

# ABS Dry Installed Wastewater Pumps Series FR

## Dismantling and Assembly

### Close-coupled and Bearing Assemblies 3R, 4R, 5R, 5F and 6F

The pump and seal assembly drawings should be available. This instruction covers complete dismantling and re-assembly procedures, including cleaning and checking. For less complete servicing, only the appropriate paragraph(s) need be referred to.



Before dismantling a pump in service ensure the drive is locked off (including any remote controls). Suction and discharge valves should be closed. The pump should be drained.

Also see our Safety Instructions Para. "Dismantling".

#### 4.1 Dismantling

##### 4.1.1 Rotor Dismantling

###### 4.1.1.1 Close-coupled

1. Loosen the screws securing the pump drive-end support foot to the baseplate.
2. Remove the nuts securing the lantern to the pump casing. Withdraw the rotor unit from the casing, using jacking screws or levers to free it, see Fig. 2a.
3. Remove the rotor unit safely, e.g. by using the ABS Lifting Arm. The socket for the lifting arm can be fastened to the floor. Place the lifting arm in the socket and lift the rotor unit as in Fig. 3a.

###### 4.1.1.2 Bearing Assemblies

1. Remove the coupling guard and any hoses/pipes for sealing, quench (low pressure sealing liquid) and cooling liquids. For belt drive see Para. 4.1.2.
2. Remove the coupling spacer, Fig. 1, and loosen the screws securing the pump drive-end support foot to the baseplate.
3. Remove the nuts securing the lantern to the pump casing. Withdraw the rotor unit from the casing, using jacking screws or levers to free it, see Fig. 2b.
4. Remove the rotor unit safely, e.g. by using the ABS Lifting Arm. Place it in its socket and then suspend the lantern from the pulley-block with a sling. See Fig. 3b.

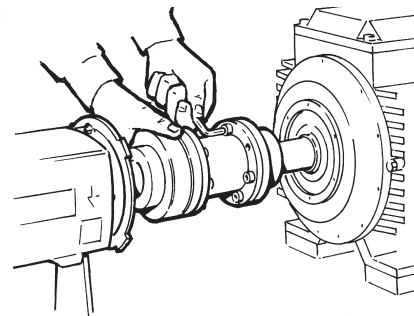


Fig. 1  
Removal of coupling spacer to provide withdrawal gap.

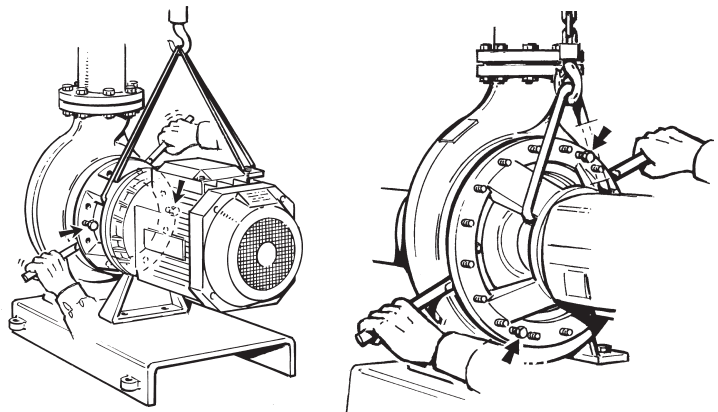


Fig. 2a Close-coupled and 2b Bearing Assembly  
To remove the rotor unit, insert jacking screws in the tapped holes as the arrows show or use levers. For Close-coupled version lift the rotor unit as in 2a. For Bearing Assemblies use a sling according to 2b.

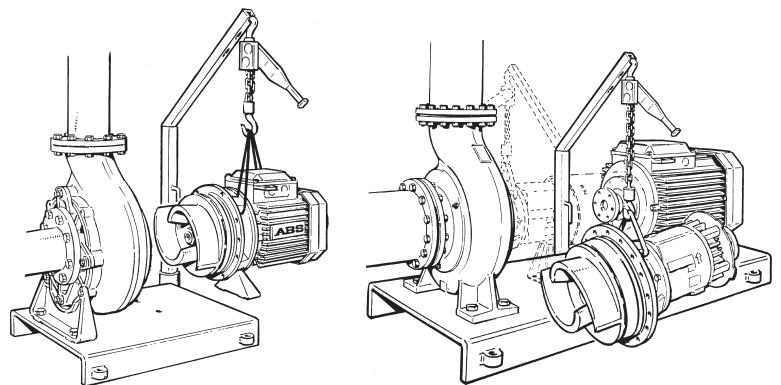


Fig. 3a Close-coupled and 3b Bearing Assembly  
By using an ABS lifting arm one man can lift out the rotor from the casing.

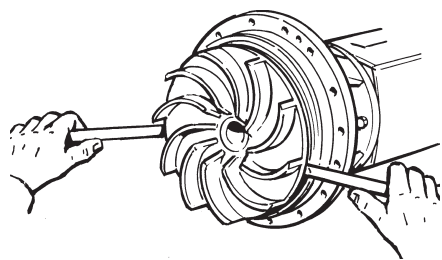


Fig. 4  
Prising off an impeller. Position levers behind the hub as shown.

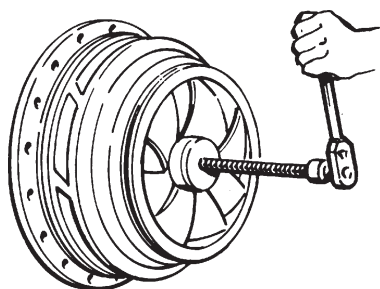


Fig. 5  
A special tool is used to draw off the impeller for Bearing Assemblies 5 and 6.

## 4.1.2 Belt Drive

### 4.1.2.1 Dismantling of belts 3R and 4R

1. Unscrew the four screws which is holding the belt guard and lift it away.
2. Slacken the four nuts under the motor plate.
3. Remove the belt from the pulleys without using any tool or force.

### 4.1.2.2 Dismantling of pulleys and bushes

1. Slacken all screws several turns, remove one or two according to number of jacking off holes shown in Fig. 16 in Instruction 1 "Installation". Insert screws in jacking off holes after oiling thread and point of grub screws or thread and under head of cup screws.
2. Tighten screws alternately until bush is loosened in hub and assembly is free on the shaft.
3. Remove assembly from the shaft.

## 4.1.3 Impeller



There may be remnants of the pumped liquid in the cavities of the impeller and in the pump casing.

Close-coupled, Bearing Assembly 3R and 4R have a **shaft extension**, which is keyed on to the motor shaft. The impeller is secured onto the shaft extension with an impeller screw and the impeller is driven by the hexagonal shape of the end of the shaft extension instead of a key.

Bearing Assemblies 5R, 5F and 6F have a keyed shaft and the impeller is fastened with impeller screw(s) onto the shaft of the bearing assembly. All sizes have a shaft sleeve.

### 4.1.3.1 Impellers for Close-coupled, Bearing Assemblies 3R, 4R and 5R

- a) Remove the impeller screw.
- b) Use levers to prise off the impeller as in Fig. 4.

### 4.1.3.2 Impellers for Bearing assemblies 5F and 6F

Remove the impeller screw(s) and then draw off the impeller using a special hub puller. See Fig. 5.

Remove the key and any burrs on the shaft and oil the shaft with e.g. molybdenum-disulphide. Remove the O-ring adjacent to the shaft sleeve and the washer.

## 4.1.4 Shaft Seal

For removing the shaft extension and seals, see Instruction No. 3 "Shaft Seal".

## 4.1.5 Close-coupled

Remove the lantern from the motor. For motor overhaul, see motor manufactures instructions.

## 4.1.6 Bearing Assembly

### 4.1.6.1 Bearing Assemblies 3R, 4R and 5R

1. Remove the lantern carefully as the stationary parts of the seals can be damaged.
2. Pull off the thrower.
3. Loosen the coupling half locking screw before pulling off the coupling half, see Fig 8. Remove the key.
4. Remove the four screws fastening the coupling guard support to the bearing bracket on the rearside of the bearing. Remove the support foot from the bearing bracket.
5. Place the Bearing Assembly on trestles or over a hole in the workbench as in Fig. 9. Slightly lift the Bearing Assembly in the shaft end and tap on the bearing bracket. All shafts have a tapped hole for an eyebolt. For hole sizes see Table 1 below.
6. Remove the bearing cover.
7. **3R and 4R:** Loosen the locking screw, which is securing the bearing, in the shaft nut and unscrew it.  
**5R:** Lift up the locking washer, unscrew the lock nut and remove the locking washer.
8. The spherical roller bearing can be removed from the shaft with a puller. Remember to place the puller on the inner race.
9. **3R and 4R:** The roller bearing, which will accompany the shaft, can be removed with a puller.  
**5R:** The roller bearing inner race, which will accompany the shaft, can be removed with a puller. For the outer race, remove the circlip from the bracket and then carefully without damaging the bearing pull out the outer race.

Table 1

| Bearing Assembly | 3R  | 4R  | 5R  | 5F  | 6F  |
|------------------|-----|-----|-----|-----|-----|
|                  | M12 | M16 | M20 | M20 | M20 |

### 4.1.6.2 Bearing Assemblies 5F and 6F

1. Remove the casing cover, see Fig. 6 and carefully tap off the lantern. See Fig. 7.
2. Pull off the thrower.
3. Loosen the coupling half locking screw before pulling off the coupling half, see Fig. 8. Remove the key.
4. Remove the four screws fastening the bearing housing and the coupling guard support to the bearing bracket. Remove the support foot from the bearing bracket.
5. Loosen the stop screw in the fan impeller and pull it off.
6. Position the bearing assembly over a hole in the work bench or place it on trestles. Lift the shaft with bearing housing out of the bearing bracket, as in Fig. 9. All shafts have a tapped hole for an eyebolt. For hole sizes see Table 1 above.
7. Remove the bearing cover. Tap off the bearing housing from the shaft-bearing unit, see Fig. 10. Lift up the locking washer, unscrew the lock nut and remove the locking washer.
8. For dismantling the three axial bearings, angular contact ball bearings, place the shaft in a hydraulic press with two 10mm steel plates under the inner race, see Fig. 11.

#### ATTENTION

Check that the plates are under the inner race, otherwise the balls outer race could crack with the balls becoming missiles.

9. The roller bearing inner race can be removed from the shaft with a puller. Remove the circlip and the outer race from the bearing bracket without damaging the bearing.

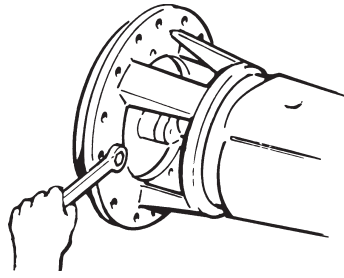


Fig. 6 Bearing Assemblies 5F and 6F Casing cover and lantern are secured together by two screws.

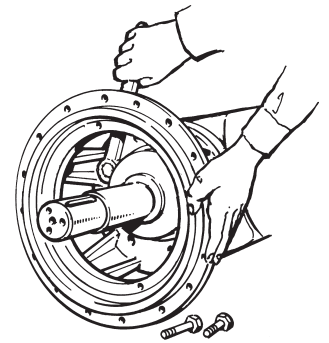


Fig. 7 Bearing Assemblies 5F and 6F Six screws secure the lantern to the bearing bracket.

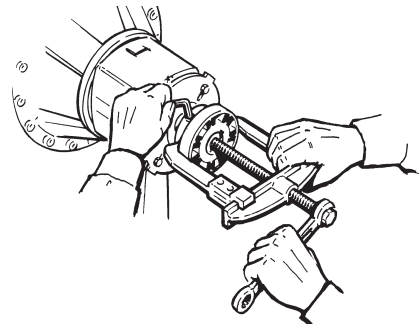


Fig. 8 Remember to loosen the locking screw before pulling off the coupling half.

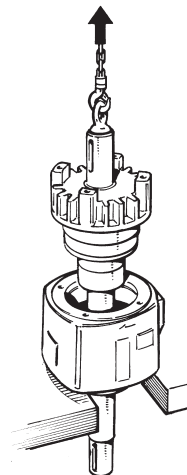


Fig. 9 (The figure shows 5F and 6F but applies to all Bearing Assemblies) When dismantling the Bearing Assembly it should be placed on trestles or over a hole in the work bench.

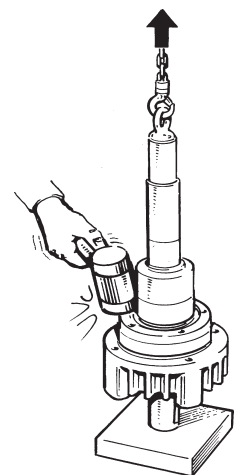


Fig. 10 Only applies to 5F and 6F The bearing housing is removed from the shaft-bearing unit.

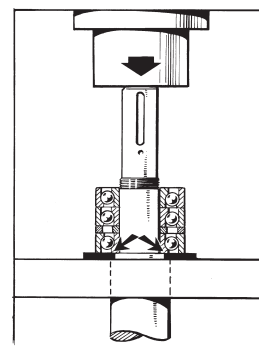
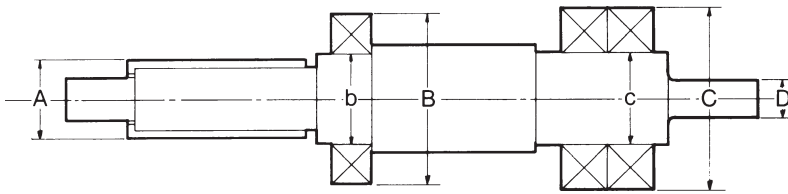


Fig. 11 When dismantling the axial thrust bearings a hydraulic press should be used. Two 10mm steel bars are placed as shown, i.e. under the inner races.



## 4.2 Cleaning and Inspection

Clean all parts after dismantling. Clean off any gasket remnants on sealing faces and rust or deposits on location surfaces.

The seal cartridge is repacked or overhauled according to Instruction No. 3 "Shaft seal".

Inspect other parts such as the gland follower and radial seals. Replace if worn. Dimensions of shafts and associated parts are given in Table 2.

### 4.2.1 Closed Impeller

Measure the clearance between the casing ring and impeller. Replace the casing ring if the max. wear is exceeded, see Table 3.

### 4.2.2 Semi-open Impeller and Wear Disc

If the pump is fitted with a semi-open impeller, then the casing will contain a replaceable wear disc. This should be replaced if worn.

## 4.3 Assembly

The procedure is basically the reverse of that for dismantling, but please note the following:

1. Heat the axial bearings and the inner race of the radial bearing to maximum 105°C.
2. After cooling, grease the bearing.

### 4.3.1 Bearing Assemblies 3R, 4R and 5R

3. **3R and 4R:** Mount the roller bearing on the shaft after heating.
- 5R:** Mount the roller bearing outer race in the bearing bracket and the inner race on the shaft after heating. Fit the retaining circlip.
4. Mount the spherical ball bearings on the shaft after heating exactly as shown in Fig. 12, i.e. the wider sides of the outer races should face each other. Do not forget the support ring.
6. **3R and 4R:** Mount the shaft nut and tighten the locking screw.
- 5R:** Mount the lock washer and the bearing nut. Tighten and lock the nut.
7. If radial seals are replaced, make sure they are fitted in the right direction (the groove pointing to the shaft end on both sides).
8. Heat the bearing bracket to approximately 50°C and push it over the bearings, the shaft should be vertical. Fit the O-ring on the bearing housing and lubricate it. Fit the bearing cover.
9. Mount the thrower and coupling guard support. Postpone mounting the support foot, see Para. 4.3.5.
10. Lubricate the bearings with grease (after cooling down). See Table 4 on page 5 for quantities.

Table 2  
Dimensions and tolerances of shafts and associated parts.

| Bearing Assembly | ØA Gland Packing | ØA Mech. Seal | Øb    | ØB    | Øc    | ØC    | ØD    |
|------------------|------------------|---------------|-------|-------|-------|-------|-------|
| 3R               | -                | 75h8          | 60m5  | 100G6 | 65k5  | 120J6 | 42m5  |
| 4R               | -                | 85h8          | 70m6  | 125G6 | 75k5  | 160J6 | 65m5  |
| 5R               | 100±0,05         | 100±0,05      | 100m6 | 180M7 | 95k5  | 200J6 | 80m5  |
| 5F               | 100h8            | 100h8         | 90m5  | 190M7 | 90k5  | 190J7 | 80m6  |
| 6F               | 120h8            | 120h8         | 100m5 | 240M7 | 110k5 | 240J7 | 100m6 |

Table 3  
Maximum wear between impeller and casing ring.

| Casing ring diameter D mm | Max. clearance S mm | New pump clearance S mm |
|---------------------------|---------------------|-------------------------|
| 40-95                     | 0,4                 | 0,15                    |
| 100-195                   | 0,7                 | 0,2-0,3                 |
| 200-350                   | 1,0                 | 0,3                     |
| 355-450                   | 1,2                 | 0,4                     |
| 455-550                   | 1,4                 | 0,5                     |

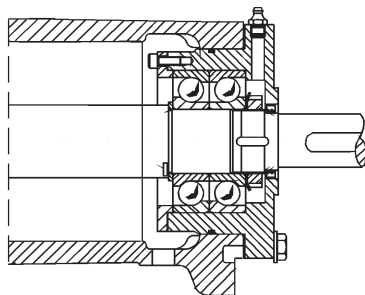
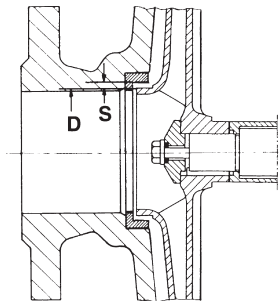


Fig. 12 (3R, 4R and 5R)  
Grease-lubricated bearing assembly.

### 4.3.2 Bearing Assemblies 5F and 6F

1. Mount the roller bearing outer race in the bearing bracket and then fit the retaining circlip. Fit the inner race on the shaft after heating.

**ATTENTION**

3. Heat the three angular contact ball bearings and mount them exactly as shown in Fig. 13. The spacing rings are placed on the shaft after the first bearing. Note that the rings are made to match and marked accordingly.
3. With the aid of a hydraulic nut the bearings and spacing rings are then forced together, see Fig. 14. Use type HMV 18 hydraulic nut for Bearing Assembly 5F and type HMV 22 for size 6F. The force is 25MPa or 10-15 Tons. (Note - It is not possible to achieve satisfactory contact between the parts by using the bearing nut.)
4. Mount the lock washer and the bearing nut. Tighten and lock the nut.
5. After cooling down, the bearings are filled with grease. See Table 4 for quantities.
6. Heat the bearing housing to approximately 50°C and push it over the bearings. Position the hole in the bearing housing over the slot in the outer distance ring to facilitate the passage of grease, as in Fig. 15.
7. Fit the bearing cover.
8. Fit the O-ring on the bearing housing and lubricate it before lowering the shaft-bearing unit into the bearing bracket. The drainage hole in the bearing housing should be facing the fastening for the support foot. The following is to be observed:

**Grease lubrication**

The hole in the bearing housing should be positioned in line with the grease nipple in the bearing bracket. See Fig. 15. The grease can now pass straight from nipple to bearing.

9. Measure the shaft overhang, as in Fig. 16. Use shims between the bearing housing and the bearing bracket if necessary.

### 4.3.3 Shaft Seal

For seal and lantern assembly, see Instruction No. 3, "Shaft Seal".

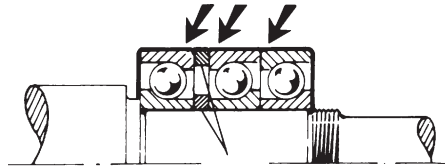


Fig. 13 Bearing Assemblies 5F and 6F  
When fitting the angular contact ball bearings each bearing is positioned so, that the wider edge of its outer race faces the spacing rings.

Table 4  
Grease quantities in grams when assembling.

| Bearing location | Bearing Assemblies |     |     |     |     |
|------------------|--------------------|-----|-----|-----|-----|
|                  | 3R                 | 4R  | 5R  | 5F  | 6F  |
| Non-drive end    | 70                 | 100 | 180 | 180 | 280 |
| Drive end        | 80                 | 115 | 190 | 190 | 315 |

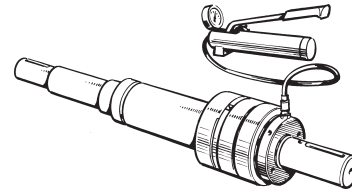


Fig. 14 Bearing Assemblies 5F and 6F  
To achieve satisfactory contact between the three bearings and the spacing rings a hydraulic nut must be used.

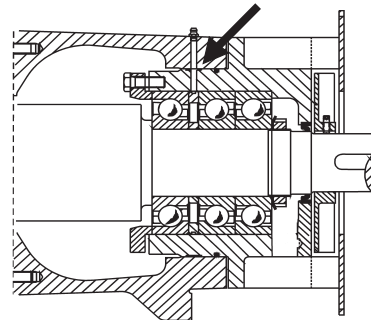


Fig. 15  
Grease-lubricated bearings. Line up the hole in the bearing housing with the grease nipple when mounting it into the bearing bracket.

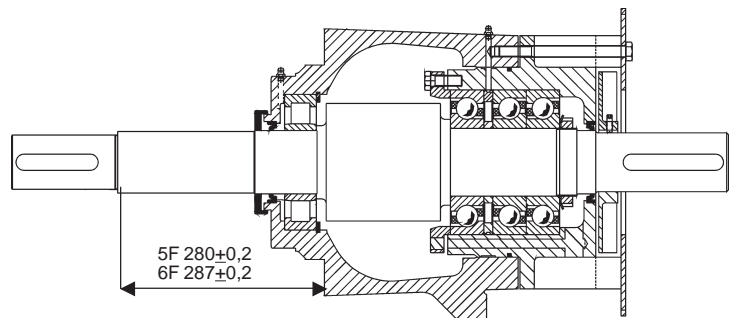


Fig. 16  
Check the shaft overhang for Bearing Assemblies 5F and 6F.

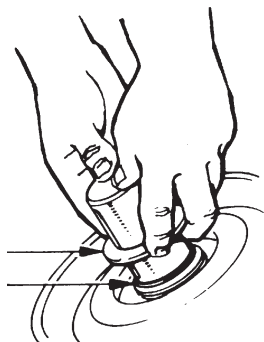


Fig. 17  
Fit O-ring and washer adjacent to the shaft sleeve, before fitting the impeller.

Table 5  
Tightening torque for impeller screws

| Bearing Assembly- and close-coupled pumps | Shaft dia.* mm | Nos. of impeller screws | Size of thread | Tightening torque |      |
|---|----------------|-------------------------|----------------|-------------------|------|
|   |                |                         |                | Nm                | kpm  |
| 3R  | 48             | 1                       | M12            | 81                | 8,1  |
| 4R  | 60             | 1                       | M20            | 385               | 38,5 |
| 5R  | 60             | 2                       | M16            | 190               | 19   |
| 5F  | 80             | 3                       | M16            | 190               | 19   |
| 6F  | 96             | 3                       | M20            | 350               | 35   |

\* At the impeller

#### 4.3.4 Checking

If the shaft or bearings have been replaced, the following should then be checked with a clock-gauge.

1. The shaft throw at the position of the shaft seal (max. 0.05mm)
2. The contact surface of the casing cover against the pump casing must be perpendicular to the shaft. (Max. error at contact diameter 0.10mm).

#### 4.3.5 Impeller

For bearing assembly sizes 5F and 6F change the O-ring in the shaft sleeve that is sealing against the washer behind the impeller, see Fig. 17.

Lubricate the shaft and impeller with e.g. molybdenum-disulphide. After fitting the impeller check for any play on the shaft and the key. Lubricate also the impeller screws with molybdenum-disulphide. The tightening torque of the impeller screws is shown in Table 5.

Check the clearance between the rear vanes of the impeller and the casing cover. The clearance should be 1-2mm.

#### 4.3.6 Other Parts

The casing cover sealant tape/gasket should be replaced after each dismantling, by ABS original.

#### **ATTENTION**

On some of the pumps with semi-open impellers the wear disc is held in position by screws that go through the casing. It is important to have the correct material for the screws and sealant.

Mount the rotor unit in the pump casing and tighten the nuts.

#### **ATTENTION**

Re-fit the support foot as follows:

#### **If the hole in the support foot is conical (4R, 5R, 5F and 6F)**

First, loosely, fit all screws. Put shims under the foot to ensure that no forces are applied and tighten the foot to the plate. Finally tighten the screw onto the bearing bracket.

#### **If the hole in the support foot is oval (3R)**

First fit the foot to the baseplate, then fit the foot to the bearing bracket to ensure that no forces are applied to the bearing bracket.

Re-fit the coupling half to the pump shaft, according to Instruction No. 1 "Installation" Para.1.5. Check the alignment in Instruction No. 1, Para. 1.6.

## 4.4 Axial Adjustment

The clearance between the semi-open impeller and wear disc is adjusted by means of adjusting screws located on the suction side of the pump casing. These screws are secured by locking screws, see Fig. 18. The distance between the wear disc and the impeller is set at an optimum before delivery from our workshop, and should not be changed unnecessarily. The clearance between disc and impeller should be 0.4-0.7mm for close-coupled, 3R, 4R and 5R.

### 4.4.1 Close-coupled, 3R, 4R and 5R

(See Fig. 18 a)

- Undo the screws (Fig. 18 a (1)) (anti-clockwise).
- Loosen (anti-clockwise (-)) the adjusting screws (Fig. 18 a (2)).
- Adjust the bottom plate with the screws (1) until it touches the impeller.
- Turn the adjusting screws (2) clockwise (+) until it touches the pump casing.
- Turn back the adjusting screws a 1/2 turn, and check that the bottom plate doesn't scratch against the impeller.
- Lock the bottom plate by securing the screw (1).
- It is very important that the disc is not askew relative to the impeller, as this will adversely affect the performance of the pump.

### 4.4.2 Bearing assemblies 5F and 6F

(See Fig 18 b)

- Undo the locking screws (1).
- Move the wear disc towards the impeller by turning the adjustment screws (2) **clockwise**. Do not force the disc against the impeller, but stop turning when the wear disc touches the impeller.
- When the whole surface of the disc is in contact with the impeller, turn each adjustment screw half a turn **anti-clockwise** and secure it with the locking screw (1). The gap should be measured with a feeler gauge and be 0,9 mm.
- It is very important that the disc is not askew relative to the impeller, as this will adversely affect the performance of the pump.

## 4.5 Installation

### ATTENTION

Check alignment according to Para. 1.6 in Instruction No. 1 "Installation".

Reconnect any hoses/pipes for cooling, quench and sealing liquids.

Start-up according to Paras. 2.1-2.3 in Instruction No. 2 "Start-up and Running Maintenance".

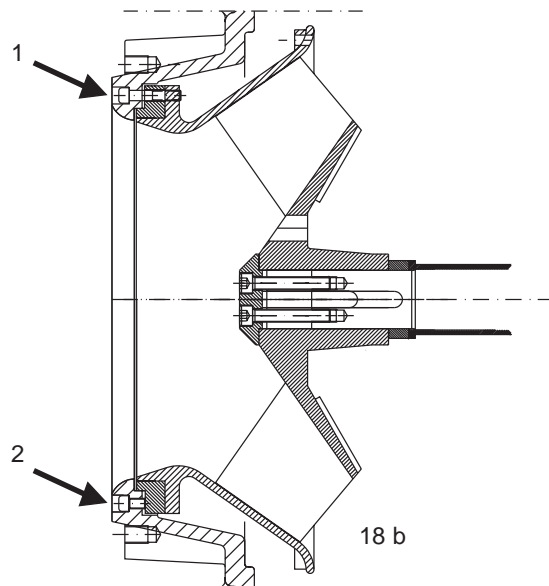
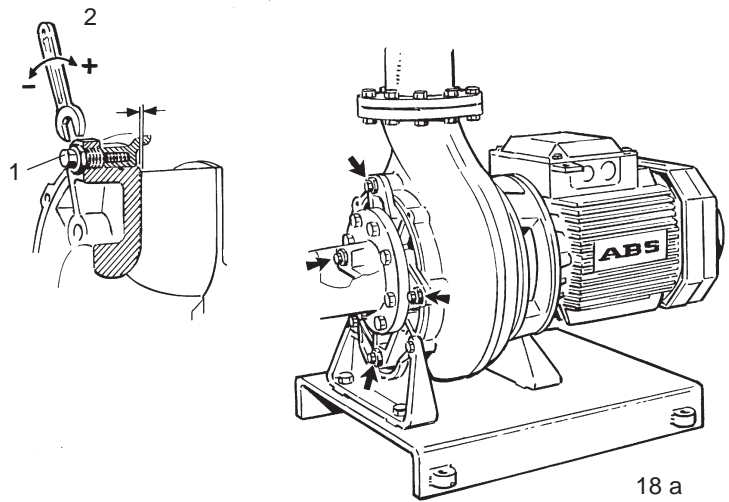


Fig. 18a Close-coupled Fig.18b Bearing Assemblies, semi-open impeller wear disc adjustment.

ABS reserves the right to alter specifications due to technical developments.

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COST-EFFECTIVE PUMPING

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