of oil dripping cannot be avoided.

Provisions to collect the leakage from the shaft seal must be made.

A drain pipe can be connected to the drain connection on the pump, (not applicable to pump series LPD). However, when pumping heavy fuel oil or any other liquid that is likely to become very viscous at ambient temperature, we recommend that the liquid is allowed to drop freely from the drain opening.

## Liquid trap

In some mounting arrangements 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, keeping the pump half filled with liquid. See fig. 11.

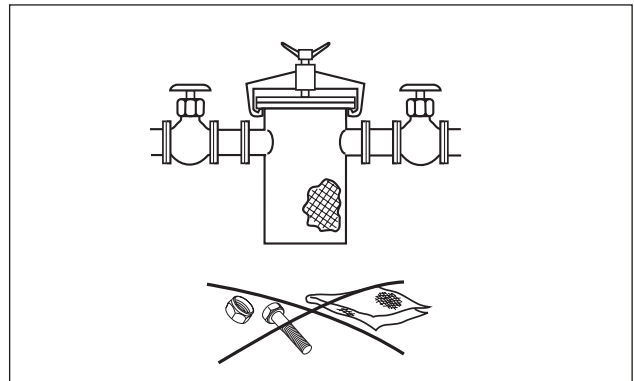


Fig. 9 Strainer

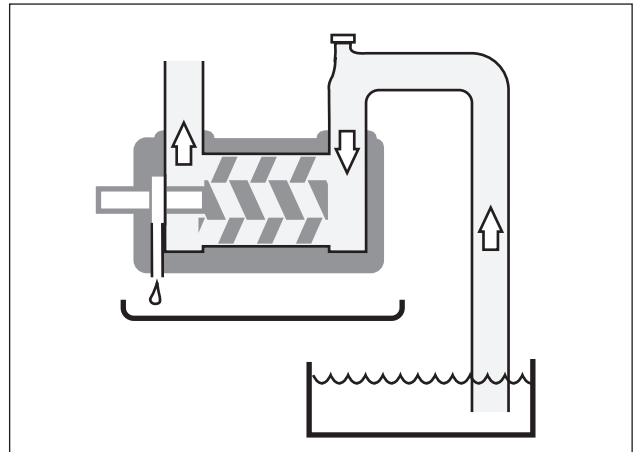


Fig. 10 Shaft seal drain

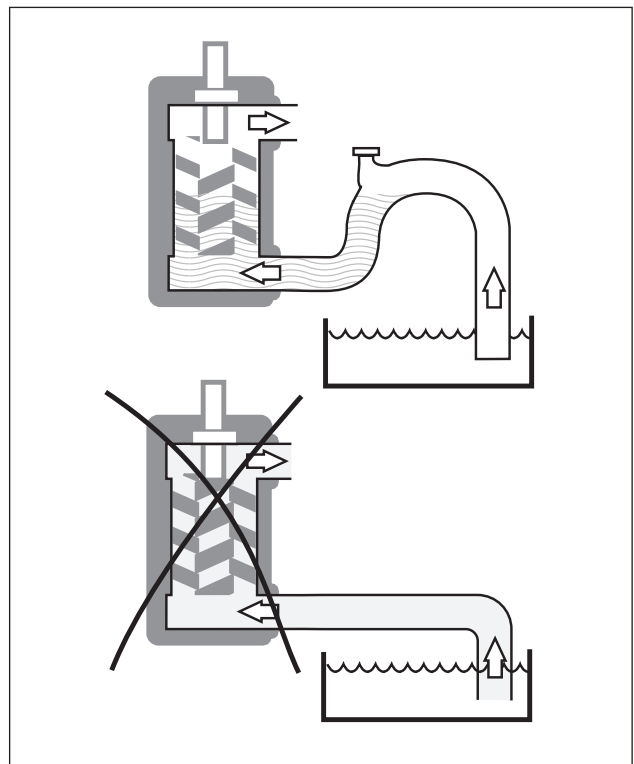


Fig. 11 Liquid trap



## Gauges

Gauges for monitoring the pump's working conditions are recommended. These gauges should be placed readable as close to the pump's in- and outlet flanges as possible. On standard pumps, series ACE, LPE, ACG/UCG, ACF/UCF and LPQ, there are gauge connections for both in- and outlet.

## Pressure relief valve

All systems with screw pumps should be equipped with a pressure relief valve installed immediately adjacent to the pump.

In the standard versions of IMO AB low pressure pumps, this pressure relief valve is an integral part of the pump to protect the pump against excess pressure.

This relief valve is intended for momentary protection of the pump against overpressure. It is neither intended to be a system pressure control device, nor used as a flow regulation device.

When liquid is circulated through the valve it is heated up in proportion to the set pressure level and the percentage of by-passed liquid.

Up to 50 % by-pass can generally pass for unlimited periods of time without harming the pump except when pumping low viscosity media.

If more than 50% recirculation is anticipated, a value specific to each application should be determined by closely monitoring the pump body temperature.

For flow less than  $\sim 50 \text{ m}^3/\text{h}$

- 100% by-pass can only be tolerated for less than about 3 minutes, provided the viscosity & temperature is within the limit of the pump type.

For flow higher than  $\sim 50 \text{ m}^3/\text{h}$

- 100% by-pass is tolerated less than 30 seconds.

Note that an open valve can cause noise.

If the pump is operating in line with a separate pressure control valve (see fig. 14), the setting of the relief valve should be high enough to not to interfere with the control valve.

Likewise, if two pumps are operating in parallel, the setting should be such that interference between the two valves is avoided.

## Pressure testing and flushing

The system must be flushed 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 after having been flushed.

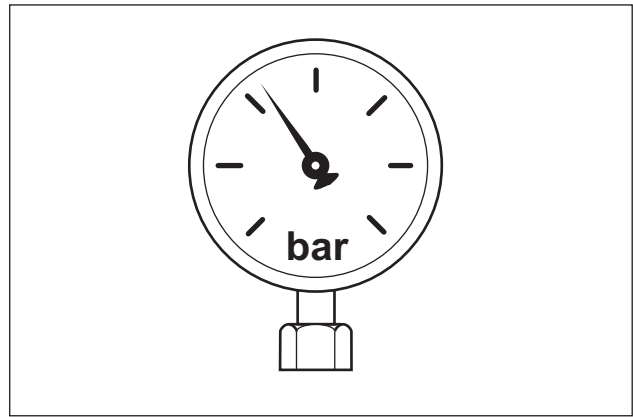


Fig. 12 Gauges

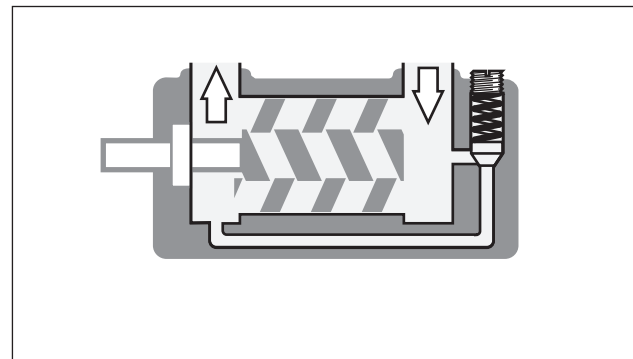


Fig. 13 Pressure relief valve

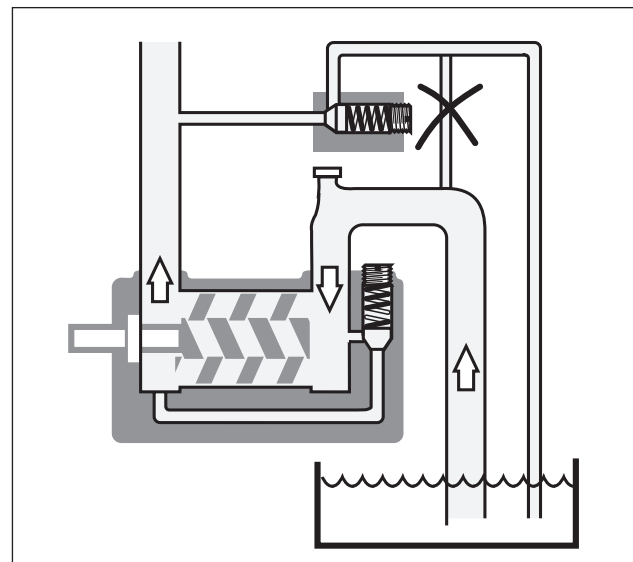


Fig. 14 External control with pressure relief valve



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

# Start-up

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

## Before starting

After installation and whenever it can be assumed that the pump has been emptied, the pump must be thoroughly filled with liquid. See fig 15.

For ACE Generation 3, LPE Generation 3, ACG Generation 7 and ACF Generation 4 delivered after 1997, ACF Generation 5 and LPQ the pumps have been fitted with deaeration plugs making venting of the shaft seal compartment easy before start-up.

In installations with positive suction pressure: After opening the inlet and outlet valves, simply open the deaeration plug a few turns until oil sips out. Tighten the plug.

In installation with negative suction pressure: After opening the inlet and outlet valves, remove the deaeration plug and fill the shaft seal compartment with oil. Fit and tighten the plug. See fig. 16.

Note: for LPQ the amount of oil is appr 50 liter.

**⚠ Make sure the prime mover is locked out and can not be started accidentally.**

Rotate the shaft by hand while filling the pump, to ensure that the rotor bores and the shaft seal cavity is filled. On the smaller pumps: (LPD, ACD, ACE, LPE, ACG/UCG), this is done by rotating the fan on the electric motor after removing the fan cover.

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

On the ACF/UCF and LPQ pumps, the pump can be turned using the shaft coupling. 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. 8 Deaeration).

**ATTENTION**

**Starting a dry pump is likely to cause damage, especially to the shaft seal.**

## 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.

The arrow is placed on different spots depending on the pump series.

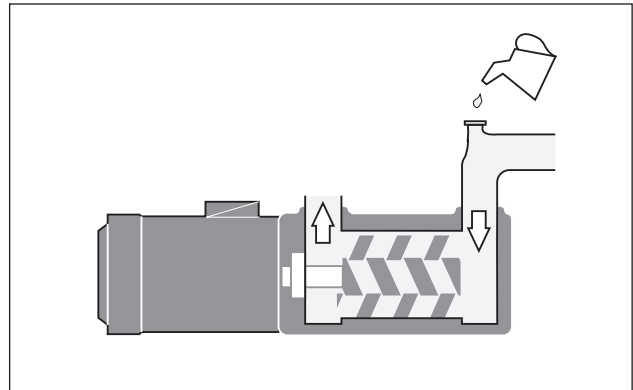


Fig. 15 Filling the pump

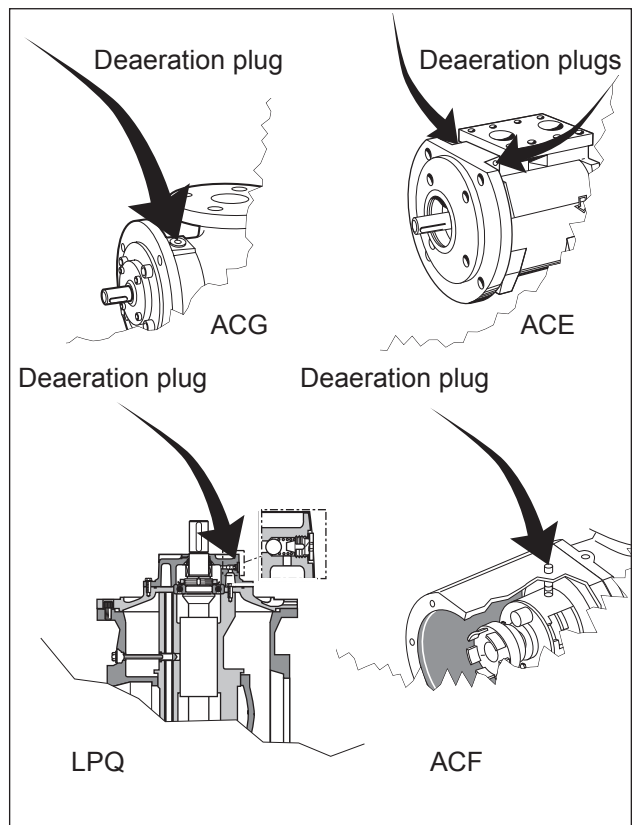


Fig. 16 Deaeration plugs

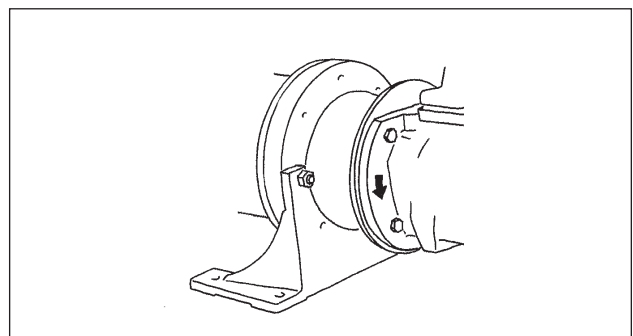


Fig. 17 Direction of rotation

## ATTENTION

**Don't mix up with arrow for inlet and outlet!**

## Starting

Check that all valves necessary for the operation are fully opened in both discharge and suction lines.

The first time, the pump should be started with the adjusting spindle of the pressure relief valve tightened to half of the available turns (the valve setting is increased when the spindle is turned clockwise).

By monitoring the pressure gauge it can be determined when the suction line is primed and the pump begins to work. Should the pump not operate normally soon after start, stop the pump within half a minute. Start again after about 3-5 minutes (the shaft seal must have time to cool off) and run for half a minute. This procedure may need to be repeated a couple of times if the suction line is extremely long. Should the pump still not work, it must be assumed there is a problem in the system that needs to be remedied. Check the suction line calculation on page 5 and/or see "Trouble shooting", page 10.



**Pumps with external ball bearing including grease nipple, must be regreased after one hour of running, while the pump is operating**

## Setting the pressure relief valve

To set the opening pressure;

Tighten the valve spindle by rotating clockwise to the maximum extent. The system pressure is regulated by throttling an external valve to required value. The pressure relief valve is eased until the pressure is just beginning to decrease by turning the spindle CCW. The internal relief valve is now preset for desired opening pressure. Open the throttling external valve entirely.

As standard, the recommended valve setting is 1 bar above system pressure.

**NOTE: The set screw on LPD is hidden behind a plate.**

## Adjusting the tuning

The tuning adjustment, which is a standard feature on ACF/UCF and LPQ (option on ACG/UCG pumps), is a device for minimizing the effects of dissolved and free air in lube oil systems. The tuning principle is described in the Product Description.

The tuning should be adjusted while the pump is working under normal operating conditions. This is done by turning the tuning spindle with an Allen key (size 8 mm for ACG/UCG, 12 mm for ACF/UCF and LPQ) to a position where the noise level comes to

a minimum. On a double acting pump like the LPQ pump, there are two tuning valves, which must be adjusted individually.

Setting of tuning of the LPQ:

1. Before starting the setting check that both setting screws (8 mm socket head cap screw on the discharge side) are closed.
2. Turn the lower screw until the noise level obtains a minimum. (If turned too much the noise will increase again).
3. Turn the upper screw and continue to reduce the noise level. (If turned too much the noise will increase again).
4. Repeat item 2. and 3. in order to achieve the lowest possible noise level.

## Setting of tuning of the ACG/UCG and ACF/UCF:

1. Before starting the setting, check that the setting screw (8 mm: ACG/UCG, 12 mm: ACF/UCF, socket head cap screw on the discharge side) are closed.
2. Turn the screw CCW until the noise level becomes the lowest (if turned too much the noise will increase again).

Once set, the tuning needs no further adjustment, providing the operating conditions stay the same.

**NOTE: It's not possible to accidentally turn the tuning spindle too far.**



**If operating temperature exceeds 60°C (149°F), appropriate measures to avoid skin contact shall be provided.**



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

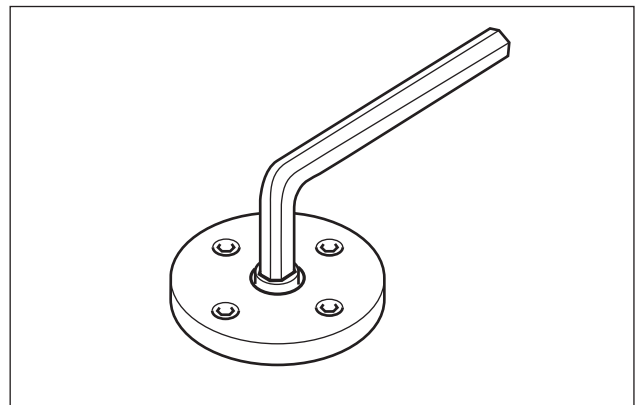




Fig. 18 Adjusting the tuning

# Trouble shooting

Problem	Cause	What to do
<b>Wrong direction of rotation</b>	<ul style="list-style-type: none"> <li>- Electric cables to motor wrongly connected.</li> </ul>	<p>Reverse the terminal connection on electric motor.</p> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;">  <p><b>Connecting and disconnecting of electric cables must be done only by personnel authorized to do such work.</b></p> </div>
<b>The pump cannot be primed</b>	<ul style="list-style-type: none"> <li>- Wrong direction of rotation.</li> <li>- Suction line is not open or pressure drop in the suction line is too high.</li> <li>- Major air leakage into the suction line.</li> <li>- The pump cannot evacuate the air through the discharge line due to excessive counter pressure.</li> </ul>	<p>See above.</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 the chapter on Deaeration (see page 5).</p>
<b>No flow</b>	<ul style="list-style-type: none"> <li>- The pump is not primed.</li> <li>- The pressure relief valve is set below the counter pressure.</li> </ul>	<p>See above.</p> <p>Readjust the pressure relief valve to a value above counter pressure.</p>
<b>Flow too low</b>	<ul style="list-style-type: none"> <li>- The pressure relief valve is set too low (Discharge pressure also low).</li> <li>- Something is restricting the flow in the suction line. (This would usually cause noise).</li> <li>- The pumped liquid contains a significant amount of compressible gas, such as free air. (This would usually cause noise).</li> </ul>	<p>Readjust the pressure relief valve.</p> <p>Check all components in the suction line (strainers, valves etc.).</p> <p>See the chapter on Noise and Vibration. ( Page 11).</p>
<b>Pressure too low</b>	<ul style="list-style-type: none"> <li>- The pressure relief valve is set too low.</li> <li>- Counter pressure in the discharge line is too low due to a major leakage.</li> <li>- The valve piston is stuck in open position.</li> <li>- Something is restricting the flow in the suction line. (This would usually cause noise).</li> <li>- The pumped liquid contains a significant amount of compressible gas, such as free air. (This would usually cause noise).</li> <li>- A too small pump has been chosen.</li> </ul>	<p>Readjust the pressure relief valve.</p> <p>Check the components in the discharge line inclusive the recipients.</p> <p>Check the valve. See Maintenance and Service instruction for respective pump.</p> <p>Check all components in the suction line (strainers, valves etc.).</p> <p>See the chapter on Noise and Vibration. ( Page 11).</p> <p>Contact your IMO AB representative.</p>

Disturbance	Cause	What to do
<p><b>Pressure too high</b></p>	<ul style="list-style-type: none"> <li>- The pressure relief valve is set too high.</li> <li>- The oil is too cold (or has higher viscosity than anticipated).</li> <li>- Counter pressure in the discharge line is too high.</li> </ul>	<p>Readjust the pressure relief valve.</p> <p>Reduce the pressure setting until operational temperature has been reached.</p> <p>Check the discharge line.</p>
<p><b>Drive motor difficult to start or tends to stop by tripping the motor overload relay</b></p>	<ul style="list-style-type: none"> <li>- Counter pressure too high.</li> <li>- Liquid too cold</li> <li>- Motor is undersized for the prevailing conditions.</li> <li>- Electrical power supply faulty.</li> <li>- Motor overload relay set too low or is faulty.</li> <li>- Incorrect setting of Y/D starter.</li> </ul>	<p>See above: Pressure too high.</p> <p>Readjust 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 relief valve is reset to normal pressure.</p> <p>Check the motor.</p> <p>Check the motor and motor connection.</p> <p>Readjust or replace the relay.</p> <p>Readjust the setting of the starting sequence. The time before the motor overload relay is tripped should not exceed 10-15 seconds.</p>
<p><b>Noise and vibrations</b></p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  <p><b>Monitor the pump function and shut down if any sign of malfunction is noticed.</b></p> </div>	<ul style="list-style-type: none"> <li>- The flow to the pump is insufficient.</li> <li>- Insufficient support of pipe work.</li> <li>- Bad alignment</li> <li>- Air leakage into the suction line.</li> <li>- Free air in the liquid or gas cavitation.</li> <li>- Faulty electrical supply.</li> </ul>	<p>See 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>For pumps with Tuning: Adjust the Tuning. If this does not help or for pumps without Tuning: Contact your IMO representative or IMO service dept.</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 ACF and UCF Generation 5 pumps with leads and sizes: 080, 090, 100 K5/N5 & 110, 125 L5/N5.  
With version codes: ITBP & NTBP. Also valid with options A020, A078, A101.

Pos	Part Denomination	Qty	Included components in Spare part sets							Explanations:
			G011	G012	G050	G053	G054	G057	G070	
1010	Complete power rotor (CCW-rot.)	1	x					x		ACF: Pump with DIN flanges
1020	Complete power rotor (CW-rot.)	1							x	UCF: Pump with ANSI flanges
(103)	Ball	1	(x)	(x)						CW: Clockwise rotation
(104)	Spring	1	(x)	(x)						CCW: Counter clockwise rotation
(105)	Hole screw	1	(x)	(x)						
(106)	Balancing piston	1	(x)	(x)						
113	Key	1	x	x						
122	Ball bearing	1					x	x	x	
130	Support ring	1					x	x	x	
131	Retaining ring	1					x	x	x	
201	Idler rotor (CCW-rotation)	2	x							G011: Rotor set CCW rotation
202	Idler rotor (CW-rotation)	2		x				x		G012: Rotorset CW rotation
401	Pump body	1								
4240	Tuning element	1								
(424)	Cover	1								G050: Compl shaft seal
(424A)	Gasket	1					x	x	x	
(425)	Screw	4								G053: Minor kit (G050+G057)
(429)	Guiding screw	1								
(429A)	Tension pin	1								G054: Major kit
(430)	Piston 1 (Valid for sizes 100-125)	1								G057: Joint kit
(432)	Tension pin (Valid for sizes 100-125)	1								G070: Valve ele- ment
(437)	O-ring	1					x	x	x	
451	Screw	4								
451A	Washer	4								
453	Screw	8								
455	Screw	4								
455A	Washer	4								
462	Plug	1								
462A	Washer	1					x	x	x	
463	Plug	1								
463A	Washer	1					x	x	x	
480	Valve housing	1								
501	Front cover	1								
506	O-ring	1					x	x	x	
509	Mechanical seal	1					x	x		
520	Compl. cover	1								
520A	O-ring	1					x	x	x	
(520B)	Tension pin	1								
521	Screw	4								
521A	Washer	1								
(537)	Plug	1								
(537A)	Washer	1					x	x	x	
556	Gasket	1					x	(x)	x	
6000	Valve cartridge	1								x
(6010)	Compl. valve cover	1								(x)
(602)	Pin	1								(x)
(603)	O-ring	1					x	x	(x)	(x)
(605)	O-ring	1					x	x	(x)	(x)
(608)	Valve spindle	1								(x)
(609)	Washer	1								(x)
(610)	Ball bearing	1					x			(x)
(612)	Regulating nut	1								(x)
(614)	Valve piston	1								(x)
(615)	Spring	1								(x)
(622)	Nut	1								(x)
(623)	Ball bearing	1					x			(x)

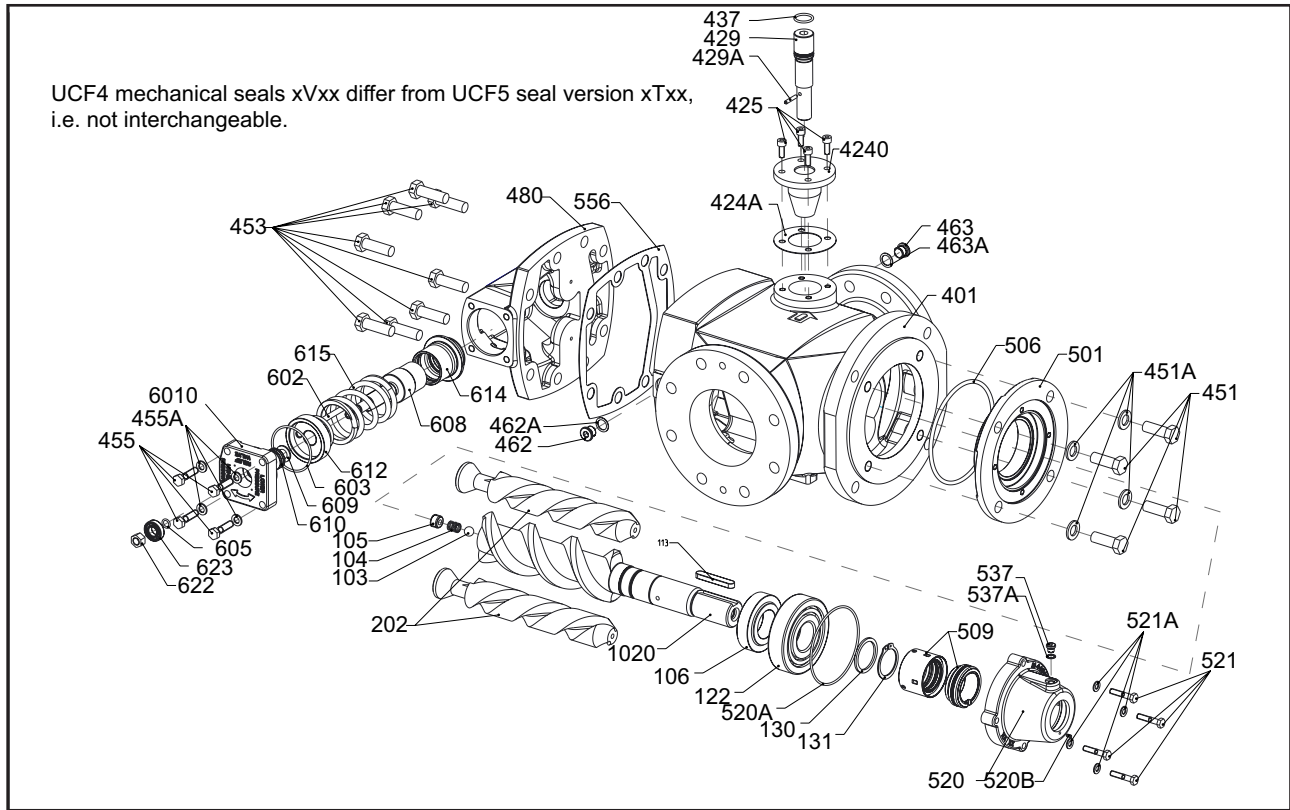
# Introduction

A screw pump from IMO is a quality product that is designed for a long problem free operation in tough environments. As all other mechanical products they do however require a certain grade of maintenance and service in order to guarantee a faultless and economic favourable operation.

For ACF: Note that former version of mechanical seal, called xVxx has been replaced by xTxx. The seals are 100% interchangeable and since Januari 2016, version xVxx is obsolete.

For UCF: UCF4 mechanical seals xVxx differ from UCF5 seal version xTxx, i.e. not interchangeable.

## Exploded view



## Recommended Spare Parts Kits

Every shutdown 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	Gaskets, o-rings, ball bearing, etc	Dismantling of the pump
G053	G057 + Shaft seal G050	Normal scheduled inspection
G054	G053 + Complete rotor set	Repair after major breakdown or great wear

## Ordering Code

Pos		Pump size					
		080	090	100	110	125	
G011	Rotor set	N-lead	901192966	901192968	901192970	901192972	901192974
	CCW	K-lead	901192967	901192969	901192971		
		L-lead				901192973	901192975
G012	Rotor set	N-lead	901192785	901192958	901192960	901192962	901192964
	CW	K-lead	901192786	901192959	901192961		
		L-lead				901192963	901192965
G050	Shaft seal	xTxx	901194659	901194659	901194660	901194660	901194660
G053	Minor kit	xTxx	901194661	901194662	901194663	901194664	901194665
G057	Joint kit		901192990	901193101	901192991	901193103	901192992
G070	Valve	xxxP	901192553	901192553	901192554	901192554	901192555
G099	Complete	IEC 132	901195015	901195014			
	shaft	IEC 160	901195004	901195004	901195008	901195008	901195008
	coupling	IEC 180	901195005	901195005	901195009	901195009	901195009
		IEC 200	901195006	901195006	901195010	901195010	901195010
		IEC 225		901195007	901195011	901195011	901195011
		IEC 250			901195012	901195012	901195012
	IEC 280			901195013	901195013	901195013	

Mechanical seal valid for both ACF5 and UCF5 xTxx seal versions.

## 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 ACF/UCF-pump are lubricated by the pumped liquid.

Pumping liquid which contain abrasive materials, or liquid that is corrosive, will significantly reduce service life and call for shorter service intervals.

Wear in the pump will normally show as:

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

We recommend planned inspection and overhaul at regular intervals, not exceeding 3 years.

It is recommended to always have the spares included in minor spare part kit G053 available for a planned inspection.

## Inspection of rotors

To reach the idler rotors in a quicker way than described in the dismantling section, loosen the rear cover (480) with valve. Screw out the idler rotors backwards. Internal clearances in the pump, which are vital for its proper function, may have been affected by wear. Acceptable wear can be determined only by experience of the actual application. As a rule of thumb the following max clearance values may apply: Between rotor and bores: 0.2 mm, Between rotor flanks: 0.4 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.

## 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. 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 grove worse and cause additional damage.

Follow the instructions in the dismantling/reassembly session. When working with a shaft seal, cleanliness is of outmost importance. Avoid touching the seal faces. If necessary, the seal faces should be cleaned immediately prior to assembly, using a dust free cloth and clean solvent.

## Warranty matters

IMO AB's warranty obligations covers new pumps for 1 year after the commissioning of the pump.

Parts that NOT are covered by the warranty are normal wear details such as the mechanical shaft seal, the ball bearing or the flexible coupling.

## Precautions prior to starting maintenance on the pump

2



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

3



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

4



When handling liquids that may harm skin, use gloves and/or protecting clothing!

5



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

6



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

7



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

8



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

9

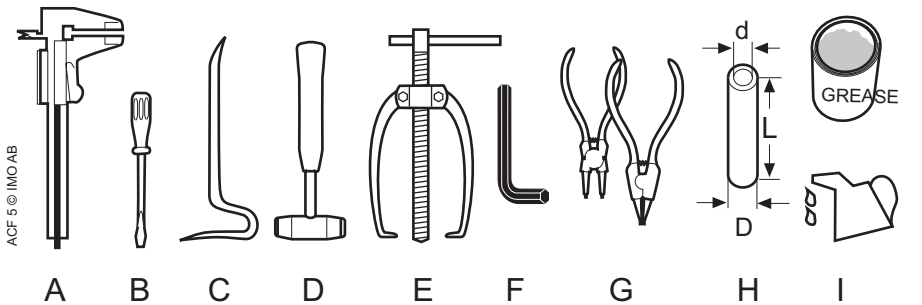


Connecting and disconnecting of electrical cables must be done only by personnel authorized to do such work.



# Dismantling and reassembling the pump

## List of tools necessary for dismantling and reassembly

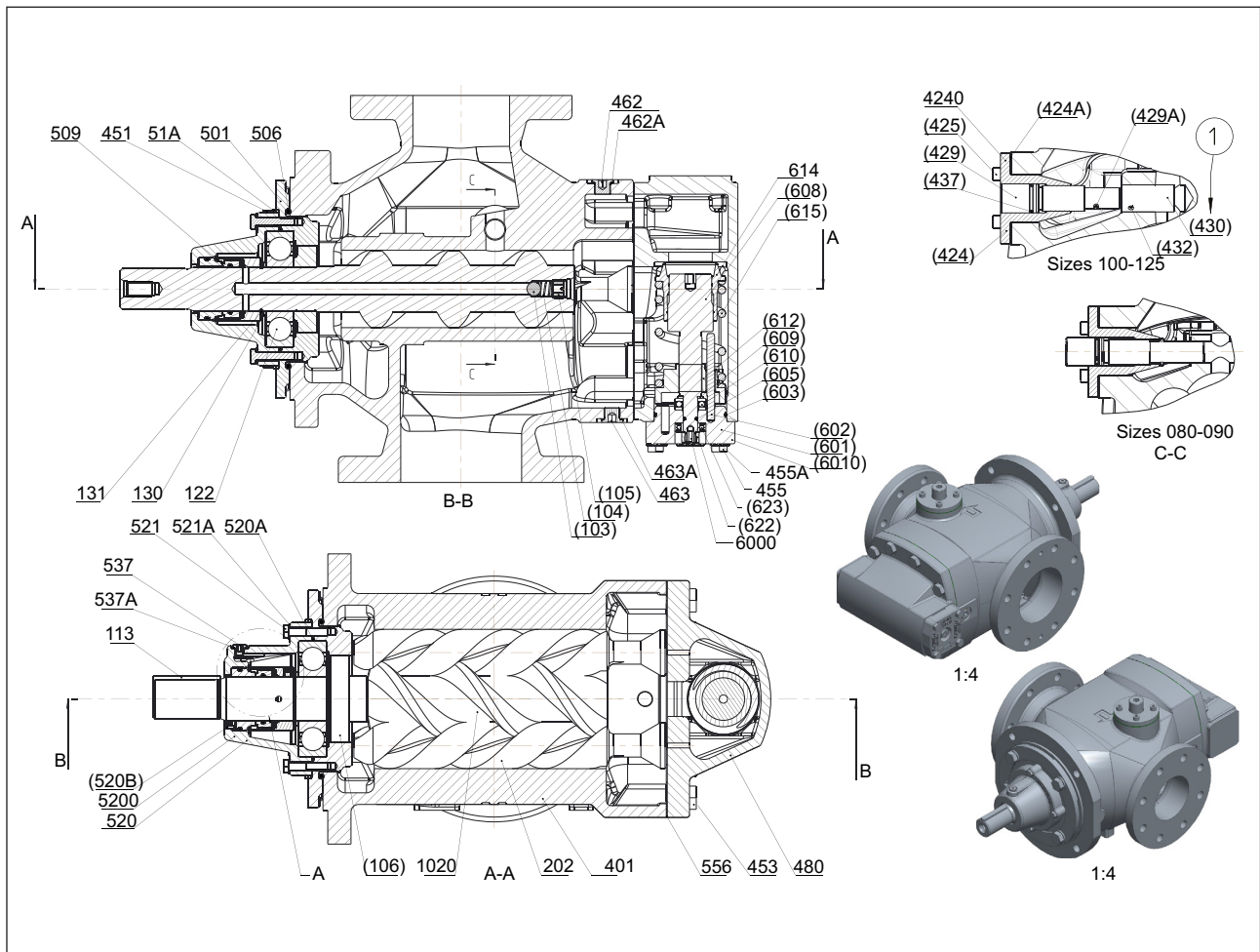


ACF 5 © IMO AB

A = Slide calliper  
B = Screw driver  
C = Crow bar  
D = Plastic mallet  
E = Puller  
F = Allen key  
G = Pairs of pliers  
H = Mounting sleeve  
I = Oil can

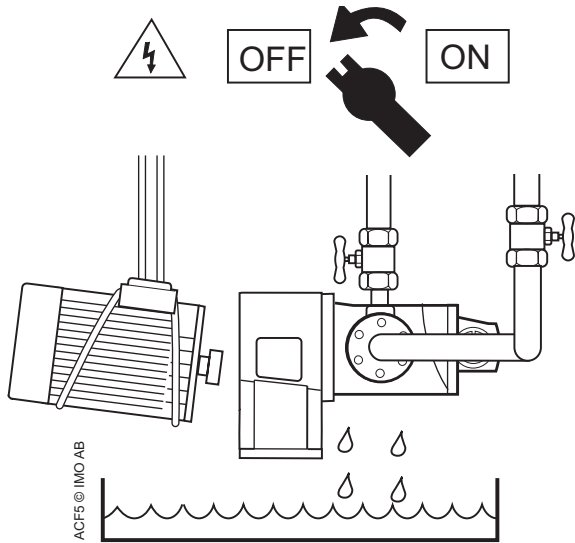
Mounting sleeve dimensions (mm)			
Pump size	d	L	D
080	46	155	62 ±3
090	46	155	62 ±3
100	66	180	85 ±4
110	66	180	85 ±4
125	66	180	85 ±4

## Sectional View




# Dismantling


**A.**



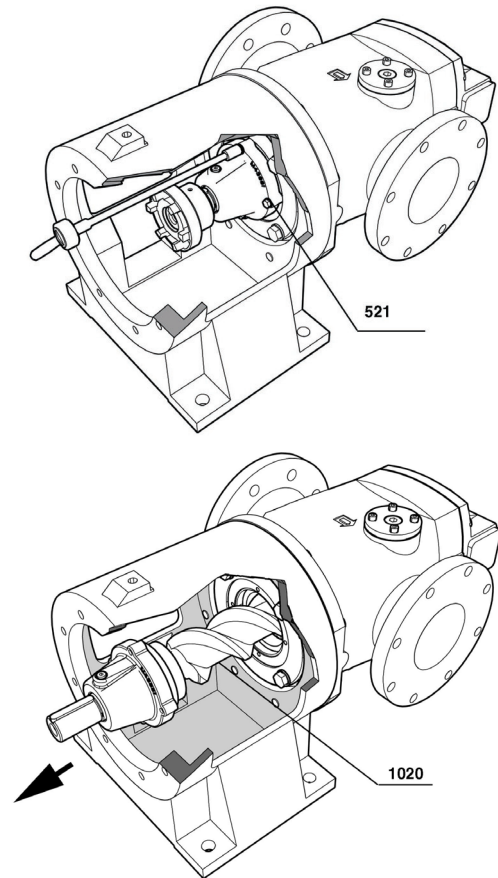
For most installations repair can be done with the pump in place by removing the motor.

- Turn the electricity OFF.
- Close the valves.
- Disconnect the electric motor.
- For horizontal installation drain the pump by loosen screws 453 3-4 turns and loosen 480 valve housing.


**10**  Use appropriate vessels to collect oil spillage when operating the pump

**11**  Pump and/or motor should be lifted with straps securely so that the centre of gravity is located in order to avoid tipping

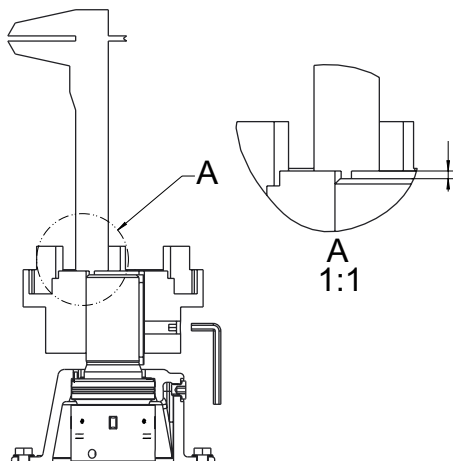
**B.**



- Loosen and remove screws 521
- Pull out the power rotor 1020 with the help of coupling half or an eye bolt fitted in the power rotor

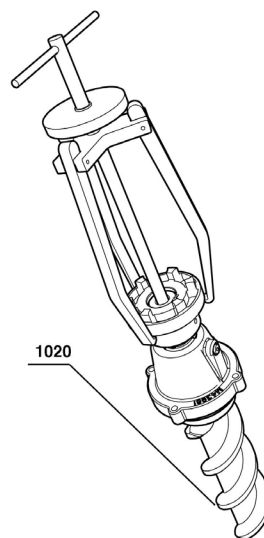
**12**  Be careful when the threaded part of the rotor passes the bore in the cover

**C.**



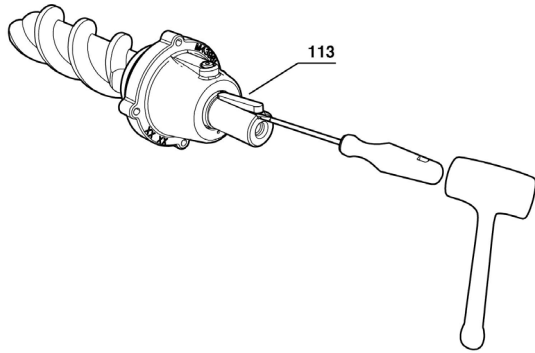
- Note the axial position of the coupling half
- Release the stop screw

**D.**



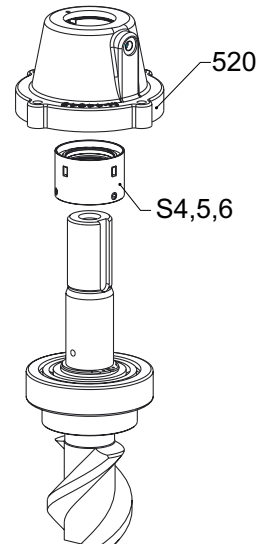
- Remove the coupling half with a puller

**E.**



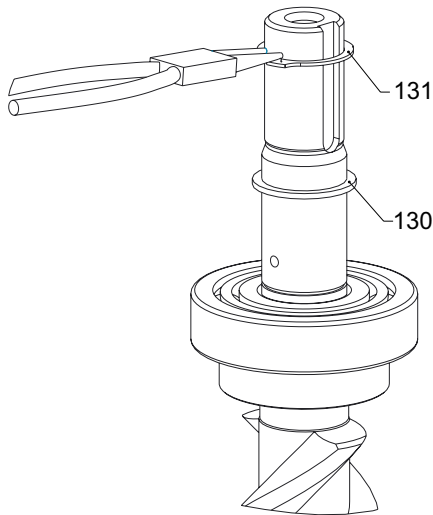
- Remove the key 113

**F.**



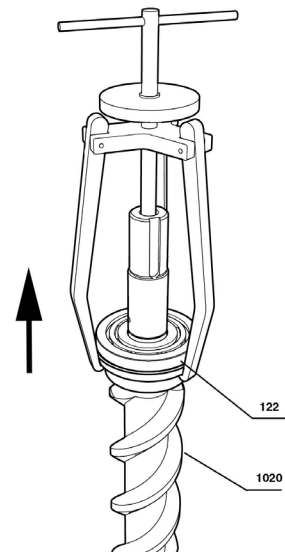
- Pull the cover 520 upwards
- Loosen set screws that lock S5 to shaft. Carefully slide the rotary shaft seal components S4, S5 & S6 upwards.

**G.**



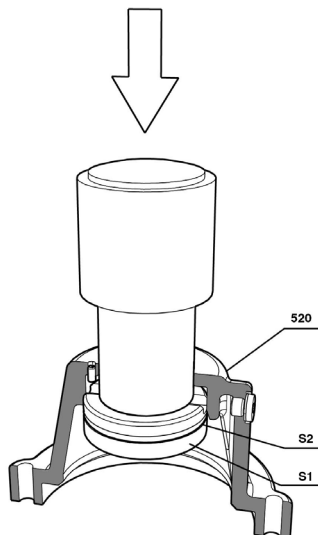
- Remove the circlip 131 with a plier.
- Remove the washer 130.

**H.**



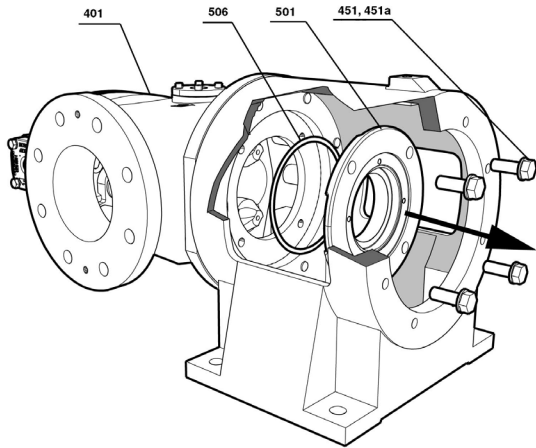
- Remove the ball bearing 122 from the rotor 1020 with a three legged puller.

**I.**



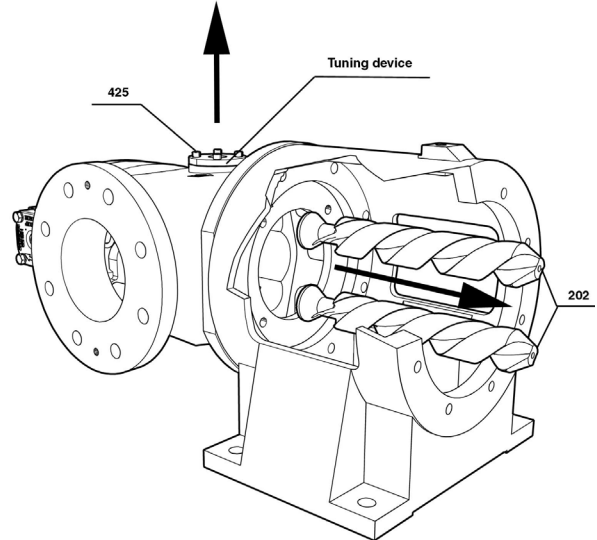
- Press down the complete stationary part of the shaft seal S1 & S2 out the end cover 520 by means of a Teflon piece that fits smoothly.
- NOTE: The other end of the Teflon piece should fit on the opposite side of S1 and is used later on when S1 is pressed into the end cover 520 again.

# J.



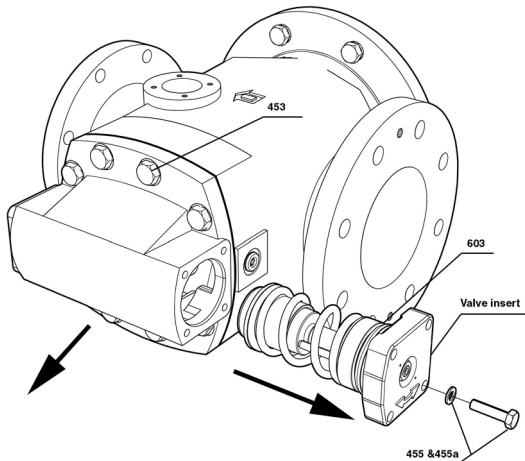
- Loosen the bolts 451 and remove the front-cover 504 with its o-ring 506 from the pump body 401.

# K.



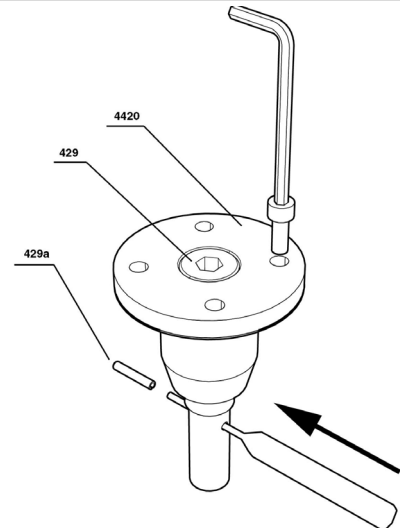
- Carefully slide the idle rotors out of the Pump body.
- Loosen the bolts 425 and pull the complete tuning device straight upwards.

# L.



- Unscrew the valve counter clockwise as far as possible in order to release the spring tension before commencing any works with valve as the spring tension otherwise can cause personal injury
- Loosen the 4 bolts 455 & 455a in order to pull out the complete valve insert.
- Reassemble in opposite order.
- Loosen the 8 bolts 453 in order to remove the back cover 480.
- Reassemble in opposite order.

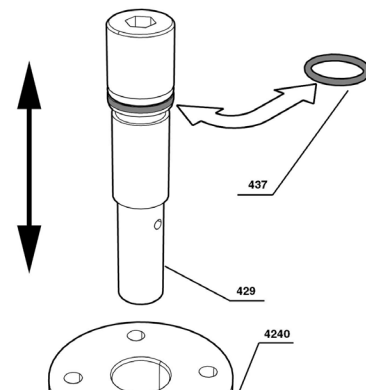
# M.



- Remove the cylindrical spring loaded pin 429a with a suitable puncher.
- Unscrew the tuning piston 429 counter-clockwise from the cover 4420.

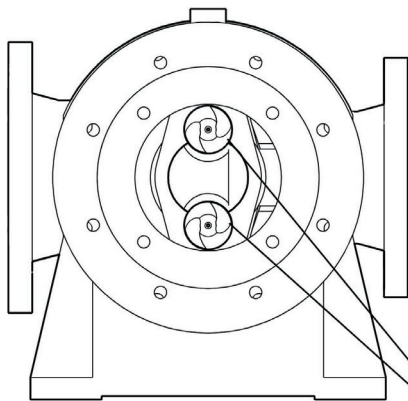
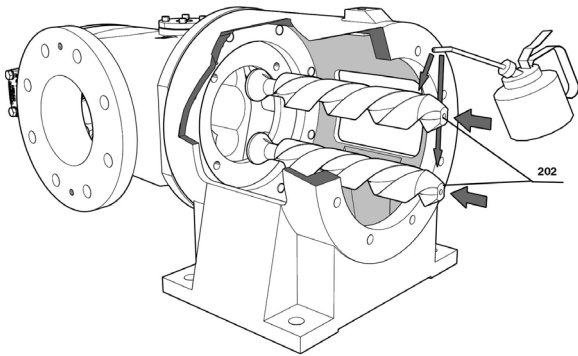
# N.

- Change o-ring 437 on the tuning piston 429 and mount it in 4240 in reverse order.



# Reassembly

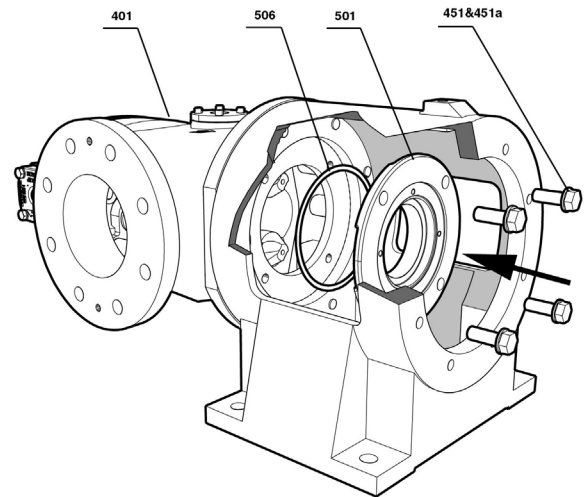
## A.



Note the position!

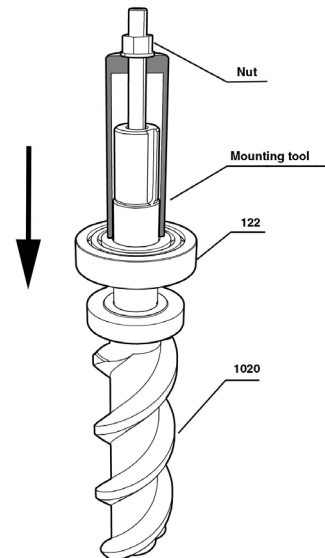
- Lubricate the idler rotors carefully and slide them into the bores of the pump body.  
NOTE: The position of the idler rotors should be exactly as shown above as it otherwise will be difficult to mount the power rotor.

## B.



- Mount the front cover 501 and its o-ring 506 on the pump body 401 with the 4 screws.
- Lubricate the o-ring 506.

## C.

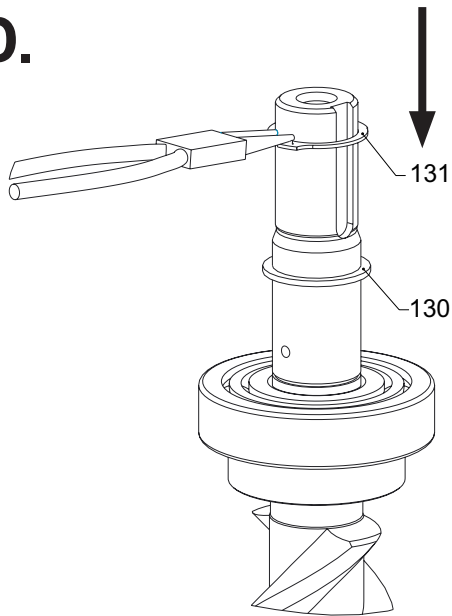


- Mount the ball bearing 122 on the power rotor 1020 with the mounting tool by tightening the nut.

NOTE: The measurement of this tool varies depending on the pump size, a measurement table can be found in the tool description on page 7.

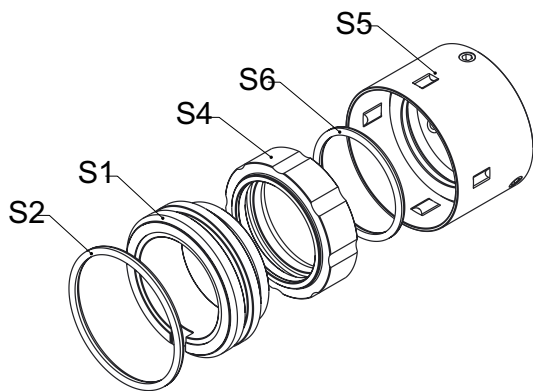
The tool can also be purchased from IMO AB.

**D.**



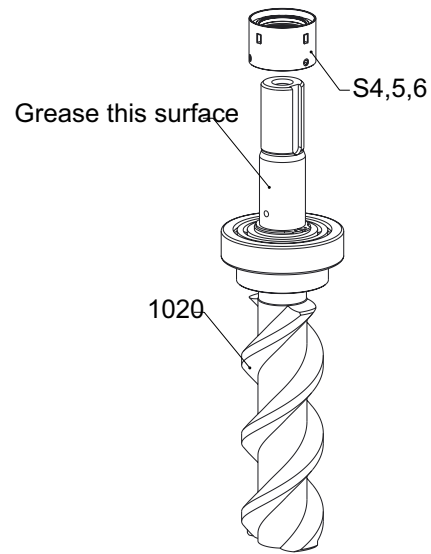
- Mount the washer 130 together with the circlip 131.

**E.**



- Complete mechanical shaft seal

**F.**

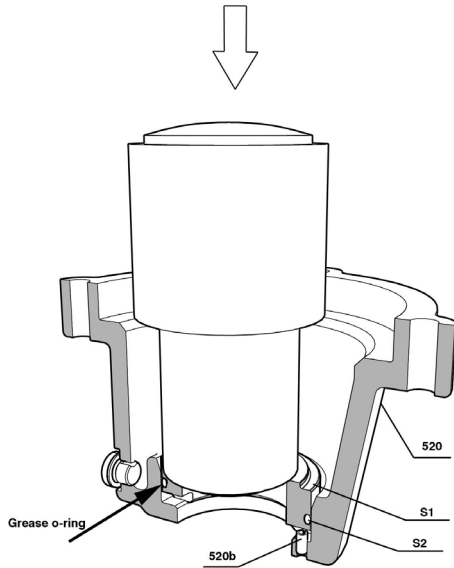


- Slide on the rotating parts of the mechanical shaft seal on the power rotor as shown above, grease the surface thoroughly on the power rotor as this prevents damage to the seals rubber details when mounting it.

- Lock set screws to 8 Nm

NOTE: It is very important that the mechanical seal is handled with care and cleanliness is to be considered as crucial.

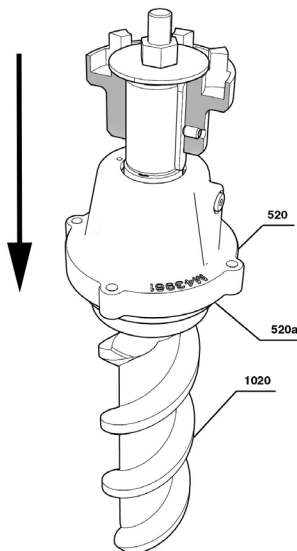
# G.



- Mount the stationary shaft seal part S1 with its o-ring S2 into the end cover 520 by means of a suitable Teflon tool.
- The seal must be mounted so that the slot at the bottom of S1 corresponds with the guiding pin 520b.

NOTE: The o-ring 509f must be thoroughly greased as it otherwise easily could be damaged during the mounting.

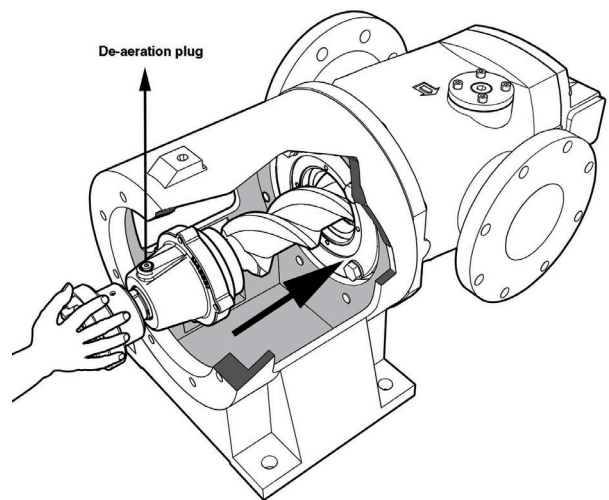
# H.



- Mount the complete end cover 520 carefully on the power rotor 1020.
- Remount the shaft coupling with a suitable tool.

NOTE: Do NOT mount the coupling half with a hammer as this will destroy the shaft seal.

# I.



- Lubricate and fit the power rotor 1020 into the pump by carefully guide it into the idler rotors "openings", see fig A on page 12.
- Make sure that the de-aeration plug always is pointing upwards and reconnect the de-aeration extension pipe.
- Tight the screws 521 crosswise to help the rotor to reach its final position.
- Check that the pump shaft moves freely.
- Fit the electric motor back to the pump.
- Check the correct setting of shaft coupling according to "Alignment and shaft couplings" and proceed according to instruction under "Start-up" in this manual.

Adress:

IMO AB  
PO Box 42090, 126 14 Stockholm  
Sweden