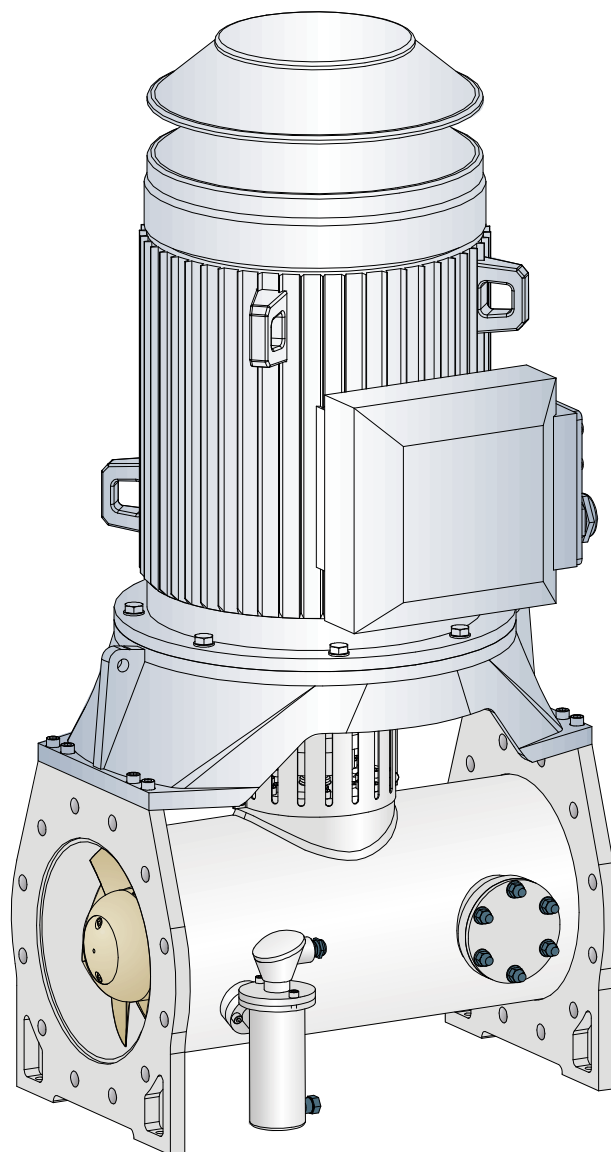


# Framo Anti-heeling Pump

No. 1275-0029-401  
Rev.D 06Mar08

## Instruction for RBP250-3 and RBP300-3





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## 1 GENERAL DESCRIPTION

The RBP250-3 and RBP300-3 are inline reversible single stage propeller pumps, driven by an electric motor. They are available in two versions for vertical or horizontal installation. The motor is connected to the pump through a flexible coupling. A 90° bevel gear reduces the motor speed. Different gear ratios are available to meet the desired head/capacity characteristics.

A vented cofferdam between the water and the gear house is connected to a leakage detection system. A mechanical seal is fitted between water and cofferdam. The seal between the cofferdam and the oil filled gear house is of lip seal type.

A small water leakage through the mechanical seal shall be expected (up to 5 ml/h) and will normally not give a leakage alarm between the inspection intervals.

The pump housing is made of stainless steel with Zn-anode for corrosion protection. The gear house is in cast bronze, and the propeller is made of Ni-Al bronze.

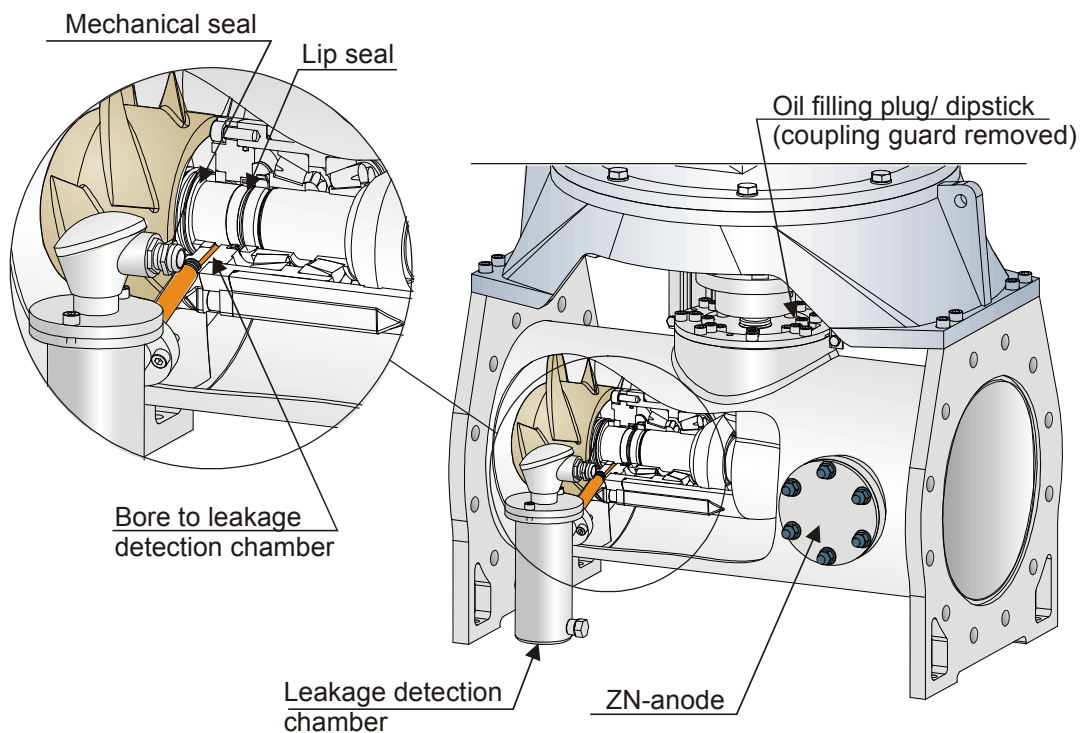
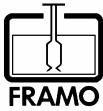


Fig.1



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## 1.1 Technical data

<b>Pump type:</b>	RBP250-3	RBP300-3
<b>Discharge flange connection:</b>	ISO DN 250 PN10 JIS A250 5 K	ISO DN 300 PN10 JIS A300 5 K
<b>Gear oil volume:</b>	0.7 litre	1.3 litre
<b>Gear oil viscosity grade:</b>	ISO VG 68	ISO VG 68
<b>Weight of pump and pump parts:</b>		
Pump head excluded el. driver :	130 KG	230 KG
Electric driver :	Refer to pump spec	Refer to pump spec
Propeller:	9.8 KG	13.6 KG

## 2 OPERATING INFORMATION

### 2.1 Prior to initial start-up

Check for free rotation by turning the flexible coupling.

Drain the leakage detection chamber.

Check gear oil level. For vertical pumps the level is checked with the dipstick mounted on a plug in the gear house. The level must be between the markings on the dipstick. If oil level is too low, remove the venting plug next to the filling plug, and fill oil by inserting a hose.

For horizontal pumps, the gear oil level is checked by opening the two filling plugs. The oil shall be at the same level as the lower hole. If oil level is too low, insert a hose in the upper hole. Fill until oil is coming out of the lower hole.

Check the motor insulation between phases and earth, and between phases. The frame and all windings not connected to measuring voltage must be earthed during the measurement. Also the temperature sensors must be earthed during the measurement. The insulation must be minimum 10 MΩ at 20°C. If the motor insulation is too low, dehydrate the motor for 24 hours in hot air, not exceeding 80°C.

Check that the direction of rotation correspond to pumping direction given on system control panel. CCV rotation of motor seen from shaft end correspond to pumping from propeller side of the pump (from left to right when pump is viewed from the leakage chamber side).

In standstill periods, the anti-condensation heater shall be energized.

### 2.2 Normal operation

In normal operation the pump is run from the anti-heeling control panel. See the anti-heeling control system operation manual.



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### 3 MAINTENANCE INFORMATION

PERIODIC MAINTENANCE		First time at				Interval		At least				Remarks
		Before start	50h	100h	1000h	1000h	4000h	Monthly	Every 6 month	Every year	Every 2nd year	
1	Gear oil level	X				X			X			
2	Gear oil change			X			X				X	
3	Draining the leakage detection chamber	X				X			X			
4	Zink-anode condition									X		
5	Clogging of cooling fan / fan-strainer								X			
6	Drain plugs in el-motor								X			
7	Bearing lubrication in el-motor						See below					If motor has grease nipples

#### Gear oil level

Check gear oil level with the dipstick, level to be between the markings on the dipstick for vertical pumps and level to the lower filling plug for horizontal pumps.

#### Gear oil change

Remove the oil filling plug / dipstick. Empty the gear house using a bilge pump. Remove the venting plug and fill oil using a hose. See pump specification for correct oil type.

#### Gear oil type

ISO VG 68

#### Draining the leakage detection chamber

Remove the plug in the leakage detection chamber. Oil in the leakage detection chamber indicates a worn out or damaged lip seal. Check gear oil level / condition and replace lip seal (see chapter 5.3).

When pump is in operation, a small water leakage through the mechanical seal should be expected. Excessive leakage indicates a worn out or damaged mechanical seal (see chapter 5.3).

#### Zink-anode condition

Close service valves and drain pump / pipe. Remove anode flange and inspect anode condition. Replace anode as necessary.

#### Clogging of cooling fan / fan strainer

Check strainer and cooling fan for clogging. Clean down if necessary



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## Bearing lubrication in el-motor

In motors without grease nipples the bearings are greased for life and no re-greasing is required.

For motors with grease nipples, if a grease outlet plug is fitted, remove it temporarily during re-greasing. If no lubrication information plate is fitted, re-grease according to the table below.

Frame size	Amount of grease	Interval (duty hours)*	
		60 Hz supply	50 Hz supply
160	50 g	1750	2300
180	60 g	1500	2000
200	80 g	1000	1500
225	100 g	750	1300
250	120 g	650	1000
(280)	(70 g)	(500)	(850)

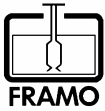
- \* At ambient temp. 45-50°C.  
Interval may be increased with decreased ambient temperature.  
For horizontally installed motors intervals shall be doubled.

Re-greasing shall take place when the motor is running.

Use only special bearing grease with the following properties:

- Good quality grease with lithium complex soap and with mineral- or PAO-oil.
- Base oil viscosity 70-150 cSt at 40°C.
- Consistency NLGI grade 2 or 3.
- Temperature range -30°C - +140°C continuously.

Avoid mixing of grease from different manufacturers.



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## 4 TROUBLE SHOOTING

Symptom	Possible reason	Remedy	Chapter
The pump fails to start.	Propeller is stuck.	Check for free rotation. Rotate motor/coupling by hand. If the shaft is stuck, remove spool piece and inspect the propeller.	
	Electric supply failure.	Check fuses, electric protection and starting device.	
Abnormal vibrations, or	Rotating parts out of balance (foreign object stuck in the propeller).	Check the propeller.	
Abnormal noise from pump.	Worn out gear, or bearings.	Change gear / bearings. Contact FM Services.	5.4 / 5.5
Abnormal noise from motor.	Worn out bearings.	Replace the bearings.	
The capacity is too low.	A rag (cloth) in the propeller.	Check the propeller.	
Gear oil in leakage detection chamber.	Worn out lip-seal. (Cofferdam-gearhouse)	Replace shaft seal.	5.3
Excessive water in leakage detection chamber.	Worn out mechanical seal. (Cofferdam-waterside).	Replace shaft seal.	5.3
Abnormally hot motor.	Insufficient ventilation.	Monitor the environment.	
	Low voltage.	Check.	
	Loose terminal connection.	Check.	
	Overload.	Check that the valve is open (partial open) prior to start. Check current consumption.	





## 5.2 Electric motor

Switch off and lock the power supply, mark the wires and their position before disconnection. Remove the electric motor. Use an extractor to remove the flexible coupling.

In case of bearing replacement, always replace both bearings and shaft seals as well.

Repair of the motor shall be carried out by qualified personnel, and prior authorization from manufacturer is essential for explosion protected motors grade EExde.

## 5.3 Seals and sleeve

Drain oil from gear house by using a bilge pump. Use an extractor to remove the flexible coupling. Remove leakage control box and cofferdam pipe prior to disassembly of seal housing on propeller shaft.

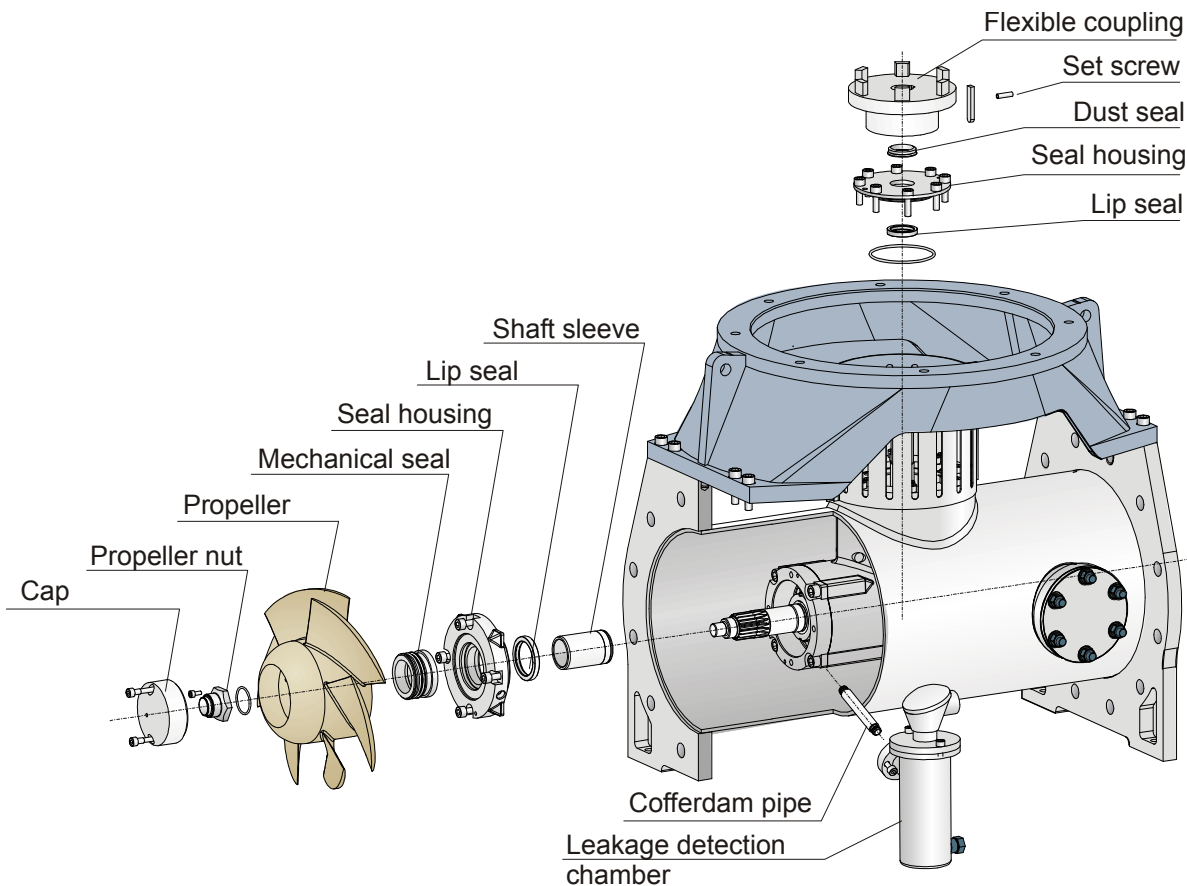
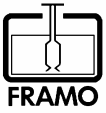


Fig.3



### 5.4 Bearing arrangement on propeller shaft

RBP250:

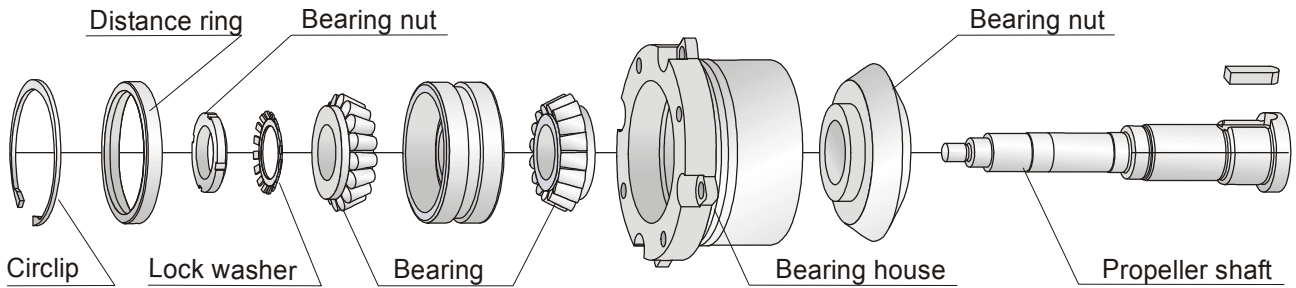


Fig.4

RBP300:

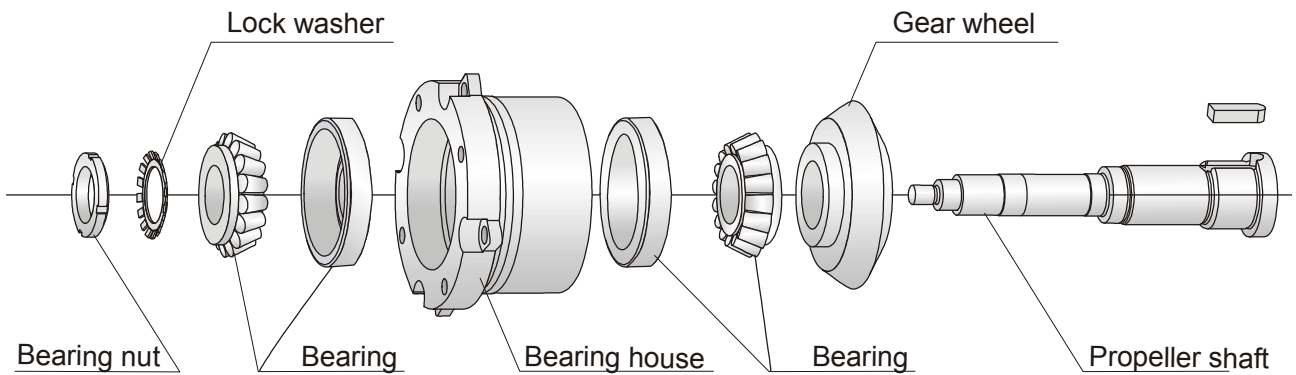
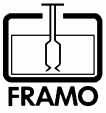


Fig.5



### 5.5 Bearing arrangement on coupling shaft

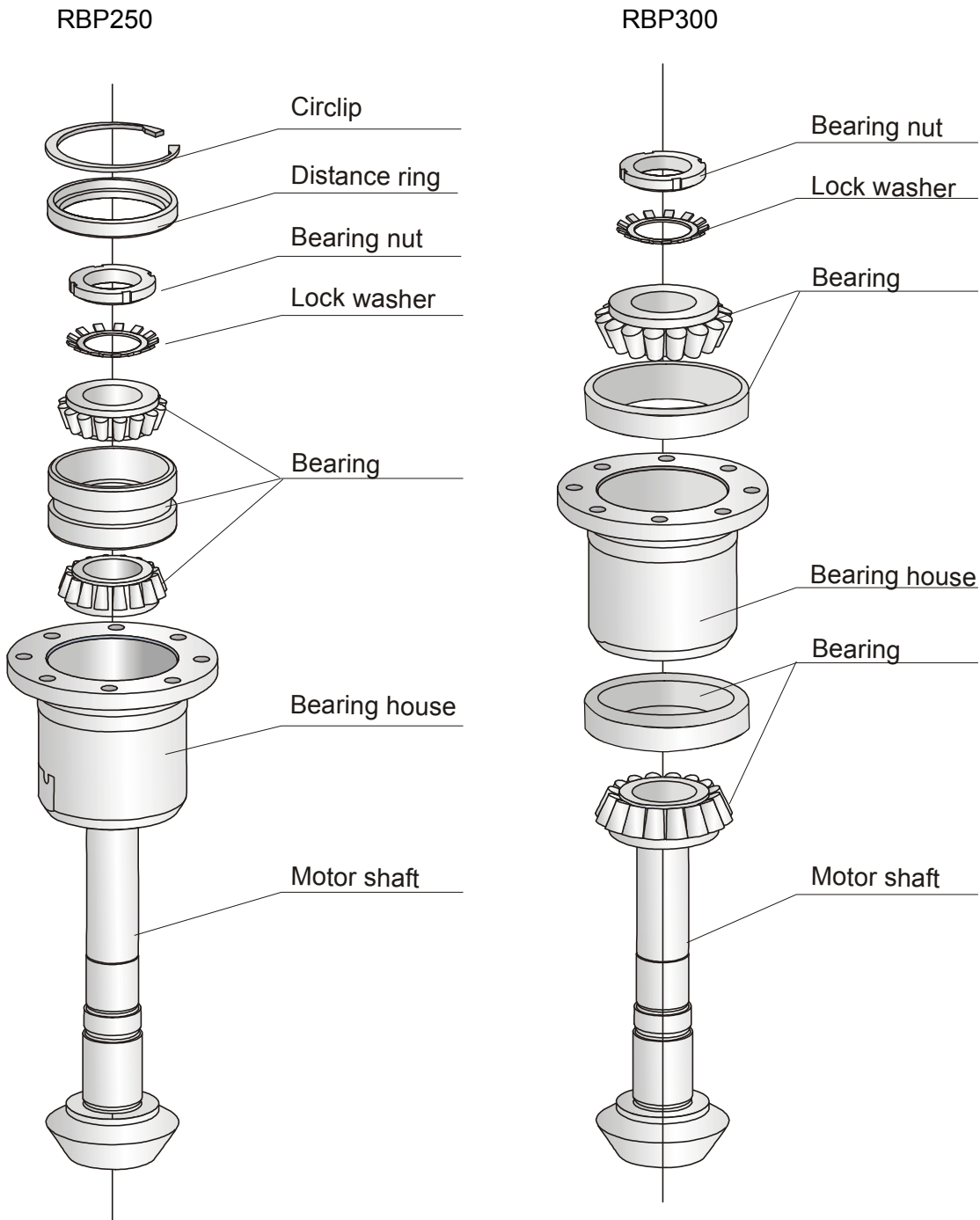
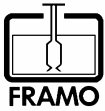


Fig.6



## 5.6 Assembling

Assembling is done in reversed order according to the dismantling. Pay special attention to the following points.

- Use only Framo genuine spare parts.
- Use grease on all O-rings.
- Use molybdenum disulphide to lubricate stainless steel bolts, nuts and washers.
- Torque setting on bolts as shown in table.

<b>Bolt</b>	<b>Torque</b>
M6	9.2 Nm
M8	22.3 Nm
M12	76.2 Nm
M16	190.0 Nm

- The bearings should be left in their original packages until immediately before mounting so that they do not become dirty. Mounting should be carried out in a dry, dust-free room away from machines producing swarf and dust.
- When adjusting the bearings it is important to turn the shafts through several revolutions in both directions. Tighten the bearing nut until the torque necessary to turn the shaft is increasing. Slightly loosen the nut and engage the locking washer to one of the slots on the bearing nut.

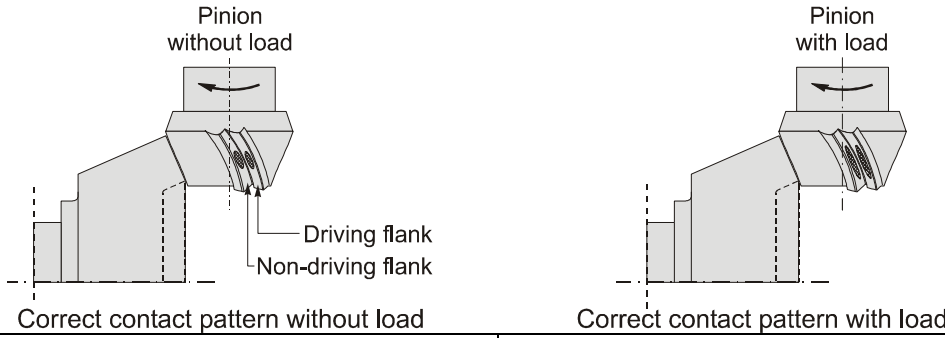


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- Adjust gears by using shims until correct contact pattern is achieved. See fig.7. The maximum allowable backlash is 0.17 mm.

## MOUNTING OF GEARS



**NOTE!**

A pair of gears with no load applied should have a contact pattern length of min. 50% of the tooth length.

Figures show incorrect contact pattern. Arrows show the direction of movement to achieve correct contact pattern.	<b>Contact pattern on pinion</b>	<b>Correction</b>	
		<b>Shims on motor shaft</b>	<b>Shims on propeller shaft</b>
	- Upper part of driving flank - Lower part of non-driving flank	Add	Remove
	- Lower part of driving flank - Upper part of non-driving flank	Remove	Add
	- Tooth top	Remove	Remove
	- Tooth root	Add	Add

Fig.7

- Use assembling tool for lip seal when assembling lip seals into seal housings. Note the direction of seal. The lip and spring shall face the oil side of seal housing.
- Special tools : see tool list

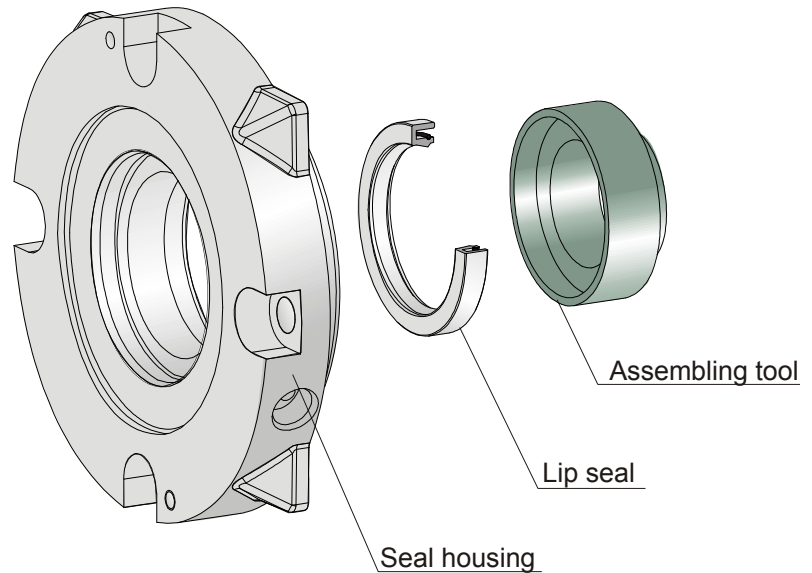


Fig.8

- Use assembling cylinder when installing the seal housing with lip seal and the mechanical seal onto the propeller shaft.
- Fill gear oil using a hose. Check for correct level using the dipstick.
- Check the lip seal for leakage by pressurizing the gear house with air at 2.5-3 bar.

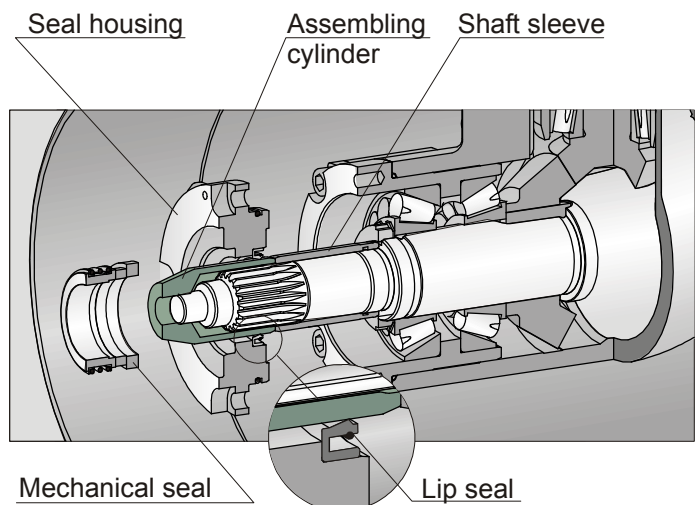


Fig.9

- Insert the drain pipe between cofferdam and leakage detection chamber, and assemble the leakage detection chamber.
- Assemble the propeller and secure the lock nut with the locking washer.
- Check for free rotation of propeller when turned by hand.
- When installing the motor, take care not to damage the flexible coupling.
- The coupling guard must always be mounted when the pump is running to prevent injury.
- After the pump is filled with water, drain leakage detection chamber. Check for leakage.