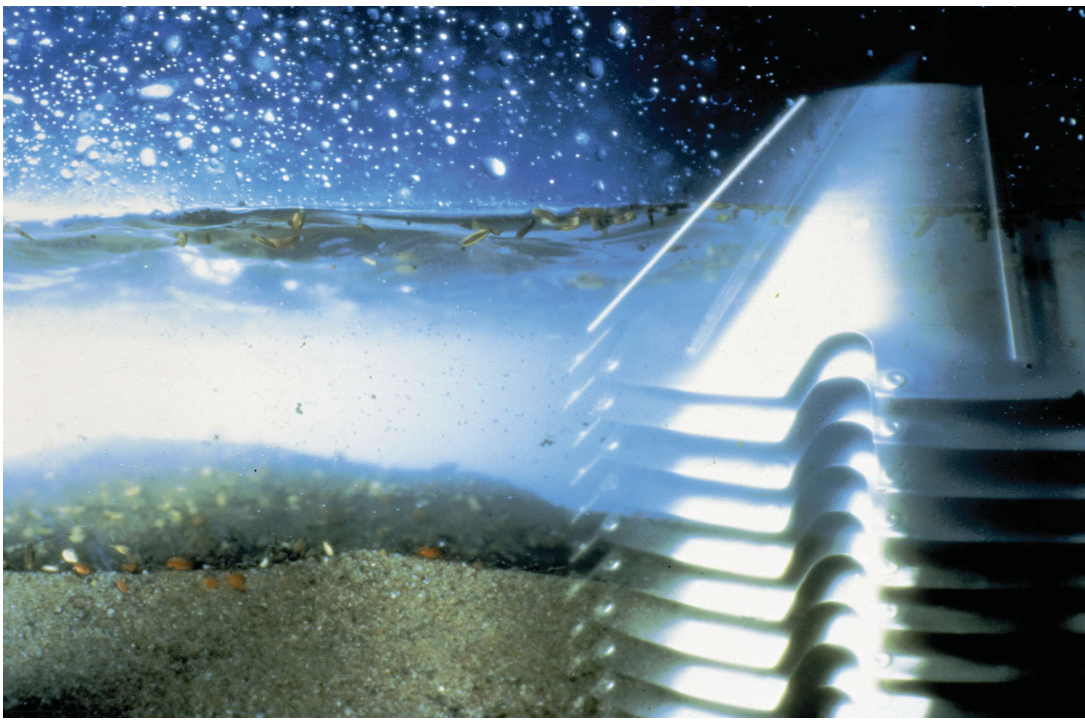
Tetra Pak Processing Components

Service & Maintenance Manual



Tetra Centri®

High Speed Separator

H60

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Original instructions

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Contents

1 Read this first 9

2 Safety Instructions 11

2.1 Warning signs in text 15

2.2 Environmental issues 16

2.3 Requirements of personnel 17

2.4 Remote start 17

3 Maintenance Directions 19

3.1 Periodic maintenance 19

3.1.1 Introduction 19
3.1.2 Maintenance intervals 19
3.1.3 Maintenance procedure 21
3.1.4 Service kits 22

3.2 Maintenance Logs 23

3.2.1 Daily checks 23
3.2.2 Lubrication of electric motor 23
3.2.3 Oil change 24
3.2.4 Intermediate Service (IS) 25
3.2.5 Major service (MS) 27
3.2.6 Renewal of frame feet 29

3.3 Cleaning 31

3.3.1 Cleaning agents 31
3.3.2 Cleaning of bowl discs 32
3.3.3 External cleaning 33

3.4 When changing oil 35

3.4.1 Worm wheel and worm; wear of teeth 35
3.4.2 Oil change procedure 38

3.5 Lubricants 40

3.5.1 Lubrication chart, general 40
3.5.2 Lubricants 41
3.5.3 Recommended lubricating oils 43
3.5.4 Recommended oil brands 44

3.6 Vibration 46

3.6.1 Vibration analysis 46

3.7 Common maintenance directions 47

3.7.1 Ball and roller bearings 47
3.7.2 Before shutdown 51

4 Dismantling/Assembly 53

4.1 Introduction 53

4.1.1 General directions 53
4.1.2 References to check points 53
4.1.3 Tools 54
4.1.4 Tightening of screws 54

4.2 Intermediate Service (IS), dismantling 55

4.2.1 Introduction 55
4.2.2 Outlet device 56
4.2.3 Bowl 66
4.2.4 Operating liquid device 77
4.2.5 Inlet device 80

4.3 Intermediate Service (IS), check points 84

4.3.1 Introduction 84
4.3.2 Corrosion 84
4.3.3 Cracks 86
4.3.4 Erosion 87
4.3.5 Guide surfaces 89
4.3.6 Bowl hood seal ring 92
4.3.7 Bowl spindle taper and bowl body nave taper 93
4.3.8 Lock ring; wear and damage 94
4.3.9 Flushing nozzle 95
4.3.10 Operating mechanism 96
4.3.11 Venting screw 97
4.3.12 Sliding bowl bottom 98
4.3.13 Springs for operating mechanism 98
4.3.14 Valve plugs 99
4.3.15 Worm wheel and worm; wear of teeth 99
4.3.16 Outlet pipe/sleeve 100
4.3.17 Speed sensor 101
4.3.18 Vibration sensor 102
4.3.19 Temperature sensor 103

4.4 Intermediate Service (IS), assembly 104

4.4.1 Introduction 104
4.4.2 Inlet device 105
4.4.3 Operating liquid device 109
4.4.4 Bowl 112
4.4.5 Outlet device 128

4.5 Major Service (MS), dismantling 140

4.5.1 Vertical driving device 142
4.5.2 Horizontal driving device 158

4.6 Major Service (MS), check points 164

4.6.1 Introduction 164
4.6.2 Cyclone; sealing rings 164
4.6.3 Guide surfaces 165
4.6.4 Lock ring; priming 166

4.7 Major Service (MS), assembly 168

4.7.1 Introduction 168
4.7.2 Horizontal driving device 169
4.7.3 Vertical driving device 176

4.8 Operating water module (OWMC) 194
4.8.1 Dismantling (MS service) 196
4.8.2 Check points 197
4.8.3 OWMC assembly (MS service) 198
4.8.4 Air tank 199





Study instruction manuals and observe the warnings before installation, operation, service and maintenance.

Not following the instructions can result in serious accidents.

In order to make the information clear only foreseeable conditions have been considered. No warnings are given, therefore, for situations arising from the unintended usage of the machine and its tools.



1 Read this first

This manual is designed for operators and service engineers working with Alfa Laval separators.

If the separator has been delivered and installed by Alfa Laval as part of a processing system, this manual is a part of the System Manual. In this case carefully study all the instructions in the System Manual.

The documentation for the separator consist of:

- *Installation Manual (ISM)*
- *Operator´s Manual (OPM)*
- *Service & Maintenance Manual (SEM)*
- *Spare Parts Catalogue (SPC)*

Complementary information for additional system components may be supplied depending on order configuration.

2 Safety Instructions



The centrifuge includes parts that rotate at high speed. This means that:

- Kinetic energy is high
- Great forces are generated
- Stopping time is long



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Manufacturing tolerances are extremely fine. Rotating parts are carefully balanced to reduce undesired vibrations that can cause a breakdown. Material properties have been considered carefully during design to withstand stress and fatigue.

The separator is designed and supplied for a specific separation duty (type of liquid, rotational speed, temperature, density etc.) and must not be used for any other purpose.

Incorrect operation and maintenance can result in unbalance due to build-up of sediment, reduction of material strength, etc., that subsequently could lead to serious damage and/or injury.

The following basic safety instructions therefore apply:



- **Use the separator only for the purpose and parameter range specified by Alfa Laval. Applies not only to the process but also to cleaning and service liquids.**
- **Strictly follow the instructions for installation, operation and maintenance.**
- **Ensure that personnel are competent and have sufficient knowledge of maintenance and operation, especially concerning emergency stopping procedures.**
- **Use only Alfa Laval genuine spare parts and the special tools supplied.**

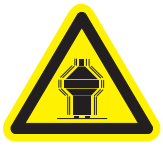


Disintegration hazards

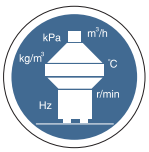
- When power cables are connected, always check direction of motor rotation. If incorrect, vital rotating parts could unscrew.



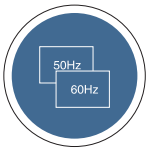
- If excessive vibration occurs, **stop** separator and **keep bowl filled** with liquid during rundown.



- Use the separator only for the purpose and parameter range specified by Alfa Laval.



- Check that the gear/pulley ratio is correct for power frequency used. If incorrect, subsequent overspeed may result in a serious break down.



- If the separator is run by a variable frequency drive, it is extremely important that the frequency does not exceed the allowed maximum, to avoid serious break down by too high speed.
- Wear on the large lock ring thread must not exceed safety limit.Φ-mark on lock ring must not pass opposite Φ-mark by more than specified distance.



- Welding or heating of parts that rotate can seriously affect material strength.



- Inspect regularly for **corrosion** and **erosion** damage. Inspect frequently if process or cleaning liquid is corrosive or erosive.





Entrapment hazards

- Make sure that rotating parts have come to a **complete standstill** before accessing parts inside the machine or starting **any** dismantling work. If there is no braking function the run down time can exceed two hours.



- To avoid accidental start, switch off and lock power supply before starting **any** dismantling work.
  Assemble the machine **completely** before start. **All** covers, connections and guards must be in place.



Electrical hazard

- Follow local regulations for electrical installation and earthing (grounding).
- To avoid accidental start, switch off and lock power supply before starting **any** dismantling work.



Crush hazards

- Use correct lifting tools and follow lifting instructions.



- Do **not** work under a hanging load.



Noise hazards

- Use ear protection in noisy environments.



Burn hazards

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





Skin irritation hazards

- When using chemical cleaning agents, make sure you follow the general rules and suppliers recommendation regarding ventilation, personnel protection etc.



- Use of lubricants in various situations.

Cut hazards

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



Flying objects

- Risk for accidental release of snap rings and springs when dismantling and assembly. Wear safety goggles.



Health hazards

- Risk for unhealthy dust when handling friction blocks/pads. Use a dust mask to make sure not to inhale any dust





2.1 Warning signs in text

Pay attention to the safety instructions in this manual. Below are definitions of the three grades of warning signs used in the text where there is a risk for injury to personnel.



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



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



CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



NOTE indicates a potentially hazardous situation which, if not avoided, may result in property damage.



2.2 Environmental issues

Unpacking

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

Wood and cardboard boxes can be reused, recycled or used for energy recovery.

Plastics should be recycled or burnt at a licensed waste incineration plant.

Metal straps should be sent for material recycling.

Maintenance

During maintenance oil and wear parts in the machine are replaced.

Oil must be taken care of in agreement with local regulations.

Rubber and plastics should be burnt at a licensed waste incineration plant. If not available they should be disposed to a suitable licensed land fill site.

Bearings and other metal parts should be sent to a licensed handler for material recycling.

Seal rings and friction linings should be disposed to a licensed land fill site. Check your local regulations.

Worn out or defected electronic parts should be sent to a licensed handler for material recycling.



2.3 Requirements of personnel

Only **skilled** or **instructed** persons are allowed to operate the machine, e.g. operating and maintenance staff.

- **Skilled person**: A person with technical knowledge or sufficient experience to enable him or her to perceive risks and to avoid hazards which electricity/mechanics can create.
- **Instructed person**: A person adequately advised or supervised by a skilled person to enable him or her to perceive risks and to avoid hazards which electricity/mechanics can create.

In some cases special skilled personnel may need to be hired, like electricians and others. In some of these cases the personnel has to be certified according to local regulations with experience of similar types of work.

2.4 Remote start

If the separator is operated from a remote position where the separator cannot be seen or heard the power isolation device shall be equipped with an interlock device to prevent that a remote start command could result in liquid being fed to the separator when it is shut down for service.

The first start after the separator has been taken apart or been standing still for a long time shall always be manually supervised locally.



3 Maintenance Directions

3.1 Periodic maintenance

3.1.1 Introduction

Periodic (preventive) maintenance reduces the risk of unexpected stoppages and breakdowns. Follow the maintenance logs on the following pages in order to facilitate the periodic maintenance.



Disintegration hazards

Separator parts that are either worn beyond their safe limits or incorrectly assembled may cause severe damage or fatal injury.

3.1.2 Maintenance intervals

The following directions for periodic maintenance give a brief description of which parts to be cleaned, checked and renewed at different maintenance intervals.

The maintenance logs for each maintenance interval later in this chapter give detailed enumeration of the check points that must be done.

Daily checks consist of minor check points to carry out for detecting abnormal operating conditions.

Oil change

The oil change interval is every **2000 hours** or at least once every year if the total number of operating hours is less than **2000 hours**

Intermediate Service (IS)

Intermediate Service consists of cleaning and inspection of the separator bowl and inlet/outlet and replacement of seal rings, valve plugs and other parts included in the service kits.

Every **3 months** or **2000 operating hours**, Outlet device and upper part of the separator bowl. (Parts in contact with product liquid).

Every **6 months** or **4000 operating hours**, Outlet device and the complete separator bowl including the operating water device. Inlet/outlet mechanical seals are inspected and replaced if needed

Major Service (MS)

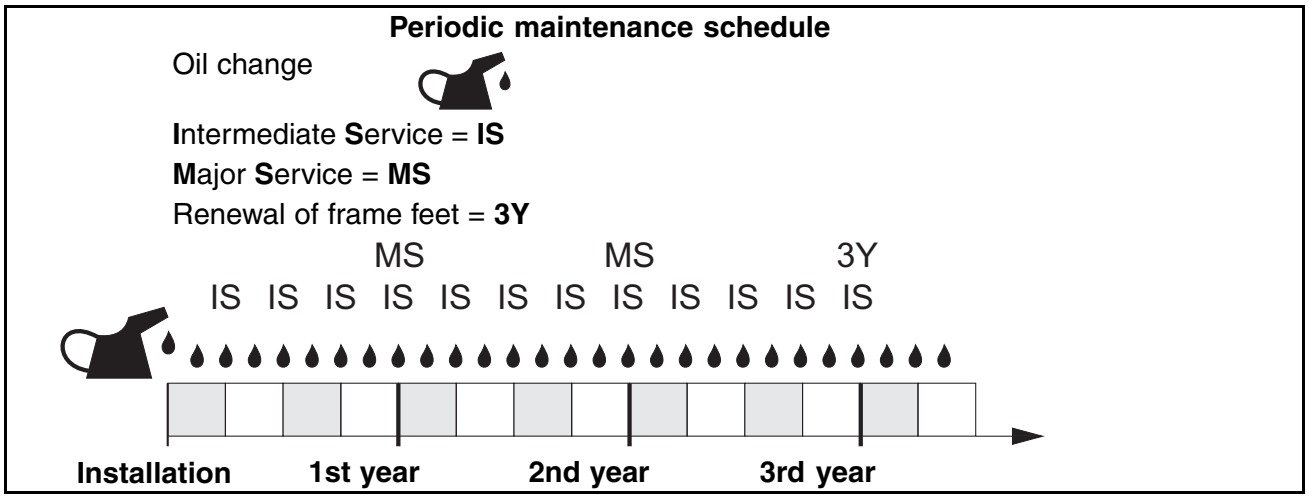
Major Service consists of an overhaul of the complete separator (including all activities in the Intermediate Service).

Every **12 months** or **8000 operating hours**, Overhaul of the Machine top part, Machine bottom part, Cyclone and Operating Water Module (OWMC).

Renewal of frame feet

The recommended interval for renewing the rubber parts in frame feet is every third year.

The service intervals can be adjusted if process and working conditions so requires The intervals stated above are recommendations.



3.1.3 Maintenance procedure

At each Intermediate and Major Service, take a copy of the maintenance log and use it for notations during the service.

The Intermediate and Major Services should be carried out in the following manner:

1. Dismantle the parts as mentioned in the maintenance log and described in chapter Dismantling/assembly.

   Place the separator parts on clean, soft surfaces such as pallets.

2. Inspect and clean the dismantled separator parts according to the maintenance log.

3. Fit all the parts delivered in the service kit while assembling the separator.

3.1.4 Service kits

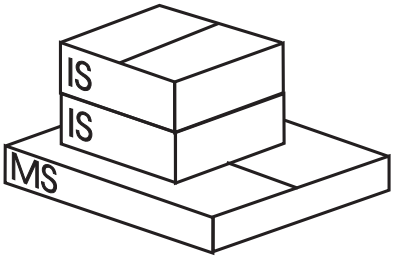
Special service kits are available for:

- Intermediate Service (IS) divided in 3 months (2000 hours) and 6 months (4000 hours) service.
- Major Service (MS) 12 months (8000 hours).
- Servicing the frame feet.
- Servicing the operating water module (OWMC).

For other services the spare parts have to be ordered separately.

Note that the parts for IS are **not** included in the MS kit.

The contents of the service kits are described in the *Spare Parts Catalogue*.



Kits are available for Intermediate Service, Major Service and for servicing the frame feet and the operating water module (OWMC)

NOTE

Always use Alfa Laval genuine parts as otherwise the warranty will become invalid.
Alfa Laval takes no responsibility for the safe operation of the equipment if non-genuine spare parts are used.

WARNING

Disintegration hazards
Use of imitation parts may cause severe damage.

3.2 Maintenance Logs

3.2.1 Daily checks

The necessary daily checks to be carried out for a safe operation are enumerated in chapter *Running* in the *Operator´s Manual*.

3.2.2 Lubrication of electric motor

The bearings of the electric motor shall be greased with intervals that is dependent of the motor speed, ambient temperature and if the bearing is located on the driving end or non-driving end.

The recommended intervals varies from 4000 up to 12000 operating hours. Correct lubrication interval and recommended type of grease can be found on a plate fixed on the motor. The information can also be found in chapter *Electric motor* in the *Installation Manual*

Manual lubrication

Manual lubrication Re-greasing while motor is running:

- Remove grease outlet plug or open closing valve if fitted.
- Be sure that the lubrication channel is open.
- Press the specified amount of grease into the bearing.
- Let the motor run 1-2 hours to ensure that all excess grease is forced out of the bearing. Close the grease outlet plug or closing valve if fitted.

Re-greasing while motor is at standstill:

Re-grease motors while running, if this is not possible, lubrication can be carried out while the machine is at a standstill.

- In this case, use only half the quantity of grease, then run the motor for a few minutes at full speed.
- When the motor has stopped, press the rest of the specified amount of grease into the bearing.
- After 1-2 running hours close grease outlet plug or closing valve if fitted.

3.2.3 Oil change

The oil change and check of worm gear should be carried out every **2000 hours** of operation.

Note: In a new installation, or after replacement of gear, change the oil after **200 operating hours** and clean the gear housing.

Main component and activity	Part	Page	Notes
Horizontal driving device			
Worm wheel shaft and gear housing			
Check	Worm wheel and worm	35	
Renew	Oil[3)] in gear housing	38	

When the separator is running for short periods, the lubricating oil must be changed every **12 months** even if the total number of operating hours is less than **2000 hours**.

[3)] See chapter 3.5 Lubricants on page 40 for further information.

3.2.4 Intermediate Service (IS)

Name of plant:	Local identification:
Separator:	Manufacture No./Year:
Total running hours:	Product No:
Date:	Signature:

Main component and activity	Part	Page	Notes
Inlet			
Clean and inspect	Inlet housing	-	
Renew	O-rings, rectangular ring and throttle ring. Parts included in the mechanical seal.		
Check	Height position of mechanical seal		
Outlet			
Clean and inspect	Parts included in the mechanical seal		
	Channels for sealing liquid		
	Threads of outlet pipe and pump wheel/paring disc		
	Outlet housing		
Check	Height position of outlet housing, see chapter Outlet device	131	
Renew	Seal rings, O-rings and gaskets	56	
Separator bowl			
Clean and check	Lock ring	94	
	Bowl hood	92	
	Bowl discs	32	
	Distributor / Venting pipe	97	
	Sliding bowl bottom	98	
	Bowl body	-	
	Guide surfaces	89	
	Bowl spindle cone and bowl body nave	93	
	Operating mechanism	96, 98	
Check	Corrosion	84	
	Cracks	86	
	Erosion	87	
	Galling of guide surface	89	
	Disc stack pressure	124	
Renew	O-rings and sealings	-	

Main component and activity	Part	Page	Notes
Operating liquid device			
Clean and check	Operating liquid device	77	
	Flushing nozzle	95	
Renew	O-rings	-	
Horizontal driving device			
Worm wheel shaft and gear housing			
Check	Worm wheel and worm	35	
Renew	Oil in gear housing	38	
Signs and labels on separator			
Check attachment and legibility	Safety label on hood	-	
	Direction of rotation arrow	-	
	Power supply frequency	-	
Monitoring equipment			
Function check	Vibration sensor	102	
	Speed sensor	101	
	Cover interlocking switch (option)		
	Temperature sensor	103	

3.2.5 Major service (MS)

Name of plant:	Local identification:
Separator:	Manufacture No./Year:
Total running hours:	Product No:
Date:	Signature:

Main component and activity	Part	Page	Notes
Outlet			
Clean and inspect	Parts included in the mechanical seal	128	
	Channels for sealing liquid		
	Threads of outlet pipe and pump wheel/paring disc		
	Outlet housing		
Check	Height position of outlet housing	131	
Renew	Seal rings, O-rings and gaskets	164	
Separator bowl			
Clean and check	Lock ring	94, 166	
	Bowl hood	92	
	Bowl discs	32	
	Distributor / Venting screw	97	
	Sliding bowl bottom	98	
	Bowl body	-	
	Guide surfaces	89, 165	
	Bowl spindle cone and bowl body nave	93	
	Operating mechanism	96, 98	
Check	Corrosion	84	
	Cracks	86	
	Erosion	87	
	Galling of guide surface	165	
	Disc stack pressure	124	
Renew	O-rings and sealings		

Main component and activity	Part	Page	Notes
Operating liquid device			
Clean and check	Operating liquid device	-	
	Flushing nozzle	-	
Check	Height position, see chapter Intermediate service assembly	109	
Renew	O-rings	-	
Vertical driving device			
Clean and check	Bowl spindle	-	
Check	Radial wobble of bowl spindle	-	
Renew	Spindle bearings, sealings and rubber buffers	-	
Horizontal driving device			
Worm wheel shaft and gear housing			
Check	Worm wheel and worm	35	
	Radial wobble of worm wheel shaft	169	
Renew	Bearings, O-rings, sealings and corrugated shim	169	
	Oil in gear housing	38	
Flexible coupling			
Electric motor			
Lubrication (if nipples are fitted)	See sign on motor	-	
Signs and labels on separator			
Check attachment and legibility	Safety label on hood	-	
	Direction of rotation arrow	-	
	Power supply frequency	-	
Monitoring equipment			
Function check	Vibration sensor	102	
	Speed sensor	101	
Renew	O-ring on sensor holder		
Operating water module (OWMC)			
Check	Cylinder, piston and two-pulse adapter	197	
Renew	O-rings and other seals	194	

Note: Renew all parts included in the Intermediate Service kit (IS), Major Service kit (MS) and service kit for operating water module (OWMC).

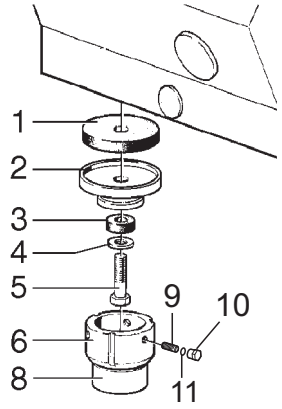
3.2.6 Renewal of frame feet

Renew the frame feet every third year as described below. The renewal can preferably be carried out in conjunction with a Major Service (MS).

NOTE

Before starting the procedure below, first read the chapter *Lifting instructions* **in the** *Installation Manual*. **Here directions are given which parts that first must be removed before lifting and also which lifting tool that must be used.**

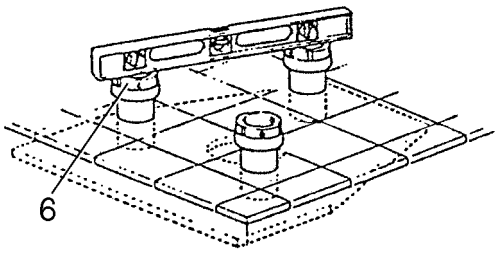
1. Disconnect pipes, hoses and cables connected to the separator and electric motor.
2. Remove the set screws (9), three for each foundation foot.
3. Lift the separator. Follow the directions in the *Lifting instructions* referred to above.
4. Unscrew the screw (5) which is locked with Loctite and then renew the two rubber cushions (1 & 3).



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1. Rubber cushion
2. Frame foot
3. Rubber cushion
4. Washer
5. Screw
6. Holder
7. Adjusting washer
8. Foot on foundation plate
9. Set screw
10. Plug
11. O-ring
A. Thickness of adjusting washers (max. 4 pcs)

5. Apply Loctite 242 on the screw thread (5) and tighten it with **40 Nm**.



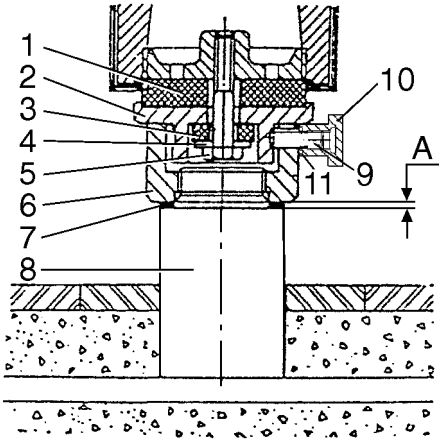
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Level against the upper face of the holders (6)

6. Level against the upper face of the three holders (6). Screw the holders to compensate for inclination, if any. Any gap between a holder and a foundation foot (8) must be eliminated by adding or removing one or more adjusting washers (7). Note that the total thickness (A) of the adjusting washers for one foot must not exceed corresponding 4 washers.

7. After all rubber cushions have been renewed lower the separator into the three holders.

8. Tighten the set screws (9), first by hand (or by a hand tool, if necessary) until all of them are in contact with the frame feet (2).
Then tighten the set screws with **100 Nm**.
Fit the O-ring (11) and plug (10).



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NOTE

Tighten the set screws before mounting the bowl.

9. Connect the previously disconnected pipes, hoses and cables.

3.3 Cleaning

3.3.1 Cleaning agents

When using chemical cleaning agents, make sure you follow the general rules and suppliers' recommendations regarding ventilation, protection of personnel, etc.

For separator bowl, inlet and outlet

A chemical cleaning agent must dissolve the deposits quickly without attacking the material of the separator parts.



Skin irritation hazard

Read the instructions on the label of the container before using the chemical cleaning agent.

Always wear safety goggles, gloves and protective clothing as the liquid is alkaline and dangerous to skin and eyes.

For operating mechanism

Use 10% acetic acid solution to dissolve lime deposits. The acid should be heated to 80 °C.

For parts of the driving devices

Use white spirit, cleaning-grade kerosene or diesel oil.

Oiling (protect surfaces against corrosion)

Protect cleaned carbon steel parts against corrosion by oiling. Separator parts that are not assembled after cleaning must be wiped and coated with a thin layer of clean oil and protected from dust and dirt.

3.3.2 Cleaning of bowl discs

Handle the bowl discs carefully to avoid damage to the surfaces during cleaning.

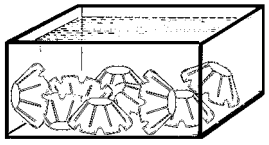
CAUTION

Cut hazard
Sharp edges on the separator discs may cause cuts.

NOTE

Mechanical cleaning is likely to scratch the disc surfaces causing deposits to form quicker and adhere more firmly.
A gentle chemical cleaning is therefore preferable to mechanical cleaning.

1. Remove the bowl discs from the distributor and lay them down, **one by one**, in the cleaning agent.



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Put the discs one by one into the cleaning agent

2. Let the discs remain in the cleaning agent until the deposits have been dissolved. This will normally take between two and four hours.

3. Finally clean the discs with a **soft** brush.



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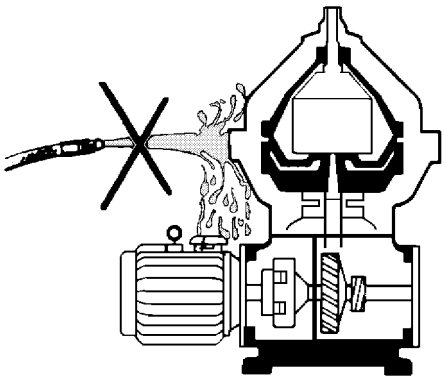
Clean the discs with a soft brush

3.3.3 External cleaning

Never wash down a separator with a direct water stream.

Totally enclosed motors can be damaged by direct hosing to the same extent as open motors and even more than those, because:

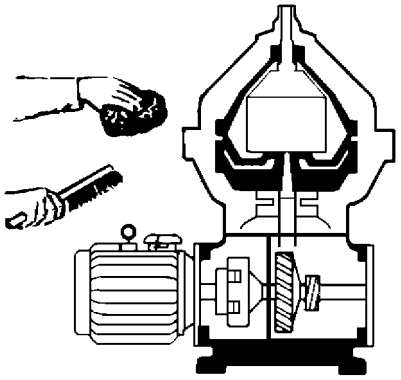
- Many operators believe that these motors are sealed, and normally they are not.
- A water jet played on these motors will produce an internal vacuum, which will suck the water between the metal-to-metal contact surfaces into the windings, and this water cannot escape.
- Water directed on a hot motor may cause condensation resulting in short-circuiting and internal corrosion.



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Never wash down a separator with a direct water stream or playing a water jet on the motor

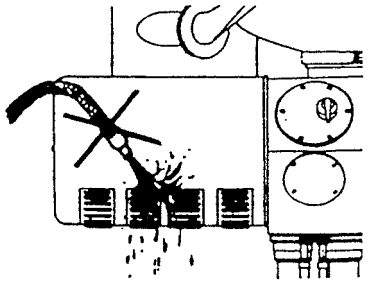
The external cleaning of the frame and motor should be restricted to brushing, sponging or wiping while the motor is running or is still hot.



g0545131

Use a sponge or cloth and a brush when cleaning

Be careful even when the motor is equipped with a protecting hood. Never play a water jet on the ventilation grill of the hood.



g0666511

A protecting hood never protects for a water jet

3.4 When changing oil

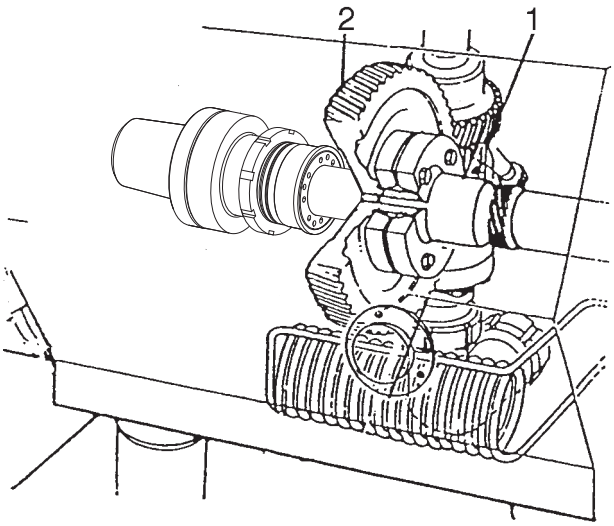
3.4.1 Worm wheel and worm; wear of teeth

To check at each oil change

Check the teeth of both the worm wheel and worm for wear. Examine the contact surfaces and compare the tooth profiles with the Tooth appearance examples on page 37. The gear may operate satisfactorily even when worn to some degree.

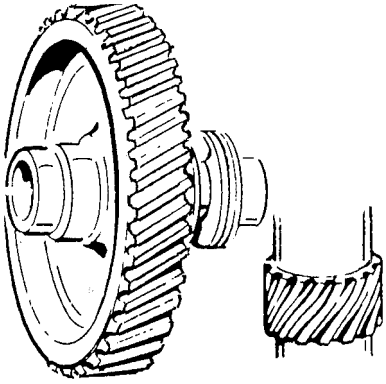
- Replace both worm wheel and worm at the same time, even if only one of them is worn.
- To avoid damaging the teeth when lifting the bowl spindle, push the worm wheel to one side first.
  Position the spindle in correct place before fitting the worm wheel.

When replacing the gear, always make sure that the new worm wheel and worm have the same number of teeth as the old ones. See chapter *Technical data* in the *Installation Manual* for correct number of teeth.



g0568061

1. *Worm*
2. *Worm wheel*



g0205411

Check the gear ratio (number of teeth) when replacing the gear

WARNING

Disintegration hazard

Check that gear ratio is correct for power frequency used. If incorrect, subsequent overspeed may result in a serious breakdown.

NOTE

Presence of metal chips in the oil bath is an indication that the gear is wearing abnormally.

Important!

When using mineral-type oil in the worm gear housing, the presence of black deposits on the spindle parts is an indication that the oil base has deteriorated seriously or that some of the oil additives have precipitated. If pitting is found on the worm gear, the cause could be that the additives are not suitable for this purpose.

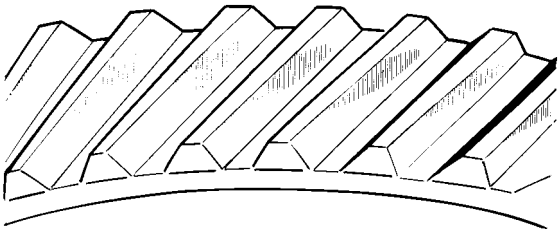
In all these cases it is strongly recommended to change to a high-temperature oil.

For further information, see chapter 3.5 Lubricants on page 40.

Tooth appearance examples

Satisfactory teeth:

Uniform wear of contact surfaces. Surfaces are smooth.



g0538711

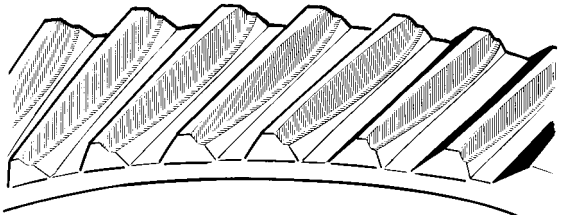
Satisfactory teeth

Good contact surfaces will form on the teeth when the gear is subjected to only moderate load during its running-in period.

Worn teeth:

Permissible wear is as a rule 1/3 of the thickness of the upper part of a tooth, provided that:

- the wear is uniform over the whole of the flank of a tooth
- all teeth are worn in the same way.

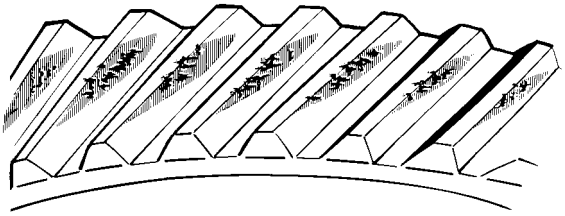


g0538811

Worn teeth

Spalling:

Small bits of the teeth have broken off, so-called spalling. This is generally caused by excessive load or improper lubrication. Damage of this type may not necessitate immediate replacement, but careful checking at short intervals is of imperative importance.

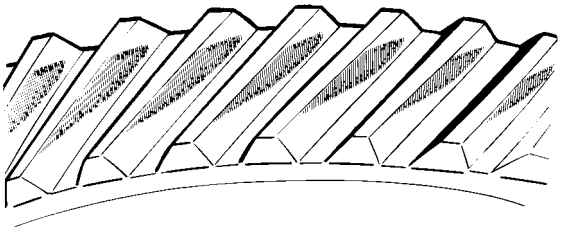


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Spalling

Pitting:

Small cavities in the teeth, so-called pitting, can occur through excessive load or improper lubrication. Damage of this type need not necessitate immediate replacement, but careful check at short intervals is of imperative importance.



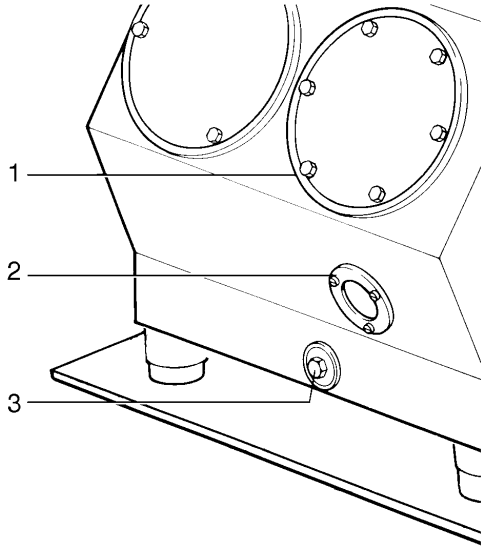
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Pitting

3.4.2 Oil change procedure

NOTE

Before adding or renewing lubricating oil in the worm gear housing, the information concerning different oil groups, handling of oils, oil change intervals etc. given in chapter 3.5 Lubricants must be well known.



g0828311

1. *Cover*
2. *Sight glass*
3. *Oil drain plug*

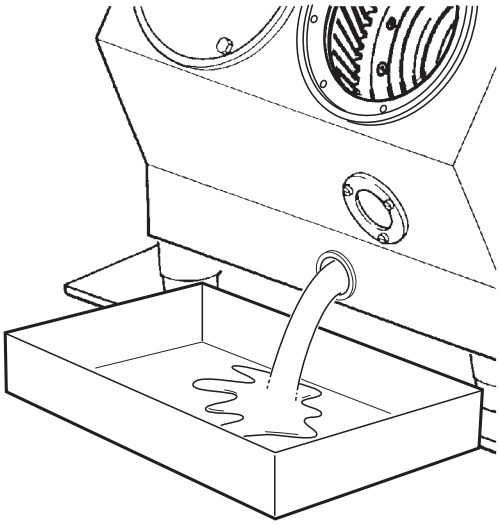
1. Place a collecting tray under the drain hole, remove the cover (1) and the drain plug (3) and then drain off the oil.

CAUTION

Burn hazard

Lubricating oil and various machine surfaces can be sufficiently hot to cause burns.

2. Attach the drain plug (3).



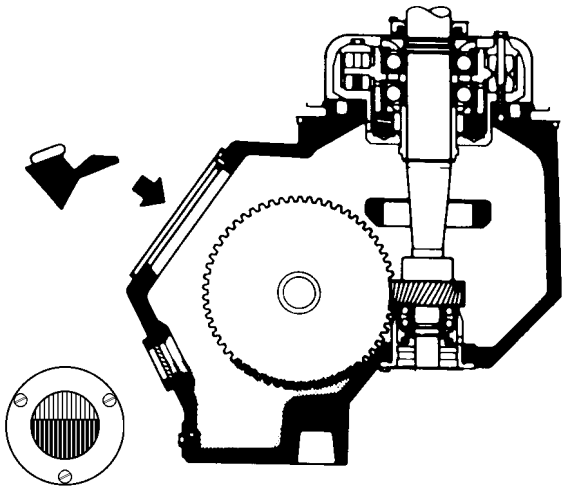
g0484241

Burn hazards: The drained oil may be hot

3. Fill new oil in the worm gear housing. The oil level should be slightly above middle of the sight glass.
Oil volume: Approx. **12 litres.**
Suitable oil brands can be found in 3.5.4 Recommended oil brands on page 44.

NOTE

During operation the oil level must be slightly below the middle of the sight glass.
If the oil level is too high, the lifetime of the rolling bearings will be reduced due to high temperature.



g0826911

The oil level should be slightly above middle of the sight glass

3.5 Lubricants

3.5.1 Lubrication chart, general

Alfa Laval ref. 553216-01 Rev. 8

Lubricating points	Type of lubricant	Interval
The oil bath. Bowl spindle ball bearings are lubricated by oil splash from the oil bath.	Lubricating oil as specified in 3.5.3 Recommended lubricating oils on page 43. See Technical data	**Oil Change:** 1. Continuous operation: 2000h 2. Seasonal operation: Before every operating period. 3. Short period´s operation: 12 months even if the total number of operating hours is less than stated above.
Bowl spindle taper.	Lubricating oil (only a few drops for rust protection).	At assembly
Bowl: Sliding contact surfaces, thread of lock nut and cap nut.	Pastes as specified in 3.5.4 Recommended oil brands on page 44.	At assembly
Rubber seal rings.	Grease as specified in 3.5.4 Recommended oil brands on page 44.	At assembly
Friction coupling ball bearings. Not valid for rigid coupling.	The bearings are packed with grease and sealed and need no extra lubrication.	-
Electric motor	Follow manufacturer's instructions.	Follow manufacturer's instructions.
Threads	Lubricating oil, if not otherwise stated.	At assembly



If not otherwise specified, follow the supplier´s instructions about applying, handling and storing of lubricants.
Instructions related to a specific design of the machine refer to general assembly drawings.



Check the oil level before start.
Top up when necessary.
Do not overfill.

3.5.2 Lubricants

Alfa Laval ref. 553217-03 Rev. 0

NOTE

The data in below tables is based on supplier information in regards to lubrication properties.

Trade names and designations might vary from country to country. Please contact your local supplier for more information.

Brands with Alfa Laval article number are approved and recommended for use.

Pastes for hygienic applications (NSF registered H1 is preferred):

Manufacturer	Designation	Hygienic Comment	Alfa Laval No	
Dow Corning	Molykote P1900	NSF Registered H1 (7 Jan 2004)		
Fuchs Lubritech, Bremer & Leguil,	Geralyn F.L.A.	NSF Registered H1 (2 April 2003) German §5 Absatz 1 LMBG approved		
	Geralyn 2	NSF Registered H1 (3 sep 2004)	561764-01 (50 g)	
Klüber	Klüberpaste UH1 96-402	NSF Registered H1 (25 Feb 2004)		
	Klüberpaste UH1 84-201	NSF Registered H1 (26 Aug 2005)		
Rocol	Foodlube Multi Paste	NSF Registered H1 (13 Apr 2001)		

Silicone grease for rubber rings:

Manufacturer	Designation	Hygienic comment	Alfa Laval No	
Dow Corning	Molykote G-5032	NSF Registered H1 (June 3 2005)	569415-01 (50 g)	
Bremer & Leguil, Fuchs Lubritech	Geralyn SG MD 2	NSF Registered H1 (30 March 2007)		
Klüber	Paraliq GTE 703	NSF Registered H1 (25 Feb 2004) Complies with LMBG and the European standard EN 1672, part 2.		
Bel-Ray	No-Tox Silicone valve seal	NSF Registered H1 (19 June 2002)		
MMCC	ALCO 220	NSF Registered H1 (25 March 2002)		
Rocol	Foodlube Hi-Temp	NSF Registered H1 (18 April 2001)		

Greases for ball and roller bearings:

Manufacturer	Designation	Hygienic comment
SKF	LGFP 2	NSF Registered H1 (17 Aug 2007)



Always follow the specific recommendation for lubrication as advised by the manufacturer.

3.5.3 Recommended lubricating oils

Alfa Laval ref. 553219-04 Rev. 1

Type of frame: M 18 with motor <52 kW.

Two groups of lubricating oil is approved. They are designated as Alfa Laval lubricating oil groups B and D.

The numerical value after the letter states the viscosity grade.

The corresponding commercial oil brands are found in chapter 3.5.4 Recommended oil brands on page 44.

Ambient temperature (°C)	Alfa Laval lubricating oil group	Time in operation Oil change interval
Between +5 and +45*)	B/320	1 500 h
Between +2 and +65	D/320	2 000 h

*) 55 °C in case of water cooling

Note:

- In a new installation or after change of gear transmission, change oil after 200 operating hours.
- When the separator is operated for short periods, lubricating oil must be changed every 12 months even if the total number of operating hours is less than stated in the recommendations above.
- Check and prelubricate spindle bearings on separators which have been out of service for 6 months or longer.
- In seasonal operation, change oil before every operating period.

3.5.4 Recommended oil brands

Paraffinic mineral lubricating oil, category (ISO-L-) CKE 320.

Alfa Laval ref. 553218-05 Rev. 3

The following is a list of recommended oil brands. Trade names and designations might vary from country to country. Please contact your local oil supplier for more information.

Alfa Laval lubrication oil group B	
Viscosity grade VG (ISO 3448/3104) Viscosity index VI (ISO 2909)	VG 320 VI >90
Manufacturer	**Designation**
Bel-Ray	100 Gear oil 90/140
BP	Energol GR-XP 320
Castrol	Alpha SP 320 (Optimol) Optigear BM 320
ChevronTexaco	Gear Compound EP 320 (H2) Ultra Gear Lubricant 320 (H2) Texaco/Caltex Meropa 320
ExxonMobil	Spartan EP 320 Mobilgear 632 Mobilgear SHC (XMP) 320, Synthetic *
Q8/Kuwait Petroleum	Goya 320
Shell	Omala 320 Omala RL 320, Synthetic *
Statoil	LoadWay EP 320
Total	Carter EP 320 Elf Epona Z 320 Carter SH 320, Synthetic *

* These oils must be used when the frame temperature is above 80 °C. If the temperature can't be measured, a rough estimate is that 80 °C is when one can touch the surface of lower part of frame only for a short time.

The list of recommended oil brands are not complete. Other oil brands may be used as long as they have equivalently quality as the brands recommended. The oil must have the same viscosity class and shall follow the requirements in one of the standards below. The oil must also be endorsed for worm gear with brass worm wheel. The use of other lubricants than the recommended is done on the exclusive responsibility of the user or oil supplier.

Standard	**Designation**
ISO 12925-1, (ISO 6743/6)	ISO-L-CKC/CKD/CKE/CKT 320
DIN 51517 part 3	DIN 51517 - CLP 320

Synthetic lubricating oil, category PAO (ISO-L-) CKE 320.

Alfa Laval ref. 587703 Rev. 0

Viscosity grade (ISO 3448/3104) VG 320.

The following is a list of recommended oil brands. Trade names and designations might vary from country to country. Please contact your local oil supplier for more information.

Brands with Alfa Laval article number are approved and recommended for use.

Alfa Laval lubrication oil group D	
Manufacturer	**Designation**
Alfa Laval	542690-84 20 litres 542690-85 4 litres
BP	Enersyn HTX 320 Enersyn EP-XF 320
Castrol	Alphasyn EP 320 Alphasyn HG 320 Optigear Synthetic A 320
Chevron	Tegra Synthetic Gear Lubricant 320 (H2)
ExxonMobil	Mobil SHC 632
Q8/Kuwait Petroleum	Schumann 320
Shell	Omala RL 320
Statoil	Mereta 320
Total	Carter SH 320 Elf Epona SA 320

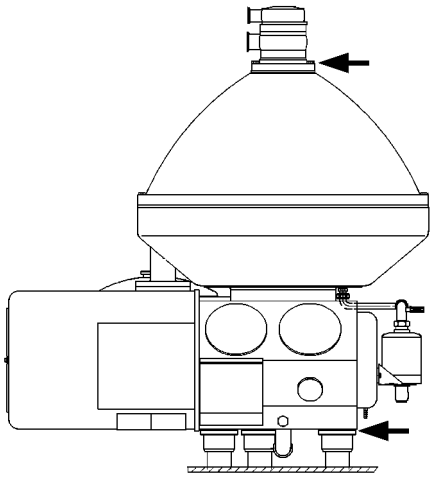
The lists of recommended oil brands are not complete. Other oil brands may be used as long as they have equivalently quality as the brands recommended. The oil must have the same viscosity class and ought to follow the ISO standard 12925-1, category ISO-L-CKC, CKD, CKE or CKT (ISO 6743-6) or DIN 51517, part 3 CLP, but shall have a synthetic base oil of polyalphaolefin type (PAO) instead of mineral base oil. The oil must also be endorsed for worm gear with brass worm wheel. The use of other lubricants than recommended is done on the exclusive responsibility of the user or oil supplier.

3.6 Vibration

3.6.1 Vibration analysis

Excessive vibration or noise indicates a malfunction. Stop the separator and identify the cause.

A vibration analysis instrument can be used to check the level of vibration. See the illustration for a selection of frequently used positions and directions for vibration measurement. Measure at these locations in two horizontal directions (parallel and perpendicular to motor shaft) and vertically.



g01204w1

Measuring points for vibration analysis

NOTE

The level of vibration, measured on the outside of the frame, should not exceed 9,0 mm/s at full speed.

WARNING

Disintegration hazard

If excessive vibration occurs, keep bowl filled and stop separator.

The cause of the vibration must be identified and corrected before the separator is restarted. Excessive vibration can be due to incorrect assembly or poor cleaning of the bowl or for example not sufficient disc stack pressure.

3.7 Common maintenance directions

NOTE

Always follow the specific instructions in the assembly sections in this manual.

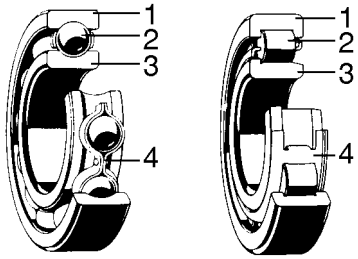
3.7.1 Ball and roller bearings

Special-design bearings for the bowl spindle

The bearings used for the bowl spindle are specified to withstand the speed, vibration, temperature and load characteristics of high-speed separators.

Only Alfa Laval genuine spare parts should be used.

A bearing that appears equivalent to the genuine may differ considerably in various respects: inside clearances, design and tolerances of the cage and races as well as material and heat treatment.



g0587321

1. *Outer race*
2. *Ball/roller*
3. *Inner race*
4. *Cage*

NOTE

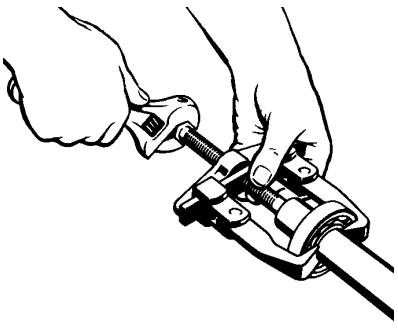
Using an incorrect bearing can cause a serious breakdown with damage to equipment as a result.

Do not re-fit a used bearing. Always replace it with a new.

Dismantling

For bearings where no driving-off sleeve is included in the tool kit, remove the bearing from its seat by using a puller. If possible, let the puller engage the inner ring, then remove the bearing with a steady force until the bearing bore completely clears the entire length of the cylindrical seat.

The puller should be accurately centred during dismantling; otherwise, it is easy to damage the seating.



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For bearings where no driving-off sleeve is included in the tool kit, use a puller when removing bearings

NOTE

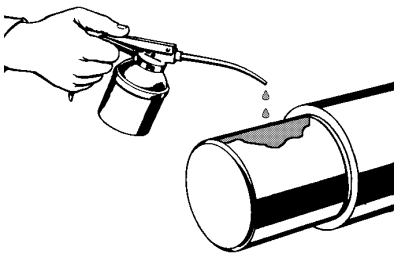
Do not strike with a hammer directly on the bearing.

Cleaning and inspection

Check shaft (spindle) end and/or bearing seat in the housing for damage indicating that the bearing has rotated on the shaft (spindle) and/or in the housing respectively. Replace the damaged part(s), if the faults cannot be remedied by polishing.

Assembly

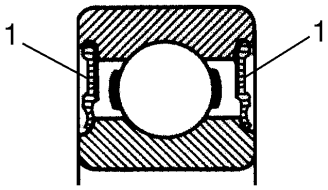
- Leave new bearings in original wrapping until ready to fit. The anti-rust agent protecting a new bearing should not be removed before use.
- Use the greatest cleanliness when handling the bearings.
- To facilitate assembly and also reduce the risk of damage, first clean and then lightly oil the bearing seating on shaft (spindle) or alternatively in housing, with a thin oil.



g0587511

Clean and oil the bearing seating before assembly

- Bearings fitted with two seals (1) are filled with grease at delivery.
  These bearings should never be heated before fitting.
  If heating, the grease in the bearing will be dissolved and the lifetime of the bearing will be considerably reduced.



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Bearing with two seals (1)

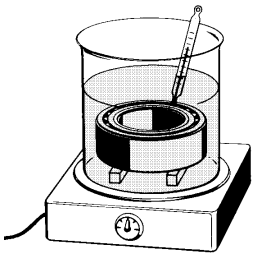
- When assembling ball bearings without seals, the bearings must be heated in oil or with an inductive-heater to **max. 125 °C**.

NOTE

Heat the bearing in a clean container.

Use only clean oil with a flash point above 250 °C.

The bearing must be well covered by the oil and not be in direct contact with the sides or the bottom of the container. Place the bearing on some kind of support or suspended in the oil bath.



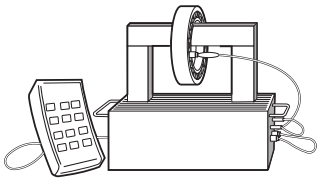
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The bearing must not be in direct contact with the container

WARNING

Burn hazards

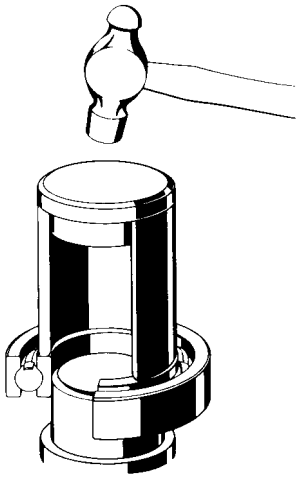
Use protective gloves when handling the heated bearings.



g0963311

Inductive-heater

- There are several basic rules for assembling cylindrical bore bearings:
  - Never directly strike a bearing's rings, cage or rolling elements while assembling. A ring may crack or metal fragments break off.
  - Never apply pressure to one ring in order to assemble the other.
  - Use an ordinary hammer. Hammers with soft metal heads are unsuitable as fragments of the metal may break off and enter the bearing.
  - Make sure the bearing is assembled at a right angle to the shaft (spindle).
- If necessary use a driving-on sleeve that abuts the ring which is to be assembled with an interference fit, otherwise there is a risk that the rolling elements and raceways may be damaged and premature failure may follow.

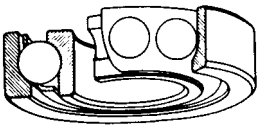


g0587711

Use a driving-on sleeve for bearings that are not heated

Angular contact ball bearings

Always fit single-row angular contact ball bearings with the wide shoulder of the inner race facing the axial load (upwards on a bowl spindle).



g0587211

The wide shoulder of the inner race must face the axial load

Lubrication

NOTE

Since roller bearings are normally treated only with rust protection oil from the factory, an initial lubrication of new bearings must always be performed whenever bearings are replaced. This is, however, not valid for bearings with seals because they are already filled with grease at delivery.

The initial lubrication implies adding a few drops of lube oil to the bearings. Use the same oil type as in the separator.

3.7.2 Before shutdown

Before the separator is shut-down for a period of time, the following must be carried out:

- Remove the bowl, according to chapter Dismantling/Assembly.
- Protect the spindle taper from corrosion by lubricating it with oil.

NOTE

The bowl must not be left on the spindle during standstill for more than one week.

Vibration in foundations can be transmitted to the bowl and produce one-sided loading of the bearings. The resultant indentations in the ball bearing races can cause premature bearing failure.

- Protect cleaned carbon steel parts against corrosion by oiling. Separator parts that are not assembled after cleaning must be wiped and protected against dust and dirt.
- If the separator has been shut-down for more than 3 months but less than 12 months, an Intermediate Service (IS) has to be made. If the shut-down period has been longer than 12 months, carry out a Major Service (MS).

4 Dismantling/Assembly

4.1 Introduction

4.1.1 General directions

The separator must be dismantled regularly for cleaning and inspection.

The recommended intervals are stated in chapter Maintenance intervals.

Intermediate Service (IS) (2000/4000 hours) / Major Service (MS) (8000/16000 hours)

When carry out a Major service all activities in the Intermediate Service are included. By that reason it is assumed that the dismantling for Intermediate Service is already done when describing Major Service.

NOTE

Never interchange bowl parts

To prevent mixing of parts, e.g. in an installation comprising several machines of the same type, the major bowl parts carry the machine manufacturing number or its last three digits.

4.1.2 References to check points

In the beginning of each sub-chapter describing the assembly you will find references to the check point instructions included in separate chapters located after the dismantling chapters. The references appear in the text as in the following example:

Check point
4.3.14 Valve plugs on page 99.

It is assumed that these check points are done before starting the assembly.

4.1.3 Tools

Tools

Special tools from the tool kit must be used for dismantling and assembly. The special tools are specified in the *Spare Parts Catalogue* and are shown as illustrations together with the dismantling/assembly instructions.



When lifting parts without weight specifications, always use lifting straps with the capacity of at least 500 kg.

4.1.4 Tightening of screws

When tightening screws, use the torques stated in the table below unless otherwise stated. The figures apply to oiled screws tightened with a torque wrench.

METRIC THREAD		
	Torque in Nm	
Thread	Stainless steel	Carbon steel
M6	7	8
M8	17	20
M10	33	39
M12	57	68
M16	140	155
M20	275	325
M24	470	570

4.2 Intermediate Service (IS), dismantling

4.2.1 Introduction

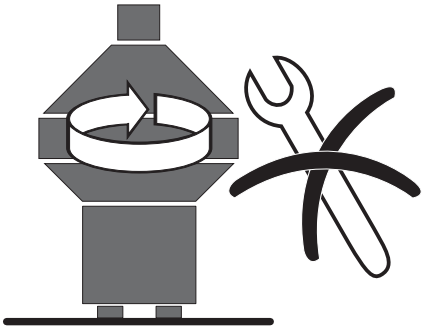
WARNING

Entrapment hazard

1. Make sure that rotating parts have come to a complete standstill before starting any dismantling work.

The impeller indicate if separator parts are rotating or not. The impeller can be observed if the outlet feed tube is dismantled. Use a torch light. Do not enter fingers or any other objects in the discharge housing.

2. To avoid accidental start, switch off and lock power supply before starting any dismantling work.



The motor fan and also pulses from the speed sensor indicate if the separator still is rotating



Lock power supply before starting dismantling

The frame hood and the heavy bowl parts must be lifted by means of a hoist. Position the hoist exactly above the bowl centre. Use an endless sling and a lifting hook with catch.

The parts must be handled carefully. Do not place parts directly on the floor, but on a clean rubber mat, fibreboard or a suitable pallet.

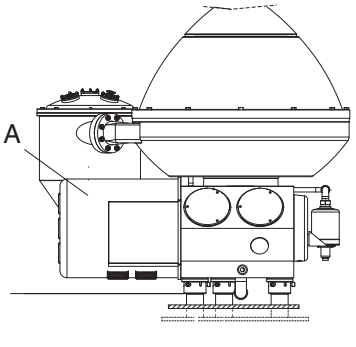
NOTE

A suitable platform or a stable ladder (not delivered) is recommended to be used when doing service on the machine.

CAUTION

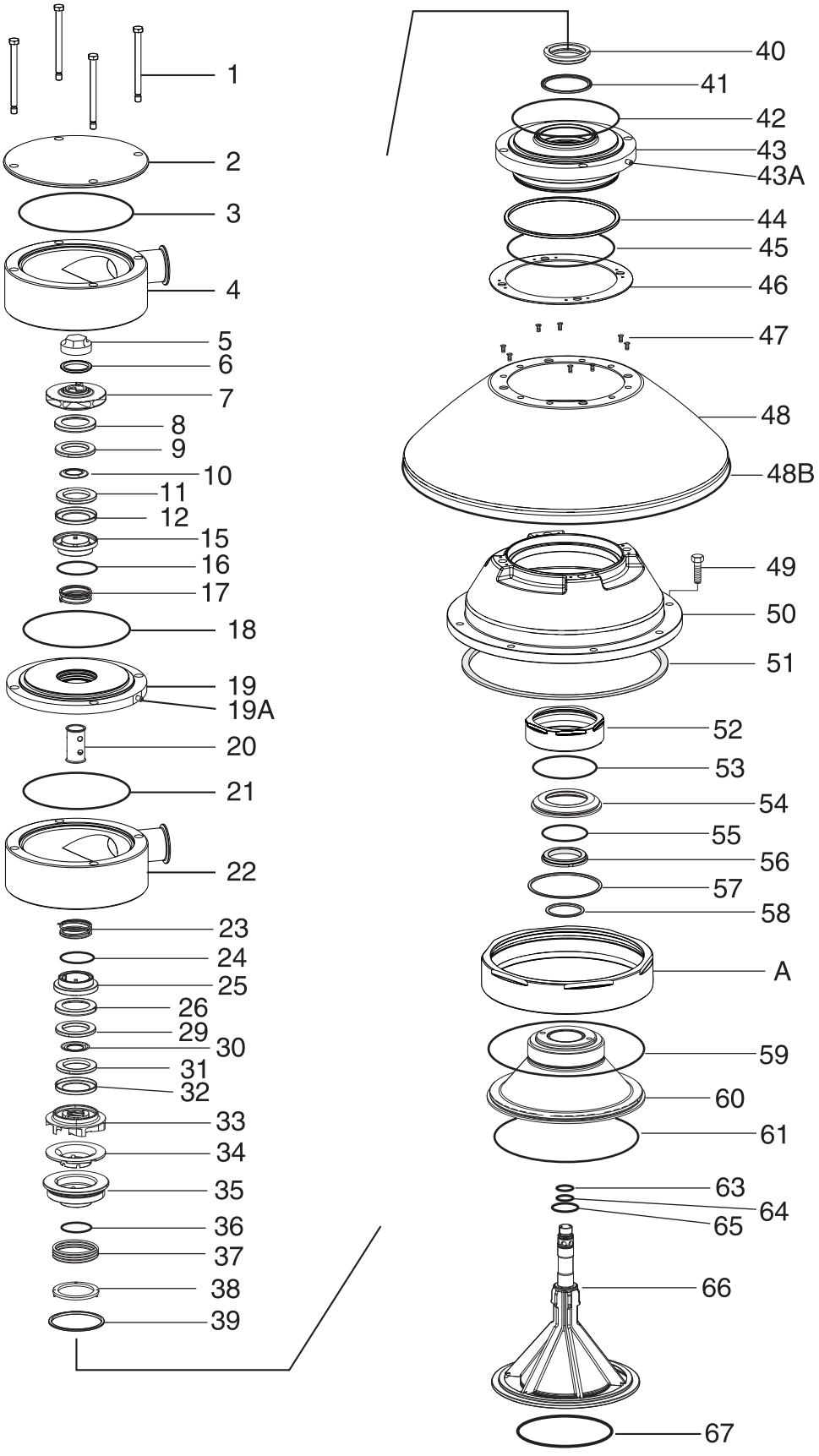
Falling hazard

Do not step up on, or stand on the motor or cover. The cover might brake or get damaged.

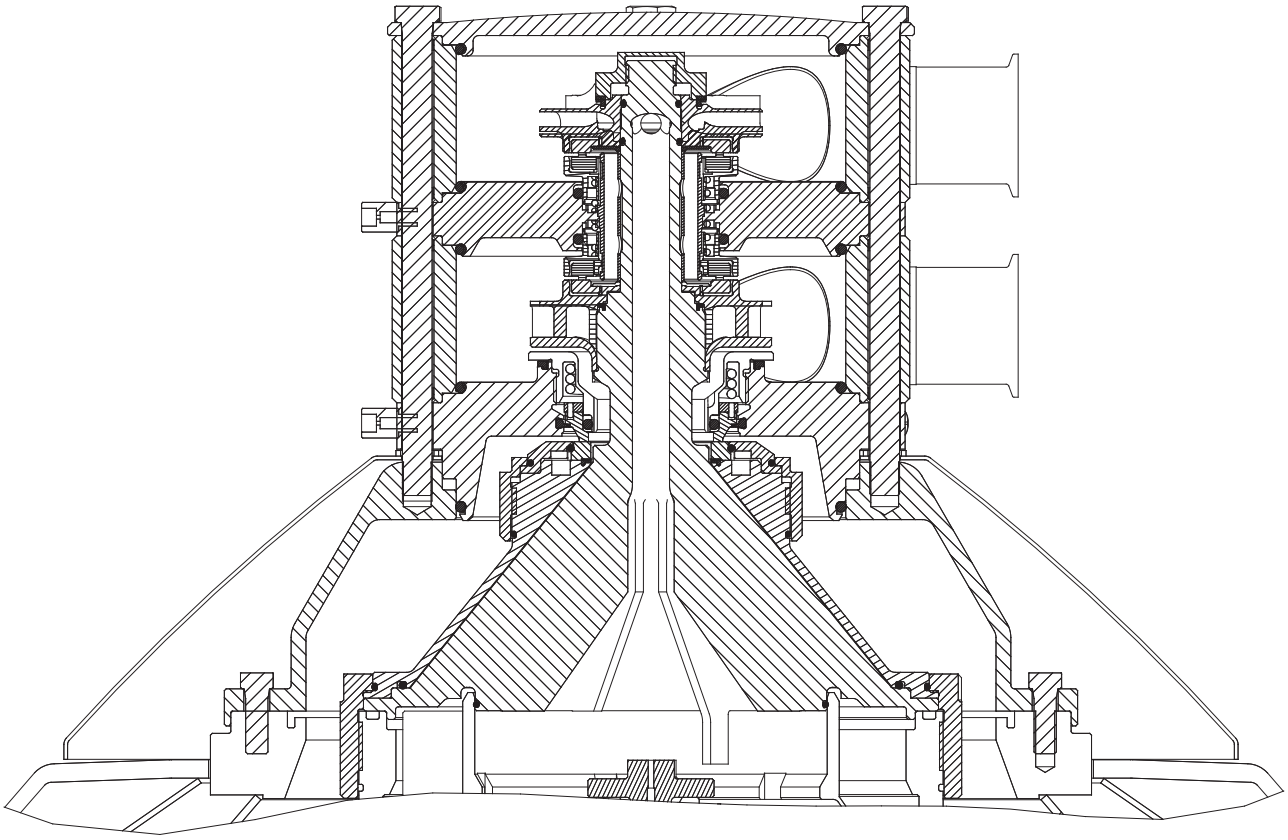


A. Motor cover

4.2.2 Outlet device

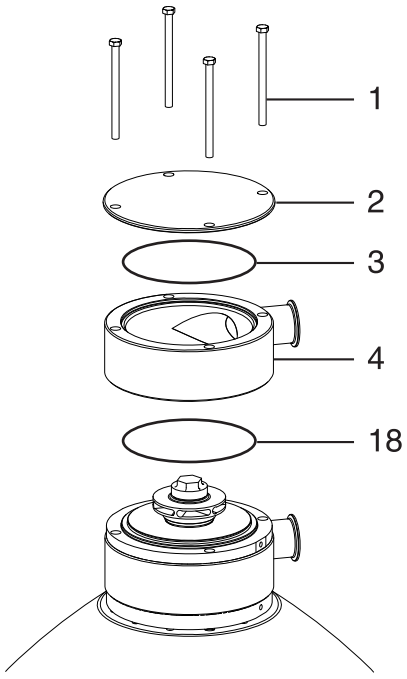


1. Screw
2. Cover
3. O-ring
4. Discharge housing
5. Nut
6. L-packing
7. Impeller
8. Gasket
9. Wear ring
10. Washer
11. Seal ring
12. L-packing
15. Spring support
16. O-ring
17. Compression spring
18. O-ring
19. Intermediate part
20. Spacing sleeve
21. O-ring
22. Discharge housing
23. Compression spring
24. O-ring
25. Spring support
26. L-packing
29. Seal ring
30. Washer
31. Wear ring
32. Gasket
33. Impeller top part
34. Impeller bottom part
35. Stator holder
36. O-ring
37. Compression spring
38. Driver
39. Lip seal (only for 3A-applications)
40. Seal ring
41. L-packing
42. O-ring
43. Intermediate part
44. Height adjusting ring
45. O-ring
46. Gasket
47. Screw
48. Hood
48B.Sealing
49. Screw
50. Connection piece
51. L-packing
52. Lock ring
53. O-ring
54. Rotor holder
55. O-ring
56. Wear ring
57. O-ring
58. L-packing
59. O-ring
60. Rotor holder
61. O-ring
63. O-ring
64. O-ring
65. L-Packing
66. Outlet pipe
67. O-ring
A. Lock ring



g10062n1

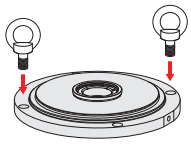
1. Unscrew the piping for process liquid and cooling water.
2. Loosen screw (1) and remove the cover (2).
3. Remove O-ring (3).
4. Remove the upper discharge housing (4).
5. Remove O-ring (18).



G10060e1

6. Unscrew and remove the nut (5) (left-hand thread) and L-packing (6).
7. Remove the complete upper impeller (7).
8. Remove the washer (10)
9. Remove the complete intermediate part (19) and O-ring (21).

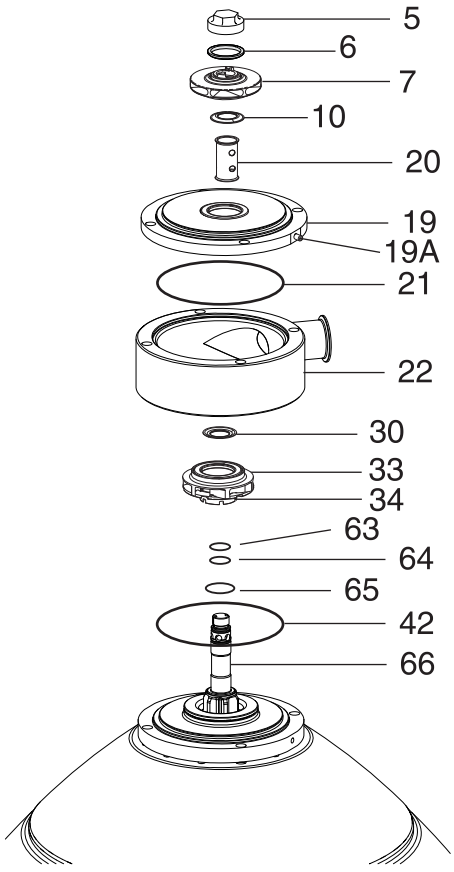
   Use lifting eyes for safe removal.


G1006041

NOTE

Note position of the intermediate part and connections before removing.

10. Remove the two O-rings (63) and (64) on the outlet feed tube (66).
11. Remove the spacing sleeve (20).
12. Remove the lower discharge housing (22).
13. Remove the complete lower and upper impeller (33 and 34) together with washer (30).

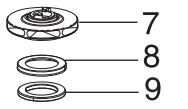


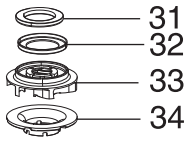
G1006061

14. Remove the O-ring (42) and L-packing (65).

15. Dismantle the upper and lower (two parts) impellers.

    Remove all parts from the impellers.





G1006071

7 / 33, 34. Impeller
8 / 32. Gasket
9 / 31. Wear ring

16. Dismantle the intermediate part, gently remove the two spring supports (15 anti-clockwise) and (25 clockwise when intermediate part turned upside down), bayonet-fitting.

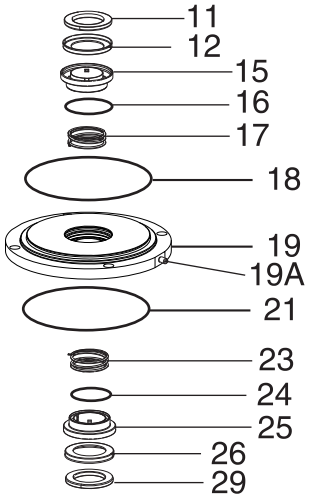
    Remove seal rings (11 / 29)

    Remove L-packings (12) and (26).

    Remove the O-rings (16) and (24).

    Remove the compression springs (17 / 23).

    Remove O-rings (18 / 21).



G1006161

NOTE

The lower spring has one end pointing out from centre.

CAUTION

Risk for injury by flying parts

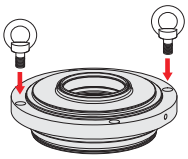
To avoid accidental release, be very careful when disengaging the spring supports from the intermediate part. The spring power can rip parts.

17. Use lifting eyes to remove outlet parts from separator.
Make sure intermediate part not get stuck in outlet pipe grooves.

    Remove the parts (35) to (46) from the outlet.

    Note! Lip seal (39) is only included if the machine is for a 3A-application.

    Use lifting eyes for safe removal of intermediate part.



G1006221

NOTE

Be careful when lifting intermediate part.

NOTE

The height adjusting ring (44) is attached to the intermediate part (43) with O-ring (45)

18. Dismantle the intermediate part. First fit the O-ring (D) to tool part support (C) and mount both parts (Spanner + Support) of the dismantling tool to the seal inside the housing.

19. Tighten the screw (B) on the tool until the compression spring (37) inside the seal is compressed.

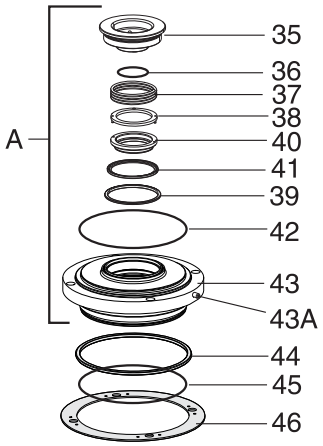
20. Remove the stator holder together with the seal parts and tool from the housing. Use a wrench to unscrew (A).

21. Dismantle the seal by carefully unscrewing the screw (B) and removing the rest of the tool.

CAUTION

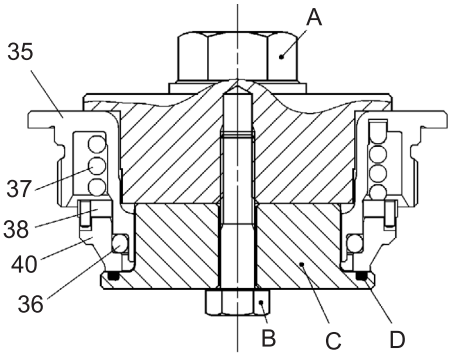
Risk for injury by flying parts

To avoid accidental release, be very careful when disengaging the wear ring supports from the guide sleeve. The spring power can rip parts.



G10062q1

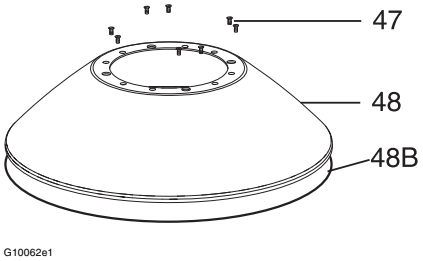
35. Stator holder
36. O-ring
37. Compression spring
38. Driver
39. Lip seal (only for 3A applications)
40. Seal ring
41. L-packing
42. O-ring
43. Intermediate part
44. Height adjusting ring
45. O-ring
46. Gasket
A. Complete intermediate part



G10062g1

A. Spanner
B. Screw
C. Support
D. O-ring
35. Stator holder
36. O-ring
37. Compression spring
38. Driver
40. Seal ring

22. Remove the hood (48) and sealing (48B) from connection piece (50).



G10062e1

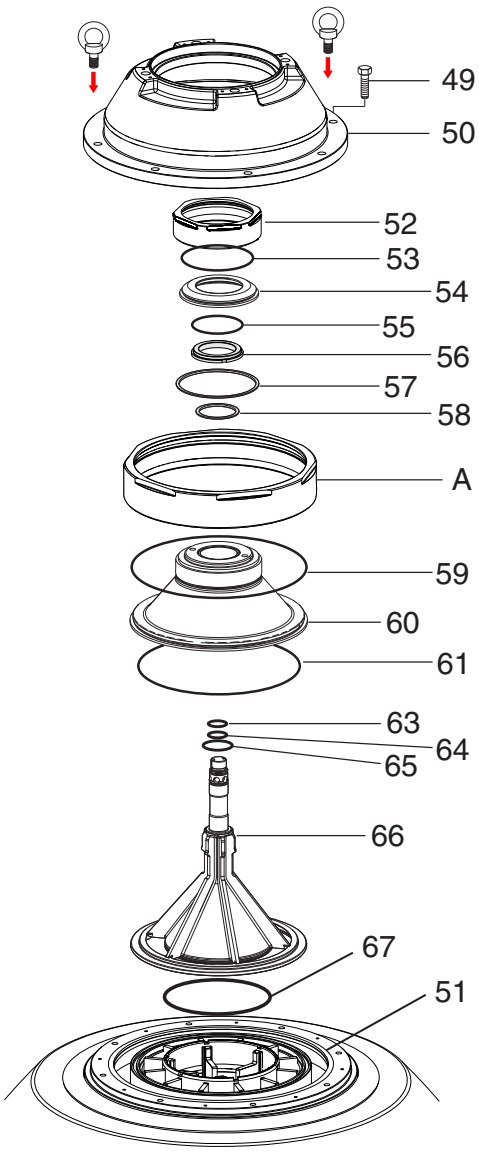
23. Remove screws (49) and dismantle connection piece (50) using lifting eyes.

24. Remove lock ring (52) to dismantle O-rings (53, 55, 57), rotor holder (54), wear ring (56) and L-packing (58).

    Note: Lock ring (52) **Left hand thread**.

25. Dismantle Lock ring (A) and remove rotor holder (60), O-rings (59, 61, 63, 64), L-packing (65), outlet pipe (66), L-packing (51) and O-ring/rectangular ring (67).

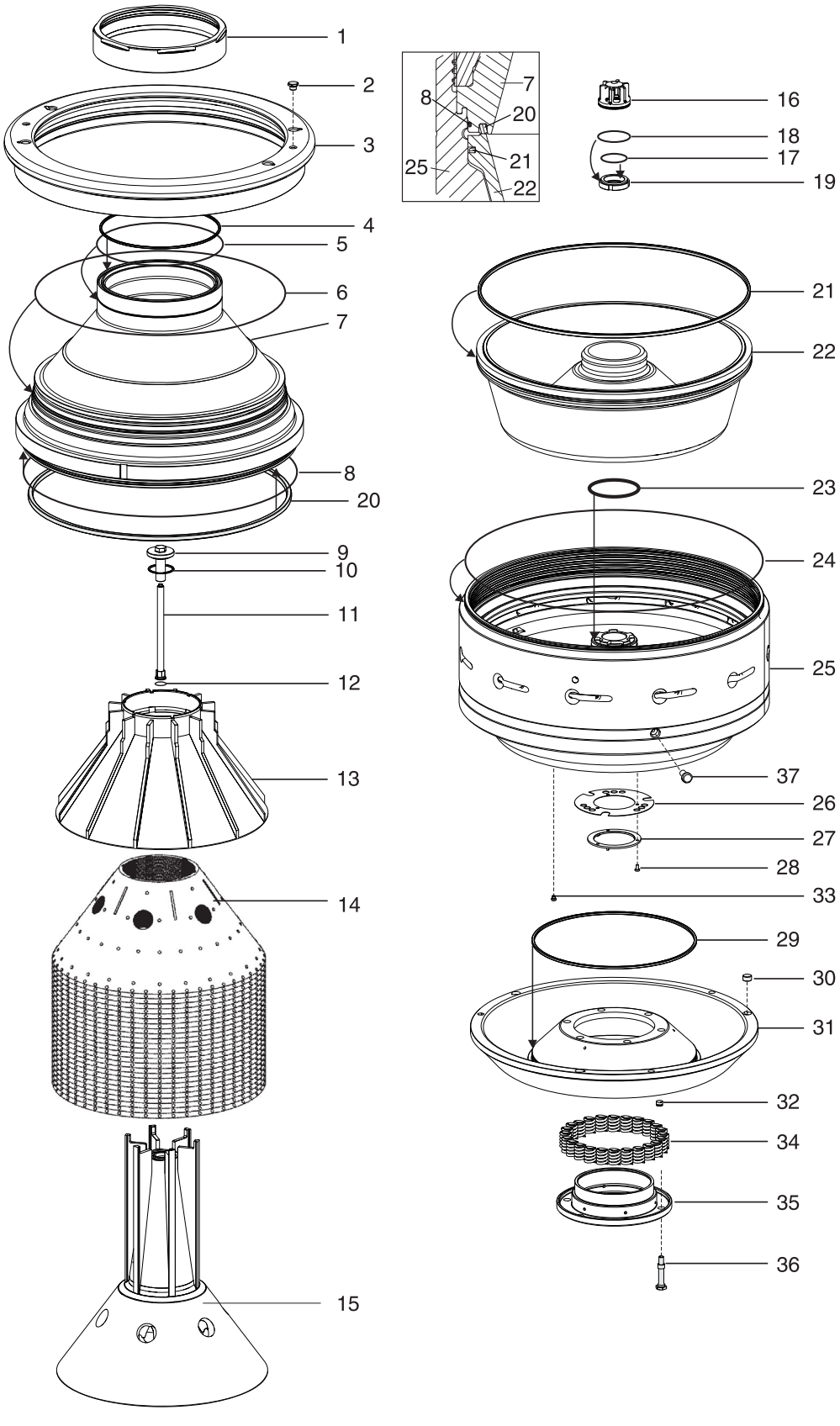
    Note: Lock ring (A) **Left hand thread**.



G1006381

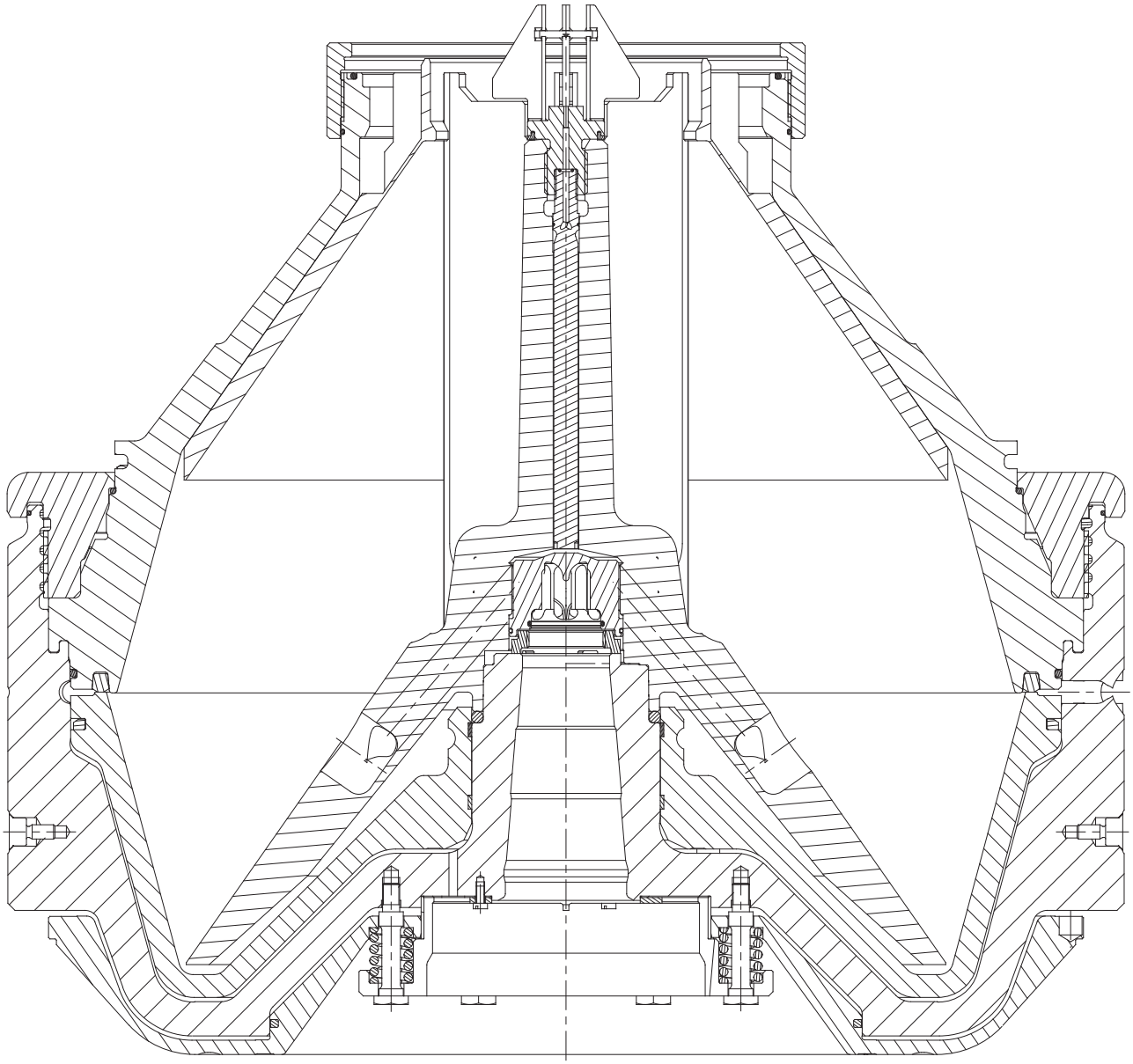
49. Screw
50. Connection piece
51. L-packing
52. Lock ring
53. O-ring
54. Rotor holder
55. O-ring
56. Wear ring
57. O-ring
58. L-packing
A. Small lock ring
59. O-ring
60. Rotor holder
61. O-ring
63. O-ring
64. O-ring
65. L-packing
66. Outlet pipe
67. O-ring

4.2.3 Bowl



G10255a1

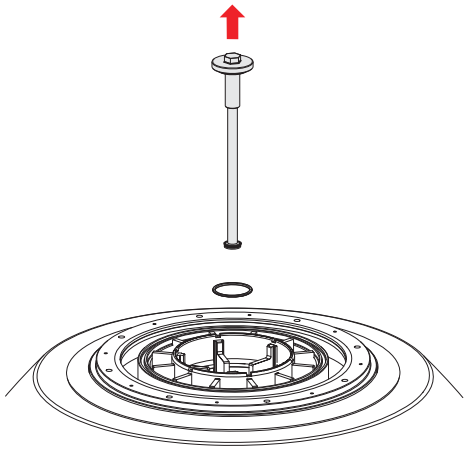
1. *Small lock ring*
2. *Plug*
3. *Large lock ring*
4. *O-ring*
5. *O-ring*
6. *O-ring*
7. *Bowl hood*
8. *O-ring*
9. *Sealing lid*
10. *L-packing*
11. *bar*
12. *O-ring*
13. *Top disc*
14. *Disc stack*
15. *Distributor*
16. *Crowned wing*
17. *O-ring*
18. *O-ring*
19. *Cap nut*
20. *Seal ring*
21. *Rectangular ring*
22. *Sliding bowl bottom*
23. *O-ring*
24. *O-ring*
25. *Bowl body*
26. *Gasket*
27. *Sleeve with wings*
28. *Screw*
29. *O-ring*
30. *Valve plug*
31. *Operating slide*
32. *Plug*
33. *Nozzle*
34. *Spring*
35. *Spring support*
36. *Screw*
37. *Plug*



g10338q1

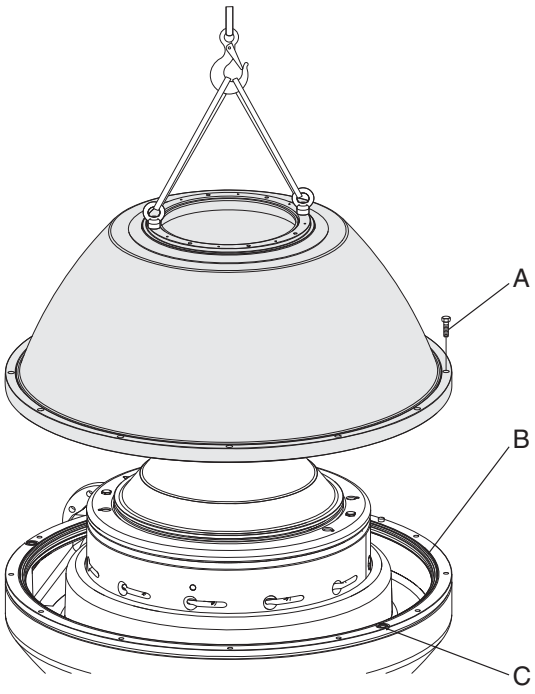
Before dismantling the bowl, the outlet has to be dismantled, for further instructions see 4.2.2 Outlet device on page 56.

1. Remove the venting screw (**Left hand thread**) and the L-packing.



G1006821

2. Remove the twelve screws for the frame hood and lift it off by using two lifting eyes.



G1006911

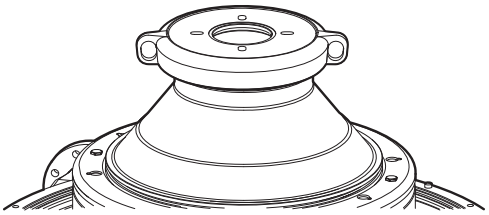
A. Screw
B. Seal ring
C. O-ring

3. Unscrew the large lock ring with the compressing tool as described.

NOTE

Use the compressing tool to reduce shocks to bearings and minimize thread wear when unscrewing the large lock ring.

a. Fit the lifting tool on the bowl hood.

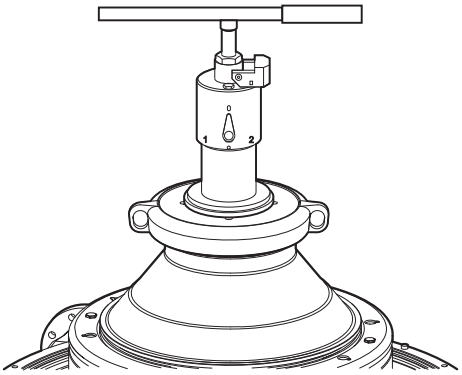


g0531261

b. Fit the compressing tool by screwing the pole of the tool into the threads of the distributor using the horizontal handle.

Left hand thread.

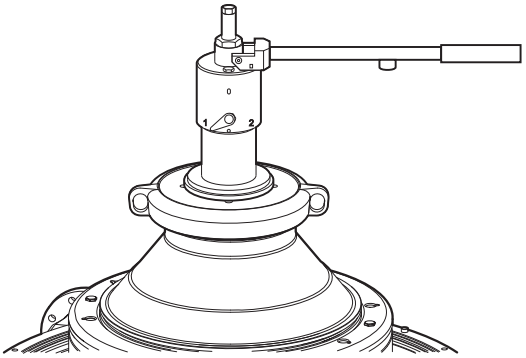
The control lever on the compressing tool should be in position 0.



g0531351

c. Turn the control lever to position 1 for compression.

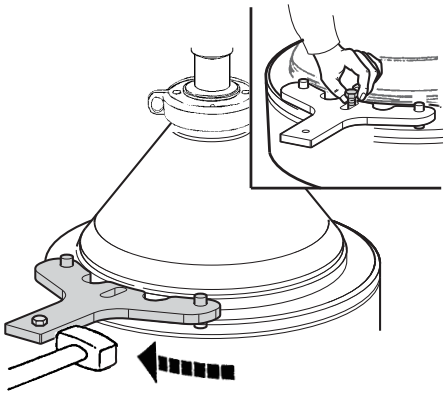
Compress the disc stack by pumping the horizontal handle until the oil pressure is released through the relief valve.



g05336B1

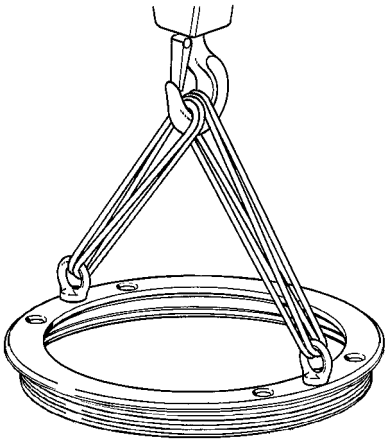
d. Fit the lock ring spanner and unscrew the large lock ring.

Left-hand thread!



G05711o1

4. Fit two eye bolts and remove the large lock ring by a hoist.



G0531541

NOTE

The lock ring must be kept lying horizontally or it may become distorted. Even the slightest distortion could make it impossible to refit.

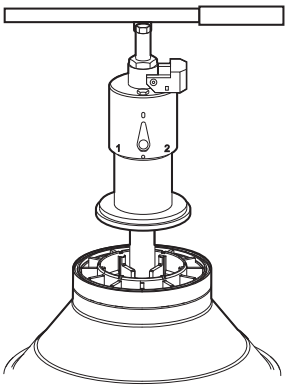
5. Separate the bowl hood from the bowl body.

   If necessary use the compression tool as described before lifting off the bowl hood.

   a. Remove the lifting tool from the bowl hood.

   b. Fit the compressing tool by screwing the pole of the tool into the threads of the distributor using the horizontal handle.

      The control lever on the compressing tool should be in position 0.

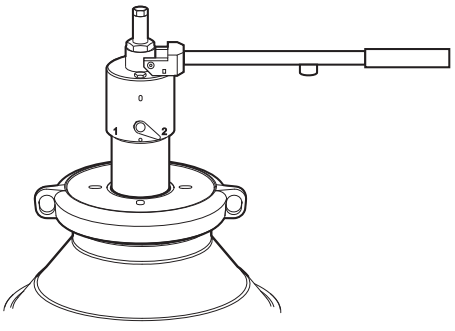


G05439d1

   c. Fit the lifting tool on the bowl hood.

   d. Turn the control lever to position 2 for expansion.

      Separate the bowl hood from the bowl body by pumping the horizontal handle.



G05336f1

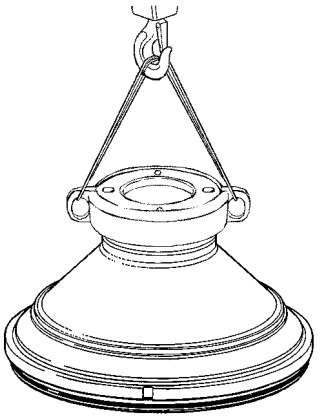
   e. Remove the compressing tool.

6. Carefully lift off the bowl hood using a hoist and place on a wooden pallet. Be careful not to scratch the bowl hood seal ring.



Crush hazard

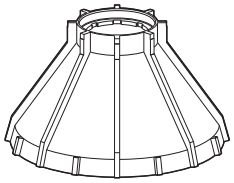
If the top disc is stuck into the bowl hood, remove it now before it accidentally falls out.



G0539991

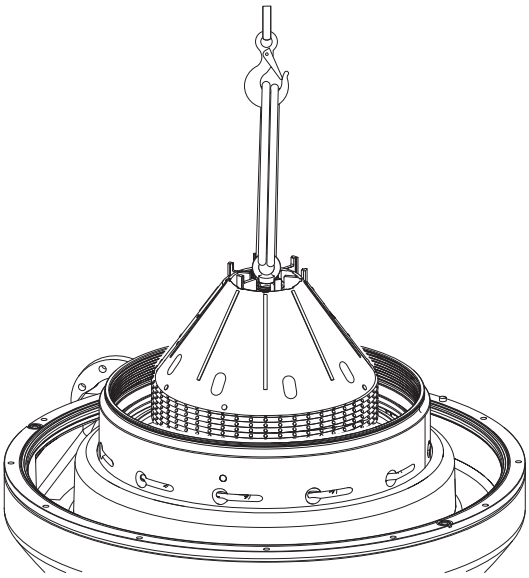
7. Remove the lifting tool.

8. Remove the top disc.



g10068i1

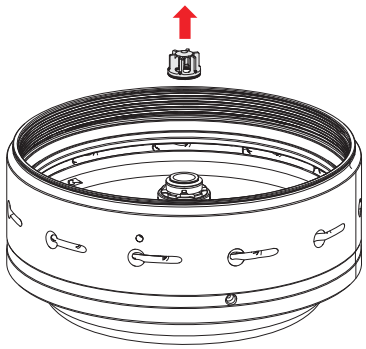
9. Fit the lifting tool into the distributor and lift the distributor with disc stack out of the bowl body using a hoist.



G10068h1

The illustration may not show the actual disc stack

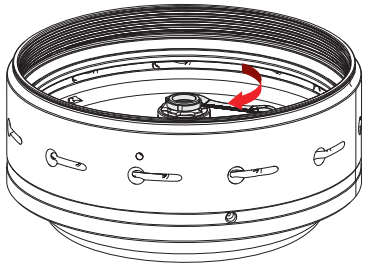
10. Carefully remove the crowned wing from cap nut, (bayonet fitting).



G1007141

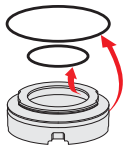
11. Unscrew and remove the cap nut using a spanner.

    Left-hand thread!



G1007111

12. Remove O-rings on cap nut.



G1007171

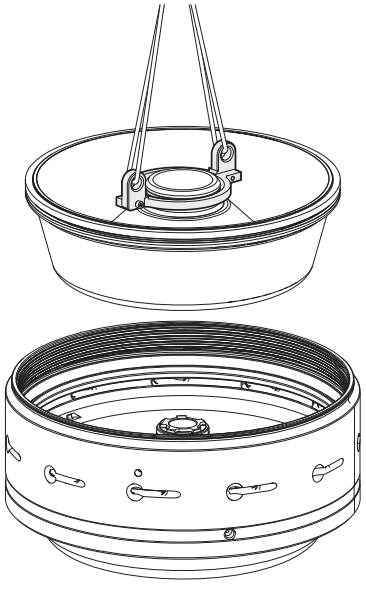
13. Fit the lifting tool onto the sliding bowl bottom and lift it out by a hoist.

    NOTE

    Ensure that the screws on the tool are properly tightened.

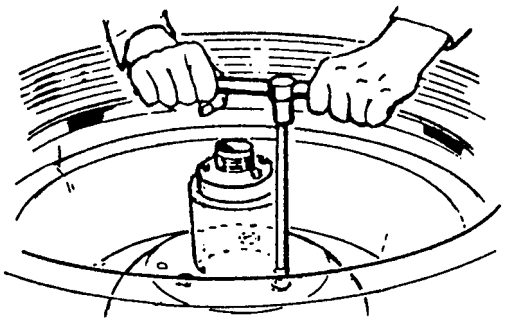
    NOTE

    Avoid sealing ring to get stuck in the bowl body ports.



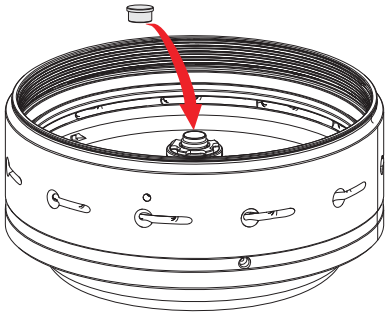
G1007231

14. Unscrew the screws in the bottom of the bowl body.



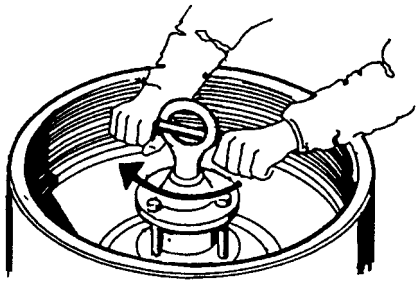
G0728911

15. Fit the cover plug in the centre of spindle.



G1007221

16. Fit the lifting tool into the bowl body bottom with the three screws. Release the bowl body from the spindle by using the lifting tool as a puller. Turn the handle at top of the lifting tool until the bowl body comes loose from the spindle taper. Turn the handle two more turns in order to avoid damaging the paring disc device.

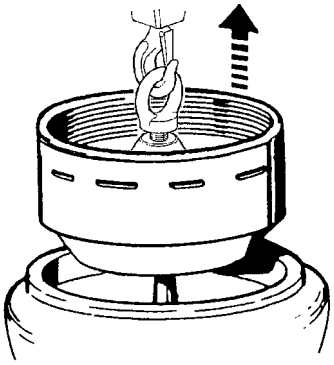


G0729011

17. Lift out the bowl body using a hoist.

NOTE

Handle the bowl body carefully. If it is roughly handled, the ejection mechanism may be damaged.



G0729131

18. Remove the bowl body lifting tool.

19. Remove the two plugs in the bowl body wall and fit the turning tool.

NOTE

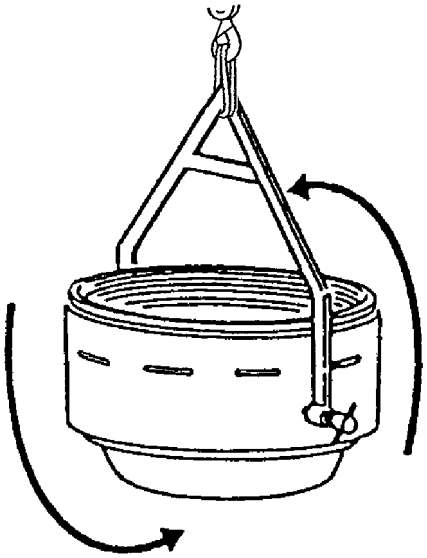
Ensure that the screws on the turning tool are properly tightened.

WARNING

Crushing hazard

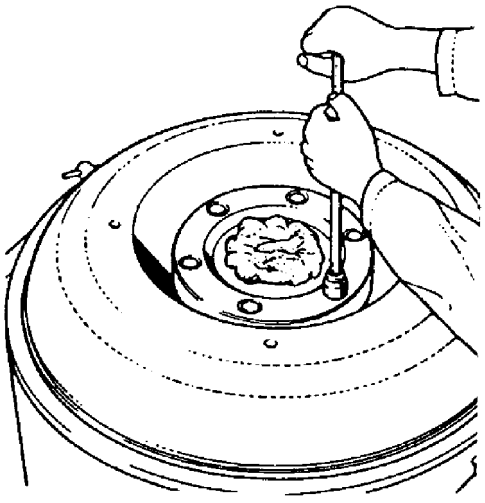
Risk for jamming injury when turning the bowl body.

20. Turn the bowl body using the turning tool.



G0570211

21. Protect the nave bore in bowl body with a rag.



G0570311

22. Loosen the screws for the spring support successively a little at a time.

23. Remove the spring support (1) and the springs (2).

24. Loosen the screws for the sleeve with wings (3). Remove the sleeve and gasket (4).

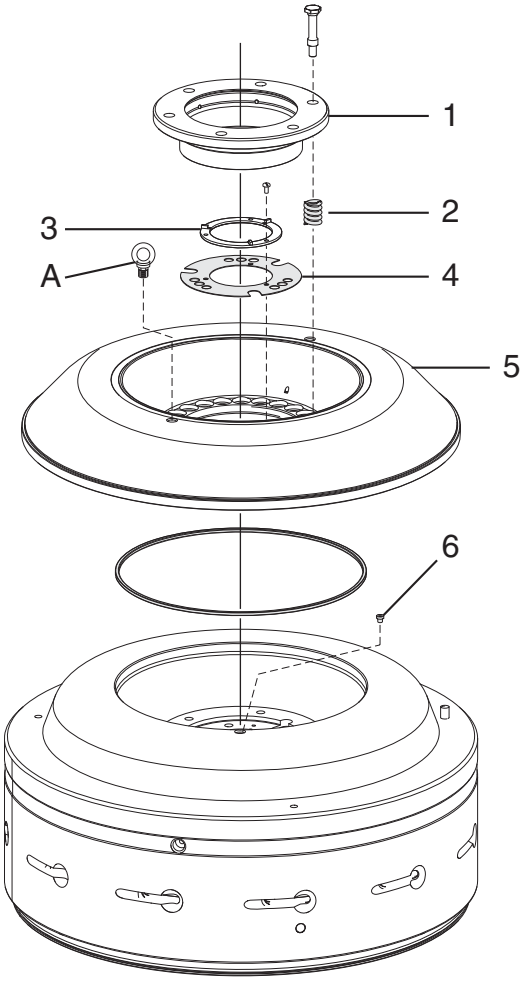
25. Remove cover plugs and fit two lifting eyes (A) into the operating slide (5) and lift it off from the bowl body.

26. Place the operating slide with the valve plugs facing upwards.

27. Remove valve plugs by carefully knocking a screwdriver into groove and prize plug out of the hole.



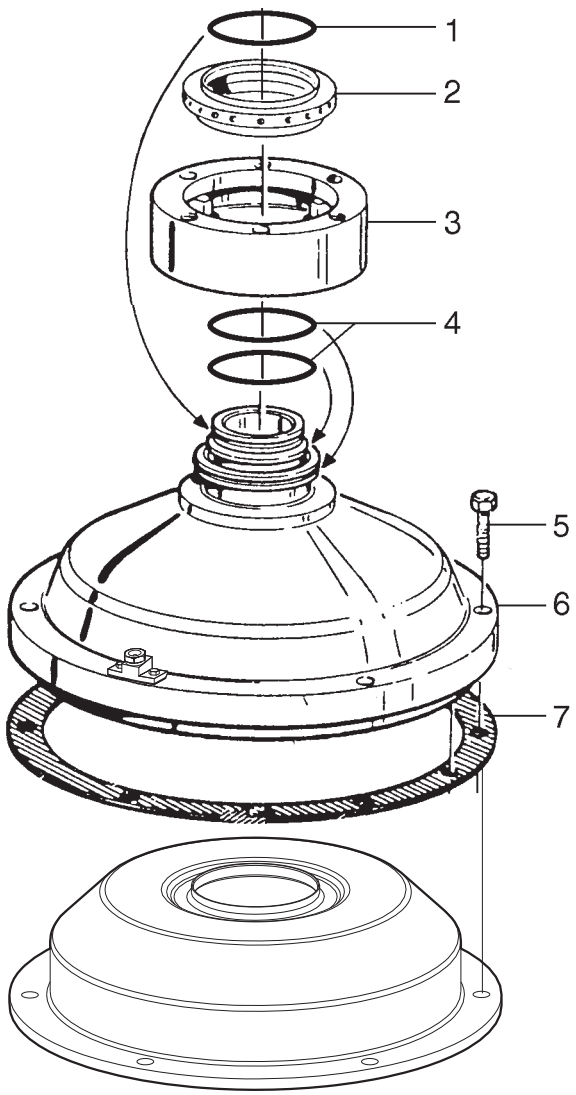
Risk for injury by flying parts
Use safety goggles when removing valve plugs.



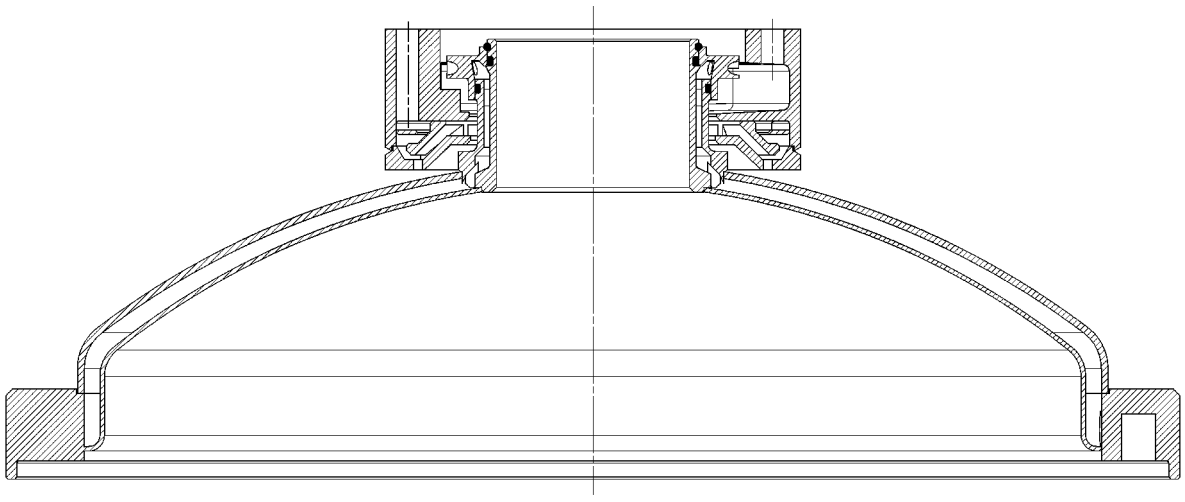
G1007311

4.2.4 Operating liquid device

1. O-ring
2. Control paring disc
3. Distributing ring
4. O-ring
5. Screw
6. Distributing cover
7. Height adjusting ring(s)

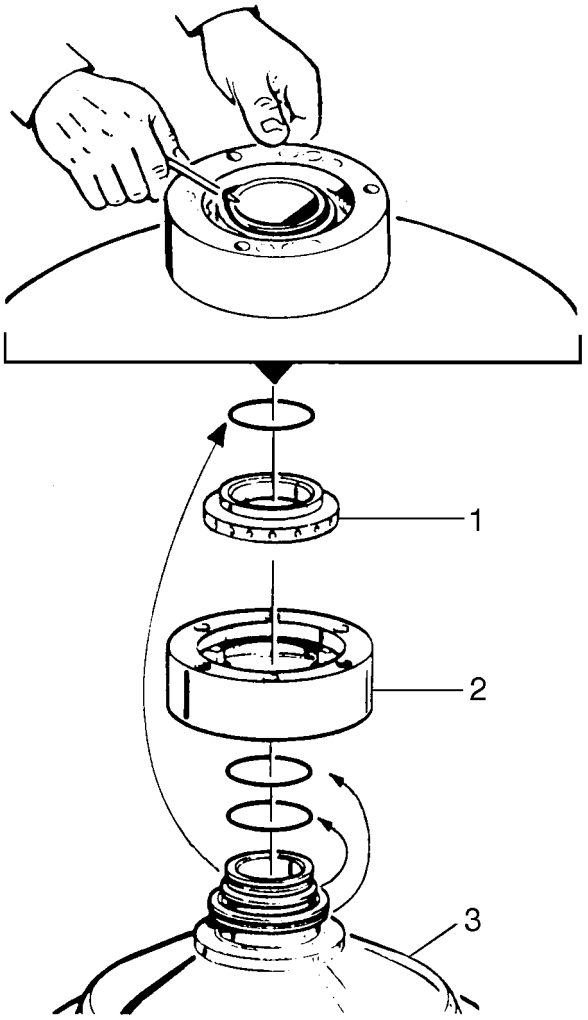


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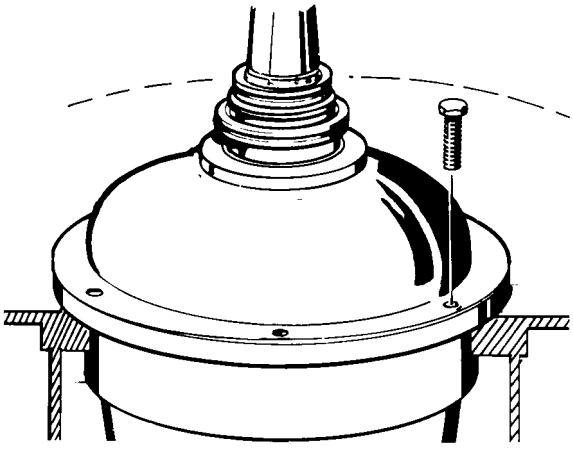
g10338s1

1. Tap the control paring disc (1) carefully with a soft drift, so that the upper O-ring is unloaded.
2. Remove the O-ring with a small screw driver or similar tool.
3. Remove the control paring disc by lifting up the distributing ring (2).
4. Remove the two O-rings from the distributing cover (3).



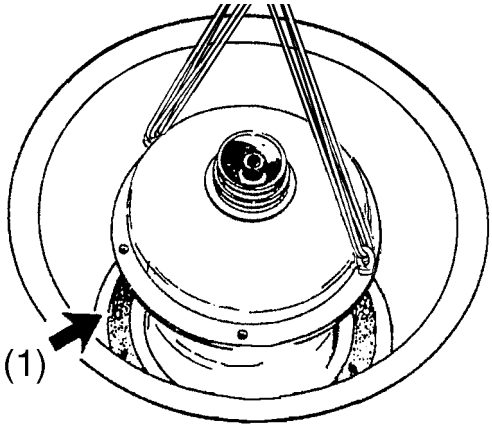
g0463181

5. Unscrew and remove the screws.



g0828431

6. Attach the two special lifting eyes and lift off the distributing cover using a sling. Remove the height adjusting rings. Note the number of height adjusting rings.



g0672851

1. Guide pin

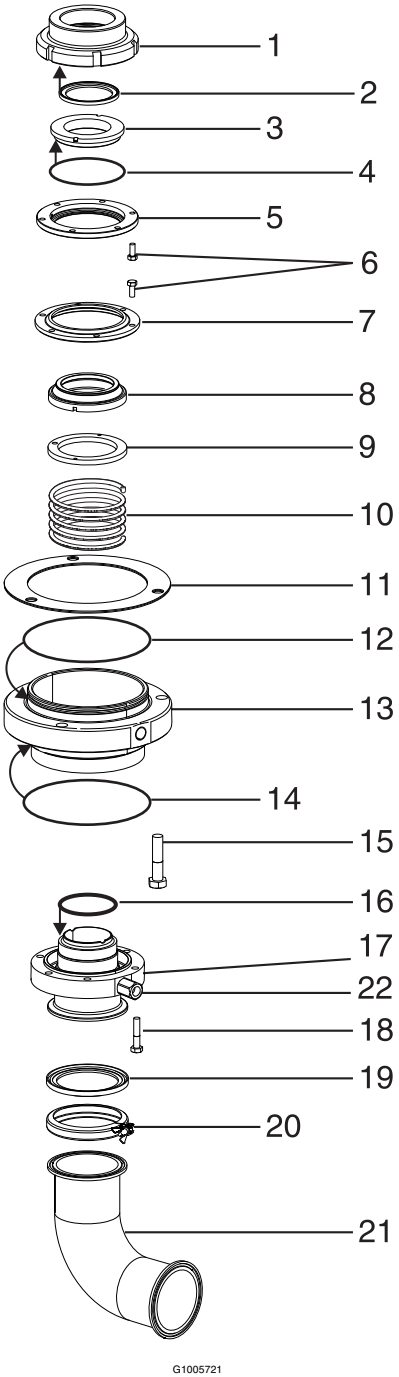
7. Check all parts for damage and corrosion.

After dismantled all parts for Intermediate Service, remove any thick deposits in the frame top part and clean all other parts thoroughly in a suitable cleaning agent. See chapter 3.3 Cleaning on page 31.

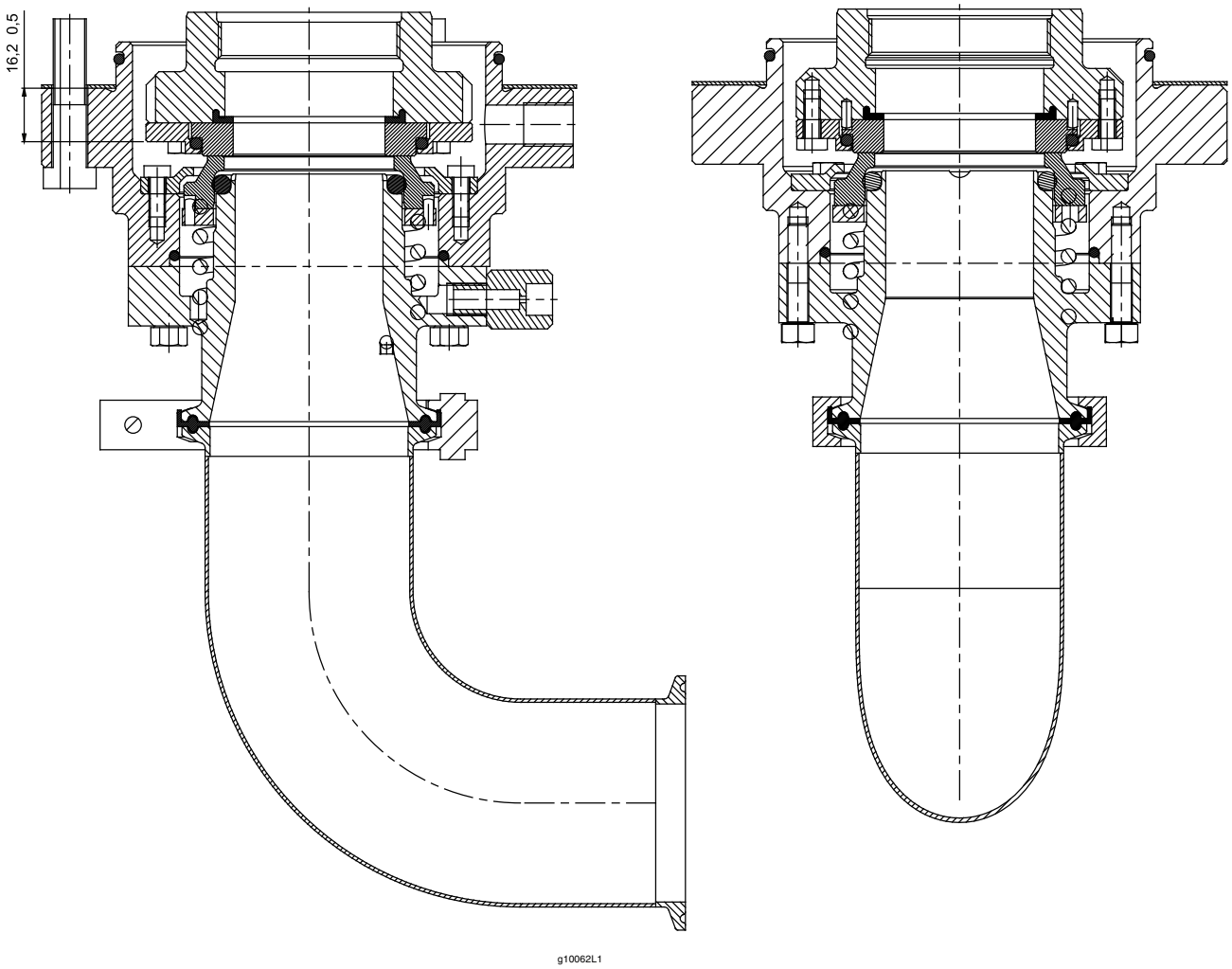
If carry out a Major Service, proceed the dismantling of the separator. The dismantling instructions continue at 4.5 Major Service (MS), dismantling on page 140.

4.2.5 Inlet device

Single sealing



1. *Rotor support*
2. *O-ring*
3. *Wear ring*
4. *O-ring*
5. *Rotor holder*
6. *Screw*
7. *Stator holder*
8. *Seal ring*
9. *Driver*
10. *Spring*
11. *Height adjusting ring*
12. *O-ring*
13. *Inlet housing upper*
14. *O-ring*
15. *Screw*
16. *O-ring*
17. *Inlet housing lower*
18. *Screw*
19. *Packing*
20. *Clamp ring*
21. *Elbow pipe*
22. *Constant flow valve*


16,2 0,5
g10062L1

1. Remove the piping for process liquid and sealing liquid.

2. Disconnect and remove the clamp ring (20), packing (19) and pipe bend (21).

3. Unscrew the screws (15) and remove the inlet housing (13, 17) as one unit.

4. Dismantle the complete housing by first removing two of the screws (6) and replace them with longer ones to prevent spring force.

   Screw out the rest of the screws, each screw a little at a time.

   Remove the longer screws and make sure no parts fly out.

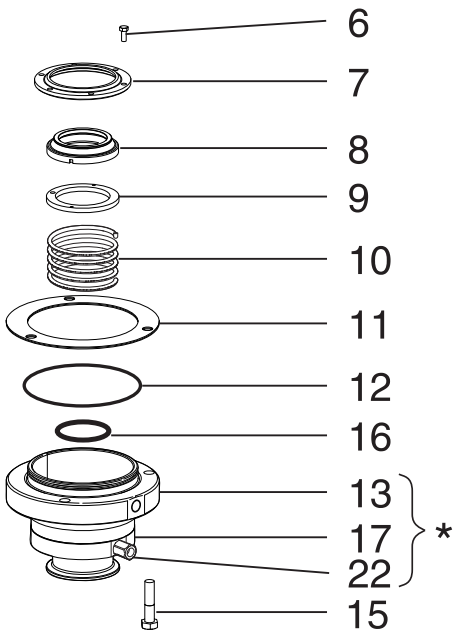
5. Remove the stator holder (7), seal ring (8), driver (9), compression spring (10) and O-rings (16) and (12).

6. Unscrew and remove the rotor support (1) from the spindle using the spanner.

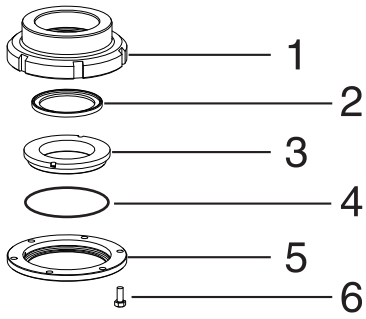


7. Remove the rotor holder (5), O-ring (4), wear ring (3), L-packing (2) by unscrewing the screws (6).

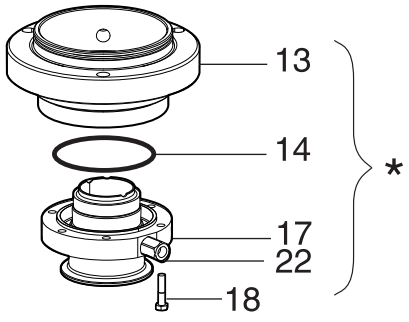
8. Dismantle the upper and lower inlet housing (13, 17) by unscrewing screw (18) and remove O-ring (14).



G1005861



G08334z1



G1005871

4.3 Intermediate Service (IS), check points

4.3.1 Introduction

This chapter consists of check points that can be done when the separator has been dismantled for Intermediate Service but before it is assembled. Other check points that can be done only in conjunction with the assembly are described in the assembly sections.

4.3.2 Corrosion

Evidence of corrosion attack should be looked for and rectified each time the separator is dismantled. Main bowl parts such as the bowl body, sliding bowl bottom, bowl hood and lock ring must be inspected with particular care for corrosion damage.



Disintegration hazard

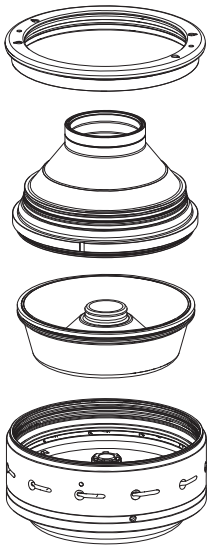
Inspect regularly for corrosion damage. Inspect frequently if the process liquid is corrosive.

Always contact your Alfa Laval representative if you suspect that the largest depth of the corrosion damage exceeds 1,0 mm or if cracks have been found. Do not continue to use the separator until it has been inspected and given clearance for operation by Alfa Laval.

Cracks or damage forming a line should be considered as being particularly hazardous.

Non-stainless steel and cast iron parts

Corrosion (rusting) can occur on unprotected surfaces of non-stainless steel and cast iron. Frame parts can corrode when exposed to an aggressive environment.

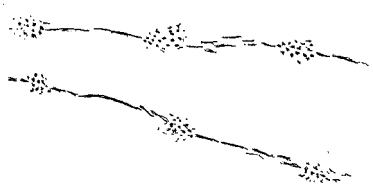


G0206171

Main bowl parts to check for corrosion

Stainless steel

Stainless steel parts corrode when in contact with either chlorides or acidic solutions. Acidic solutions cause general corrosion. The chloride corrosion is characterised by local damage such as pitting, grooves or cracks. The risk of chloride corrosion is higher if the surface is:



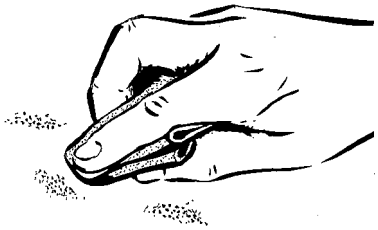
Example of chloride corrosion in stainless steel

- Exposed to a stationary solution.
- In a crevice.
- Covered by deposits.
- Exposed to a solution that has a low pH.

Corrosion damage caused by chlorides on stainless steel begins as small dark spots that can be difficult to detect.

1. Inspect closely for all types of damage by corrosion and record these observations carefully.

2. Polish dark-coloured spots and other corrosion marks with a fine grain emery cloth. This may prevent further damage.



Polish corrosion marks to prevent further damage



Disintegration hazard

Pits and spots forming a line may indicate cracks beneath the surface.

All forms of cracks are a potential danger and are totally unacceptable.

Renew the part if corrosion can be suspected of affecting its strength or function.

Other metal parts

Separator parts made of materials other than steel, such as brass or other copper alloys, can also be damaged by corrosion when exposed to an aggressive environment. Possible corrosion damage can be in the form of pits and/or cracks.

4.3.3 Cracks

Cracks can initiate on the machine after a period of operation and propagate with time.

- Cracks often initiate in an area exposed to high cyclic material stresses. These are called fatigue cracks.
- Cracks can also initiate due to corrosion in an aggressive environment.
- Although very unlikely, cracks may also occur due to the low temperature embrittlement of certain materials.

The combination of an aggressive environment and cyclic stresses will speed-up the formation of cracks. Keeping the machine and its parts clean and free from deposits will help to prevent corrosion attacks.



Disintegration hazard

All forms of cracks are potentially dangerous as they reduce the strength and functional ability of components.

Always replace a part if cracks are present.

It is particularly important to inspect for cracks in rotating parts and especially the pillars between the sludge ports in the bowl wall.

Always contact your Alfa Laval representative if you suspect that the largest depth of the damage exceeds 1,0 mm. Do not continue to use the separator until it has been inspected and cleared for operation by Alfa Laval.

4.3.4 Erosion

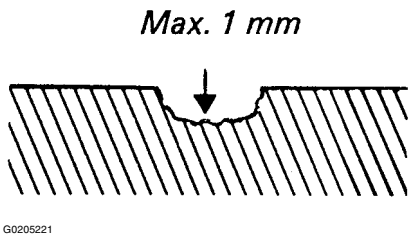
Erosion can occur when particles suspended in the process liquid flow along or strike against a surface. Erosion can become intensified locally by flows of higher velocity.



Disintegration hazard

Inspect regularly for erosion damage. Inspect frequently if the process liquid is erosive.

Always contact your Alfa Laval representative if the largest depth of any erosion damage exceeds 1,0 mm or if the surface of the sliding bowl bottom shows any sign of damage. Valuable information as to the nature of the damage can be recorded using photographs, plaster impressions or hammered-in lead.



G0205221

Max. permitted erosion

Erosion is characterised by:

- Burnished traces on the material.
- Dents and pits having a granular and shiny surface.

Look carefully for any signs of erosion damage. Erosion damage can deepen rapidly and consequently weaken parts by reducing the thickness of the metal.

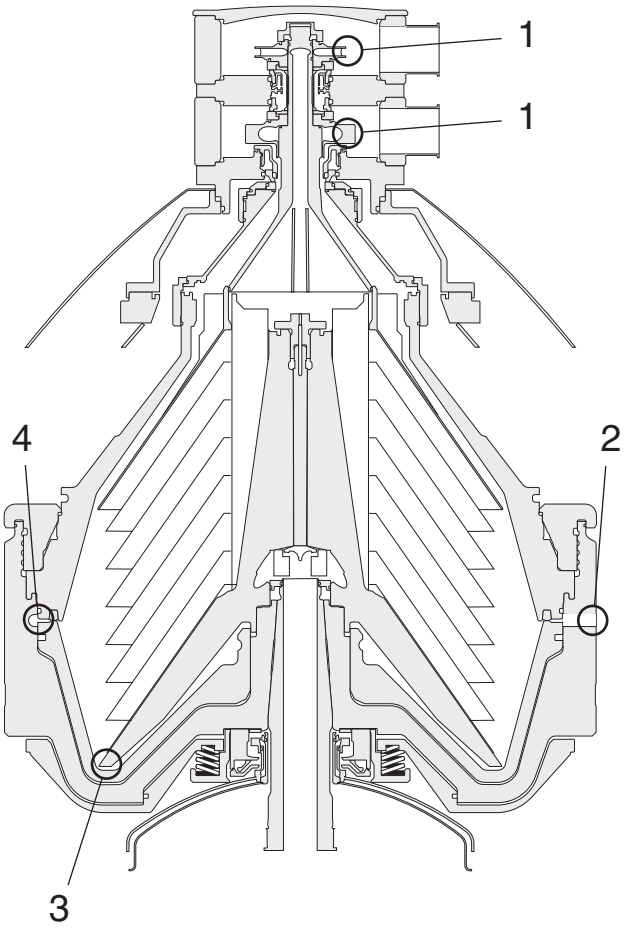


Disintegration hazard

Erosion damage can weaken parts by reducing the thickness of the metal.

Pay special attention to the pillars between the sludge ports in the bowl wall.

Renew the part if erosion is suspected of affecting its strength or function.

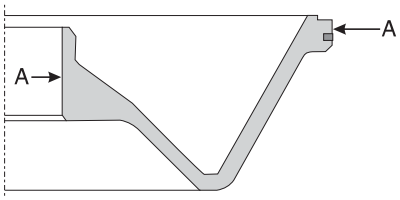


Surfaces particularly subjected to erosion

1. *The impeller*
2. *The pillars between the sludge ports in the bowl wall.*
3. *The surface of the sliding bowl bottom that faces the conical part of the distributor.*
4. *The sealing edge of the sliding bowl bottom.*

4.3.5 Guide surfaces

Clean the illustrated parts with a suitable cleaning agent. **Do not** degrease the contact surfaces indicated B. These surfaces are primed with a slide lacquer which must not be removed.



G03782l1

Sliding bowl bottom

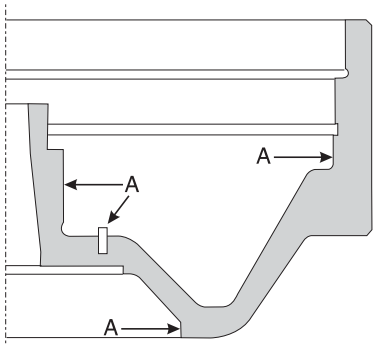
NOTE

To avoid the risk of galling, the contact surfaces indicated B are primed with a slide lacquer at every Major Service (MS). The slide-lacquered surfaces will be destroyed if the surfaces are degreased.

Check surfaces indicated A and B for burrs or galling. Rectify when necessary.

For repair of galling on guide surfaces, see following pages.

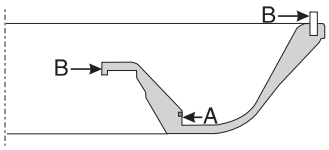
Before fitting the parts, see 3.5.2 Lubricants on page 41 and apply lubricants accordingly with a well-cleaned brush on surfaces indicated A and B.



G03782j1

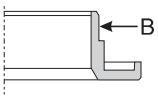
Bowl body

Lubricate the O-rings and seal rings with silicone grease making sure they are not damaged and lie properly in their grooves.



G03782g1

Operating slide



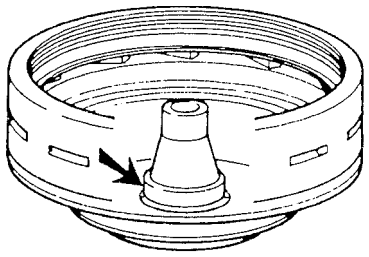
G03782h1

Spring support

Repair of galling on guide surfaces

Galling (friction marks) may appear on guide surfaces in the operating system, the bowl body and the sliding bowl bottom. Surfaces subject to repair are indicated by an arrow.

The example below describes the repair of the lower guide surface of the bowl body nave.



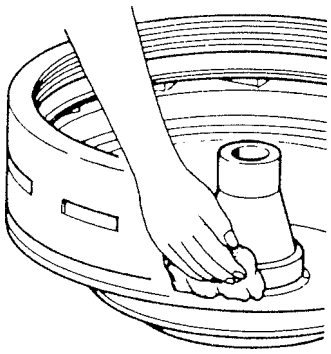
G0205511

Guide surface in the bowl body

Recommended tools for correction of galling:

- Emery cloth, 240 grade.
- Small power drill
- Degreasing agent.
- Fibre brush, Ø 25mm.
- Fibre brush, Ø 50 mm.
- Very fine single-cut file.

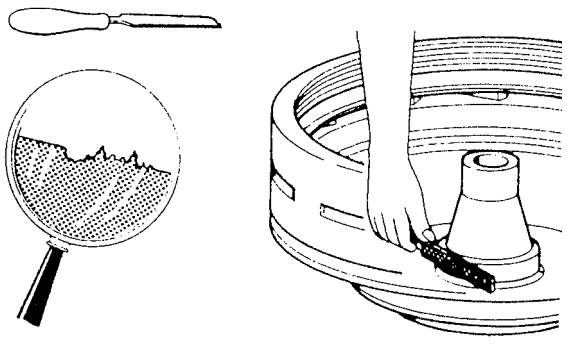
1. Clean the surface thoroughly with a degreasing agent, i.e. white spirit. This is important.



G0205611

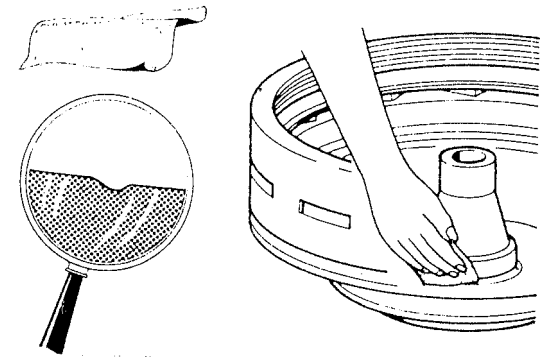
2. If the galling is excessive, first use the fine single-cut file. The file should be used with caution so that the damage is not made worse.

   Remove the high spots on the surface. Do not use rotating files or similar. Remove the high spots only - not the undamaged material.



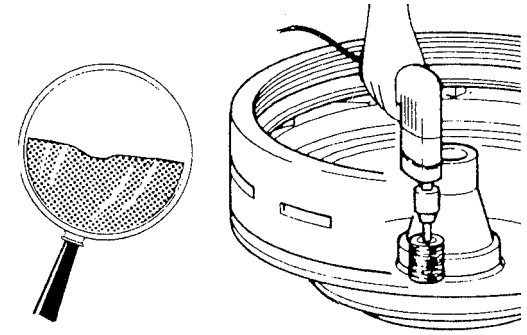
G0205711

3. An emery cloth of 240 grade should be used to smooth the edges and to remove any burnt-in foreign matter.



G0205811

4. Finish off by polishing the damaged spot with the fibre brushes and brush wax. It is recommended that the whole area where galling may occur is polished. Polishing will help smooth the whole of the damaged area, even in the deepest parts.



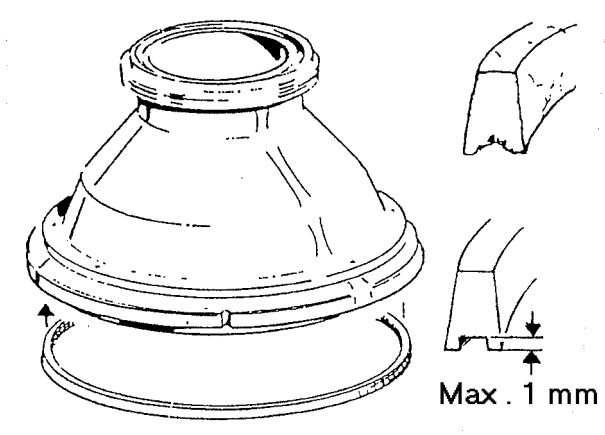
G0205911

5. Prime the repaired area with slide lacquer. Read the correct procedure under check point 4.6.4 Lock ring; priming on page 166. Apply lubricant paste, see 3.5.2 Lubricants on page 41 on the surface after priming.

4.3.6 Bowl hood seal ring

Poor sealing between the bowl hood seal ring and the sealing edge of the sliding bowl bottom will cause a leakage of process liquid from the bowl.

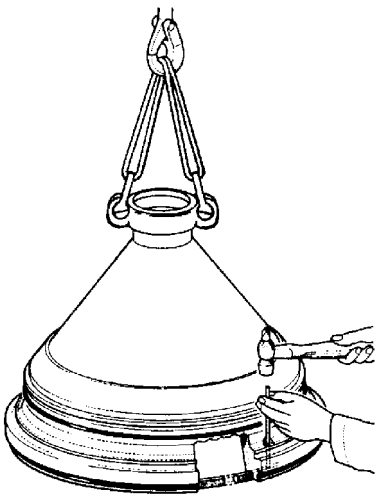
Renew the bowl hood seal ring at each Intermediate Service (IS).



G0206211

Max. permitted indentation of the seal ring is 1 mm

Knock out the old ring by means of a pin inserted in the holes intended for this purpose.



G0570831

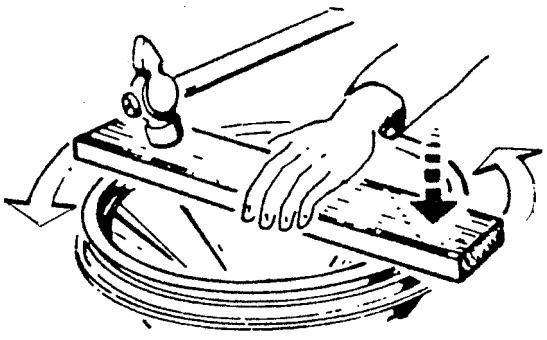
Removal of the seal ring

Fit the new ring as follows:

Press the ring into the groove with a straight wooden board placed across the ring.

NOTE

If the new ring is too narrow, place it in hot water (70-80 °C) for about 5 minutes. If it is too wide, it will shrink after drying at 80-90 °C for about 24 hours.



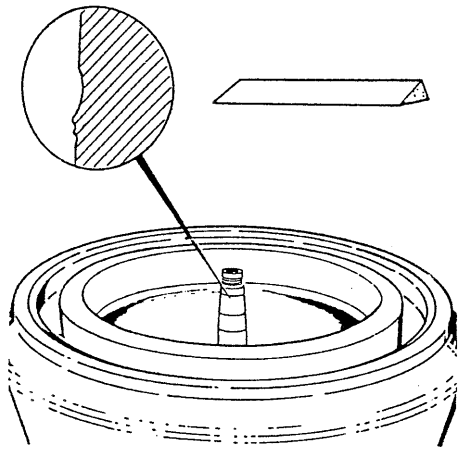
G0206411

Fitting of the seal ring

4.3.7 Bowl spindle taper and bowl body nave taper

Impact marks on the spindle taper or in the bowl body nave taper may cause poor fit and out-of-balance vibrations.

The bowl spindle and the nave should also be checked if the bowl spindle has been dismantled or if the bowl runs roughly.



G0682811

Remove impact marks from the bowl spindle taper..

Corrosion may cause the bowl to stick firmly to the spindle taper and cause difficulties during the next dismantling.

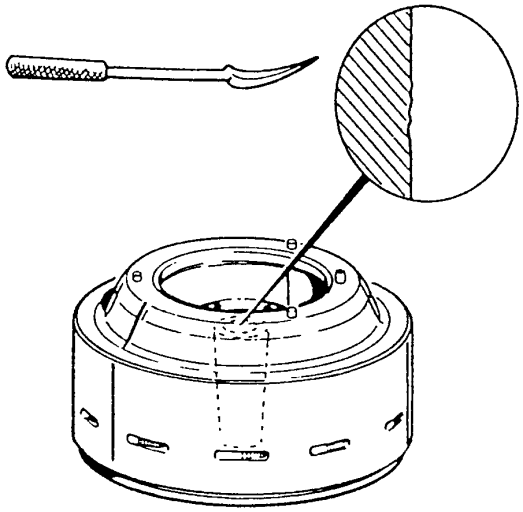
- Remove any impact marks with a scraper and/or whetstone.

NOTE

Always use a scraper with great care. The taper shape must not be deformed.

Rust can be removed by using a fine-grain emery cloth (e.g. No. 320).

Finish with polishing paper (e.g. No. 600).



G0725111

... and from the bowl body nave taper

4.3.8 Lock ring; wear and damage

Excessive wear or impact marks on threads, guide and contact surfaces of the lock ring, bowl hood and bowl body may cause hazardous galling.

Check the thread condition by tightening the lock ring (1) after removing the disc stack and bowl hood O-ring (2) from the bowl.



Disintegration hazard

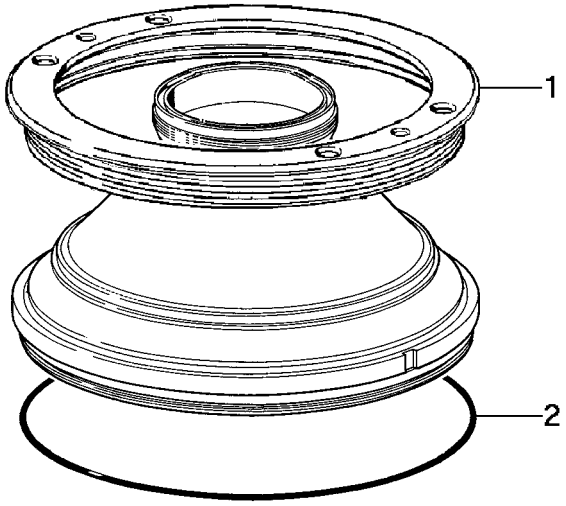
Wear on large lock ring thread must not exceed safety limit. The Φ-mark on lock ring must not pass opposite Φ-mark by more than the specified distance.

In a new bowl the alignment marks on the lock ring and the bowl body are exactly opposite each other.

If thread wear is observed, mark the lock ring at the new position opposite the alignment mark on the bowl body by punching in a new mark.

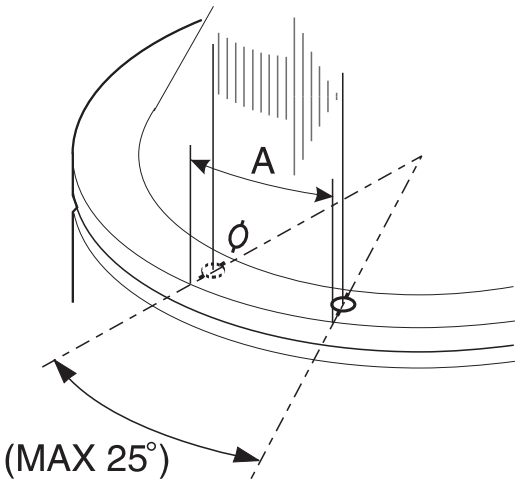
If the original Φ-mark on the lock ring passes the Φ-mark on the bowl body by more than 25° (which corresponds to **A=150 mm**), an Alfa Laval representative must be contacted immediately.

If the marks become illegible, an Alfa Laval representative should be contacted immediately to inspect thread wear and for determining the position of new alignment marks.



G0535221

1. *Lock ring*
2. *O-ring for the bowl hood*



G0578161

The Φ-mark on the lock ring must not pass the Φ-mark on the bowl body by more than 25°

Damage

The position of the threads, contact and guide surfaces are indicated by arrows in the illustration.

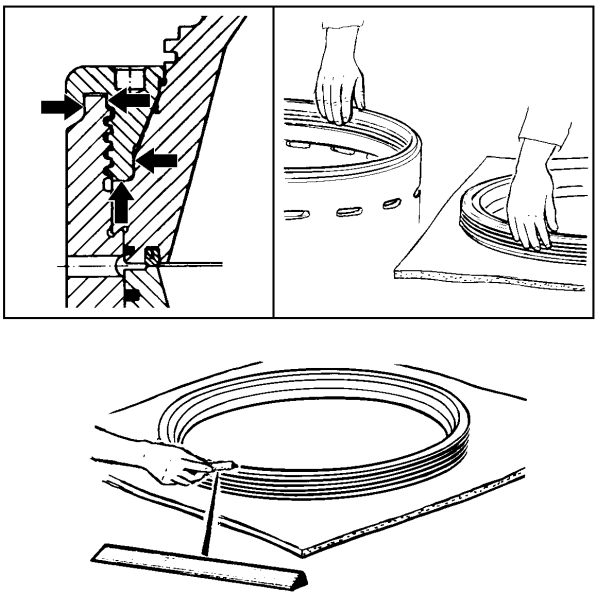
Clean the threads, contact and guide surfaces with a suitable degreasing agent, see chapter 3.3.1 Cleaning agents on page 31.

Check for burrs and protrusions caused by impact.



Cut hazard

The lock ring thread may have sharp edges which can cause cuts.



G0537291

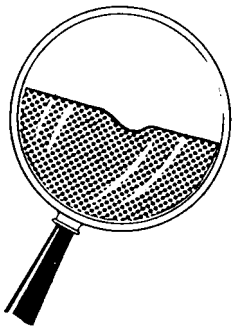
Clean and check thread, contact and guide surfaces of the lock ring

If damage is established, rectify by using a whetstone or fine emery cloth (recommended grain size 240). Do not use rotating files etc. If the damage is considerable, use a fine single-cut file, followed by a whetstone.

Remove the damage material on top of the surface. Just take away the damage, not the undamaged material.

After remedy, the edges of the damaged surfaces should be smooth.

Accomplish the treatment by priming the damaged surfaces if Intermediate Service. If Major Service, the whole lock ring should anyway be primed as described in chapter 4.6.4 Lock ring; priming on page 166.

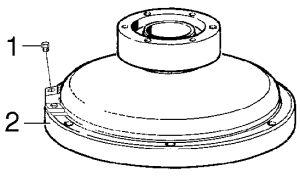


G0686621

The edges of treated surfaces should be smooth

4.3.9 Flushing nozzle

One nozzle (1) for flushing under the bowl is fitted in the distributing cover (2). It is possible to install a second nozzle to clean the inner wall in the low part of the bowl casing if needed. Check that these nozzles are free from impurities.

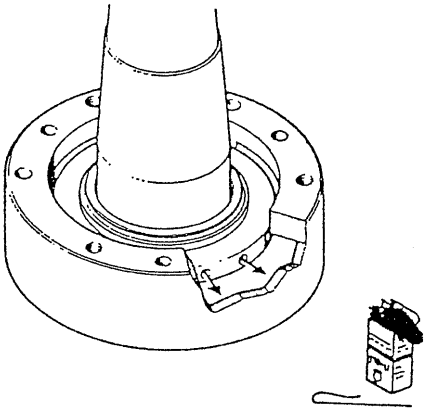


G0831011

4.3.10 Operating mechanism

Dirt and lime deposits in the operating mechanism may cause poor discharge function or no function at all.

Clean all ducts in the control paring disc with a soft iron wire or similar. Remove deposits on other surfaces with steel wool.



g0672911

Clean all ducts in the control paring disc

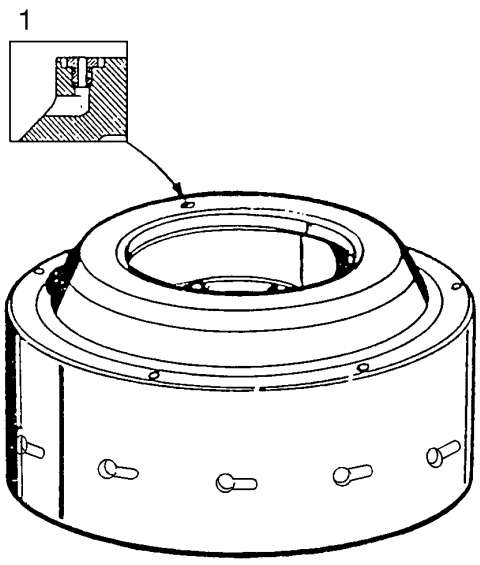
NOTE

Lime deposits can preferably be dissolved in 10% acetic solution which should first be heated to 80 °C.

Clean the nozzle (1) in bottom of the bowl body. Preferably use a soft iron wire.

Reasons for dirt or deposits:

- Hard or unclean operating water. Change water supply or install a water softener or a fine filter.
- Sludge has been sucked down into bowl casing and into the operating system. Check the installation and the venting system of both the sludge tank and bowl casing drain.



g06705c1

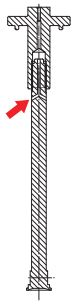
1. Nozzle

4.3.11 Venting screw

Check that the deaeration duct in the venting screw is free from impurities.

A clogged duct may cause difficulties in getting the liquid to flow when starting the process and after large discharges.

A clogged duct can also cause increased inlet pressure.



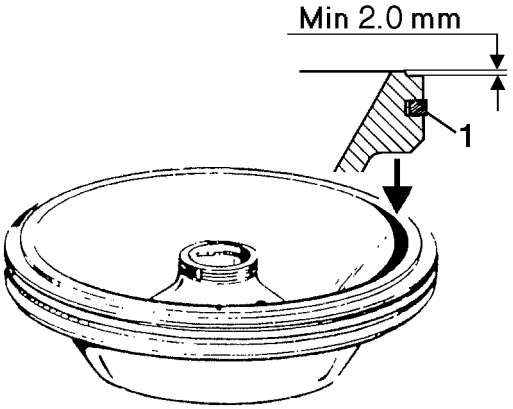
G1007611

Check that the duct in the sealing lid has free flow

4.3.12 Sliding bowl bottom

Poor sealing between the bowl hood seal ring and the sealing edge of the sliding bowl bottom will cause a leakage of process liquid from the bowl.

Check the sealing edge of the sliding bowl bottom. If damaged either through corrosion or erosion, it can be rectified by turning it in a lathe. Maximum permissible reduction of the original profile height (2,5 mm) is **0,5 mm.**



G0379971

Min. height of the profile on sliding bowl bottom

NOTE

Never reduce the height outside the sealing edge to reach the minimum profile height.

If the seal ring (1) for the sliding bowl bottom is to be renewed, use a screwdriver to remove it.

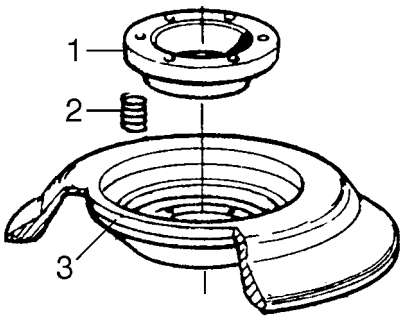
WARNING

Risk for eye injury
Wear safety goggles.

4.3.13 Springs for operating mechanism

Defective or broken springs may prevent complete closing of the bowl.

If any spring differs from other springs in regard to length or are defective in other respects, all springs have to be renewed.



g0670651

Check for defective or broken springs

1. *Spring support*
2. *Spring*
3. *Operating slide*

4.3.14 Valve plugs

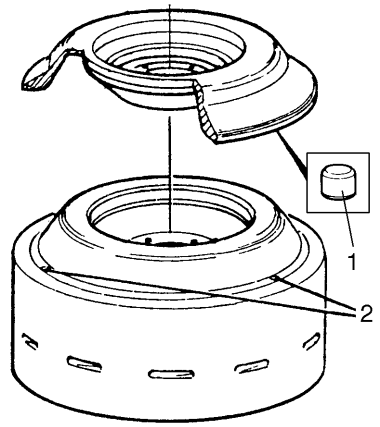
Poor sealing between the valve plugs (1) in the operating slide and bowl body may prevent complete closing of the bowl.

Examine the sealing surfaces (2) of the bowl body in contact with the valve plugs. Remove any marks and lime deposits with a very fine grain emery cloth.

Remove valve plugs by carefully knocking a screwdriver into groove and prize plug out of the hole. Tap in the new plugs.

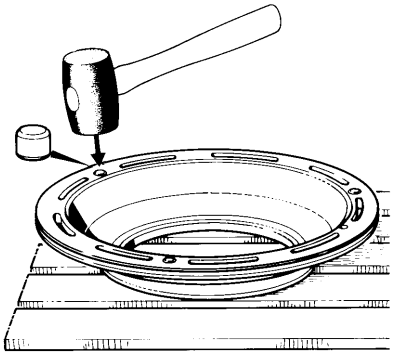


Risk for eye injury
Wear safety goggles.



g0670641

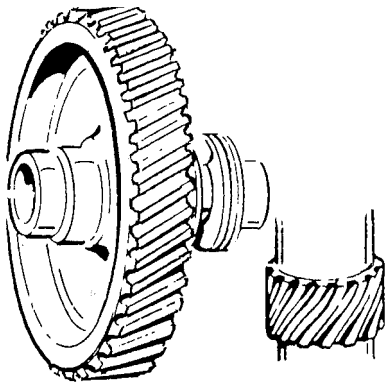
1. *Valve plug*
2. *Bowl body sealing surfaces in contact with the valve plugs*



G0536911

4.3.15 Worm wheel and worm; wear of teeth

As described in 3.4.1 Worm wheel and worm; wear of teeth on page 35



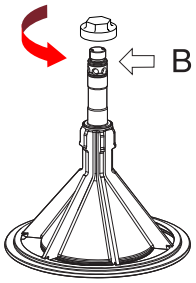
g0205411

4.3.16 Outlet pipe/sleeve

Damage to the threads (B) of the outlet pipe and the nut will cause problem in fixing it in proper position that might lead to mechanical damage of the outlet parts.

Check that the nut can be turned easily on the outlet pipe.

Left-hand thread!



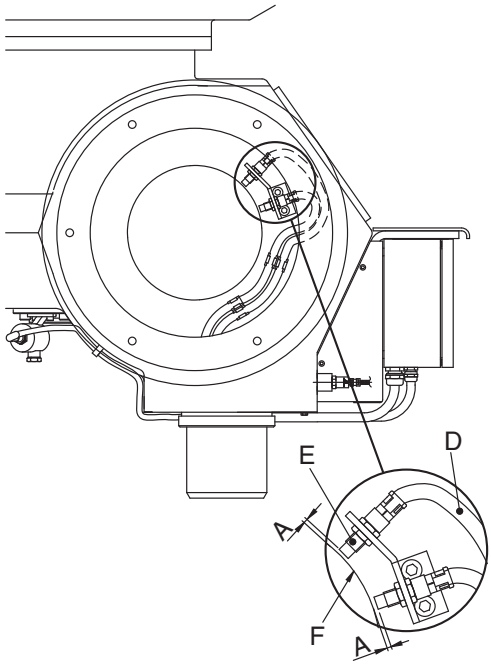
G1006361

Check the threads of the outlet pipe (left hand thread)

4.3.17 Speed sensor

- Check that the electrical cables (D) and connections are not damaged.
- Check that the distance between the sensors (E) and the coupling pulley (F) is **A = 2 ± 0,5 mm**, see the illustration.
- Check that the sensor and its bracket are well attached. The tightening torque of the nuts fixing the sensor in the bracket is **50 Nm**.

For technical reference, see chapter *Connection list* in the *Installation Manual.*



G09376e1

Measurement of the air gap between sensor and coupling pulley.

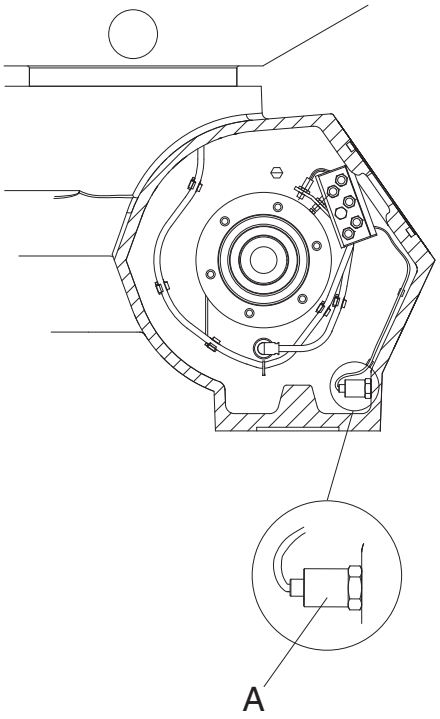
4.3.18 Vibration sensor

- Check that the electrical cables and connections are not damaged.
- Check that the sensor (A) is well attached to the frame. If the sensor has to be tightened, see below.

If the sensor, for any reason, has to be replaced, fit it in the following way:

1. Check that the contact surfaces on the sensor and separator frame are clean and the tube adapter with the protective tube are properly installed.
2. Mount the stud bolt in the frame, if removed, and secure with Loctite 243.
3. Mount the vibration sensor A (with washers, if required). Tightening torque: **35 Nm**.

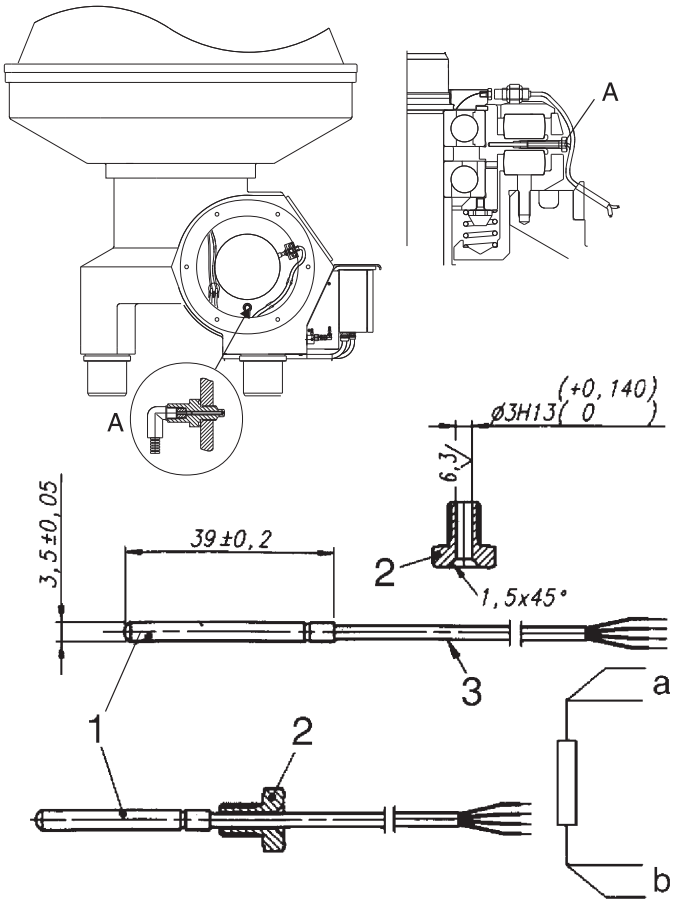
For technical reference, see chapter *Connection list* in the *Installation Manual*.



A Vibration sensor (No ATEX)

4.3.19 Temperature sensor

Check that the electrical cables and connections are not damaged.



G0937741

A. Location of sensors
1. Temperature sensor
2. Screw
3. Cable length 3 m, diameter 2,5 mm, color: black.
a. White
b. Red

4.4 Intermediate Service (IS), assembly

4.4.1 Introduction

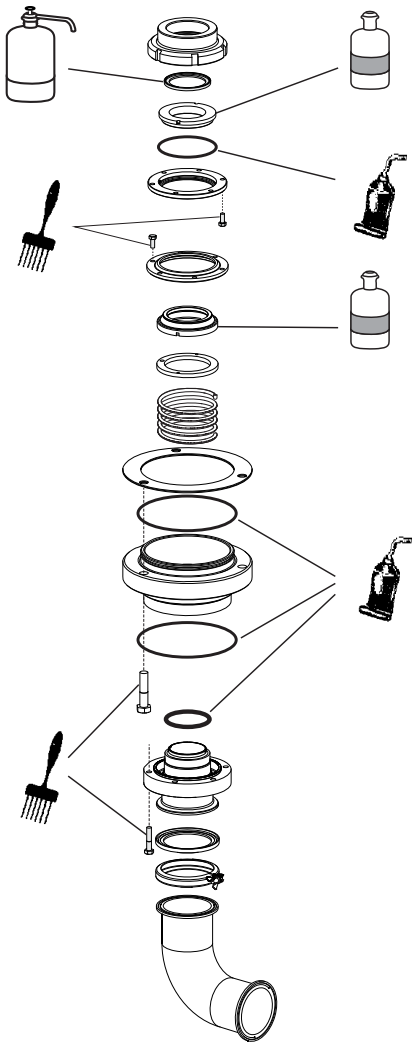
Before starting the assembly first carry out the Intermediate Service check points starting on page 84.



Renew all parts included in the IS-kit. The O-rings and other sealing rings should be lubricated with grease of silicone type or soapy water.

4.4.2 Inlet device

Lubrication chart (Single sealing)



Lubricate with paste	*Lubricate with grease*	*Lubricate with soapy water*	*Use alcohol for cleaning*
For further information about approved lubricants see 3.5 Lubricants on page 40.			

A section view of the inlet device can be found on page 80.

1. Notice the following

   - Renew and lubricate with silicone grease or soapy water (see Lubrication chart) the O-rings and L-packings on all parts.
   - Check that all contact surfaces for rubber gaskets, seal rings and wear rings are free from deposits.

NOTE

Cleanliness and accuracy is of greatest importance when handling seals.

Never expose the seal to blows or other careless handling.

   - Check that sealing surfaces of the wear ring and seal ring are free from deposits and defects which can give rise to leakage and exceptionally rapid wear.

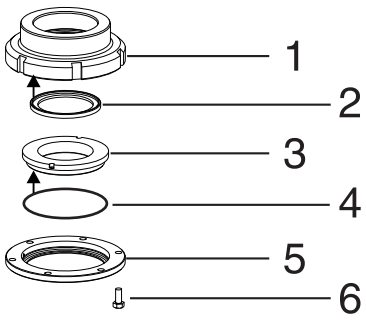
2. Apply soapy water on O-ring (2) and assemble the parts.

NOTE

Clean the sealing surface of wear ring (3) with alcohol after assembly.

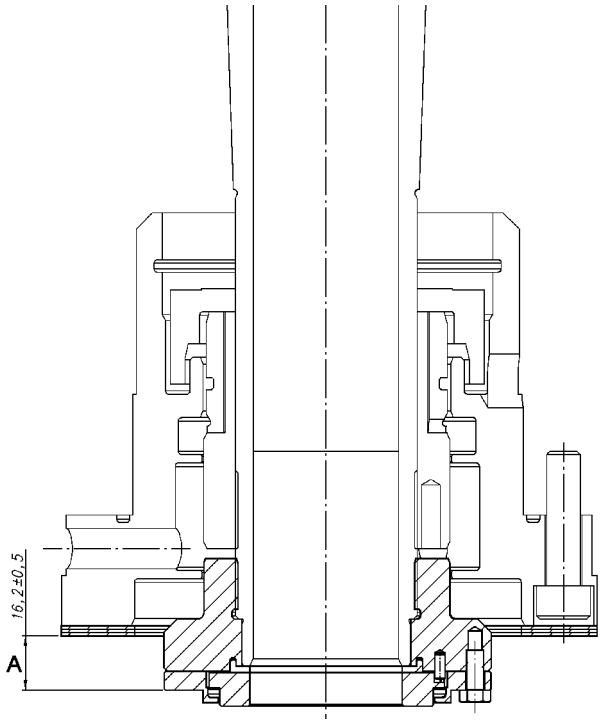
3. Fit the rotor support (1) to the spindle using the spanner.





G08334L1

4. Check the height position (A) of the upper inlet housing. Measure from the bottom edge of the rotor holder.
Correct distance of **A** is **16,2 ±0,5** mm.
If the height has to be adjusted, add or remove appropriate height adjusting rings.



G08680s1

NOTE

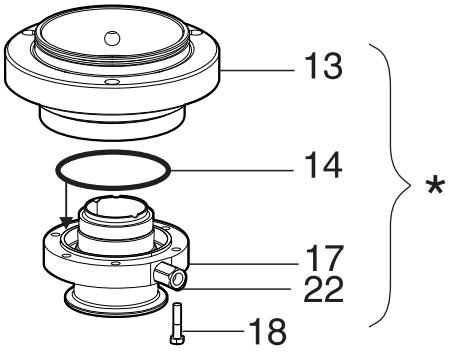
Check that the height adjusting rings are correctly centred. Otherwise it can be difficult to fit the mechanical seal.

Also Ensure that no visible damage is present and leading edges are free from burrs.

NOTE

The bowl should be mounted when doing the height adjustment.

5. Fit the O-ring (14), flow valve (22) and assemble the inlet housings (13) and (17) by fastening the screws (18).



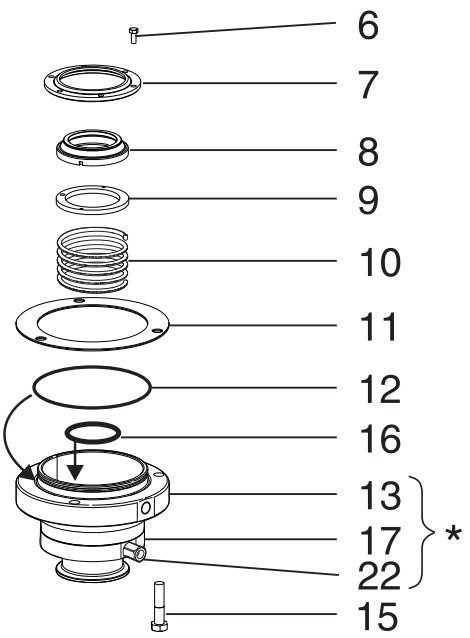
G1005831

6. Fit the O-rings (12) and (16).

7. Fit the compression spring (10) into the housing, make sure that the pin on the spring enters the hole in the housing.

8. Fit the driver (9) onto the spring.

9. Fit the seal ring (8) to the driver (9), make sure that the pins enter the holes.



NOTE

Clean the sealing surface of seal ring (8) with alcohol after assembly.

10. Fit the stator holder (7) and make sure that the O-ring (14) inside the housing is in place.

11. Press down the stator holder (7) and fasten each of the screws (6) a little at a time.

    Make sure that the spring is working by pressing it down a few times.

12. Fit the complete assembled inlet housing to the frame using the spanner.



13. Fit the clamp ring (20) and packing (19).

    For connections see the *Installation Manual*.

4.4.3 Operating liquid device

Check point

4.3.10 Operating mechanism on page 96.

4.3.9 Flushing nozzle on page 95.

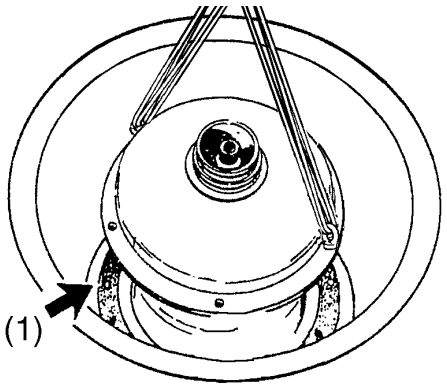
An exploded view of the operating liquid device can be found in chapter 4.2.4.

1. Replace the height adjusting rings, the same number as were removed.

NOTE

Check that the holes for the liquid supply in the height adjusting ring(s) corresponds with the holes in the separator frame.

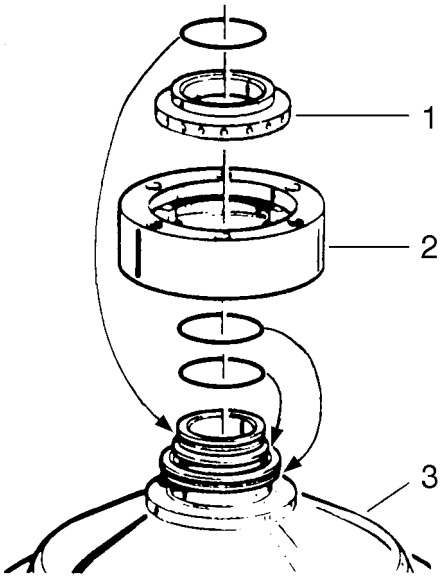
Fit the distributing cover. Bring the cover into position defined by the guide pin (1) and tighten the screws.



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1. Guide pin

2. Lubricate with silicone grease and fit two new O-rings on the distributing cover (3).



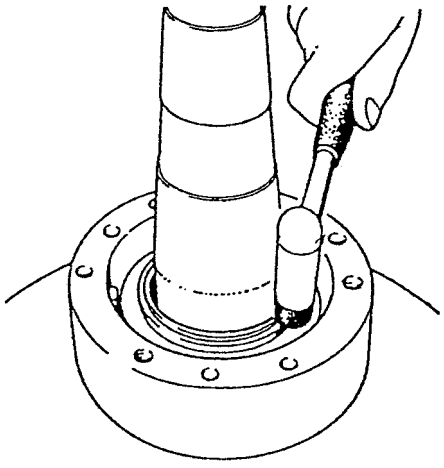
g0463171

1. Control paring disc
2. Distributing ring
3. Distributing cover

3. Fit the control paring disc arrangement according to the illustration.

   The upper O-ring must be fitted after the control paring disc (1) has been fitted. Lubricate with silicone grease.

4. If it is difficult to press down the control paring disc (1) in position by hand, knock it down cautiously by means of a plastic hammer.



g0673011

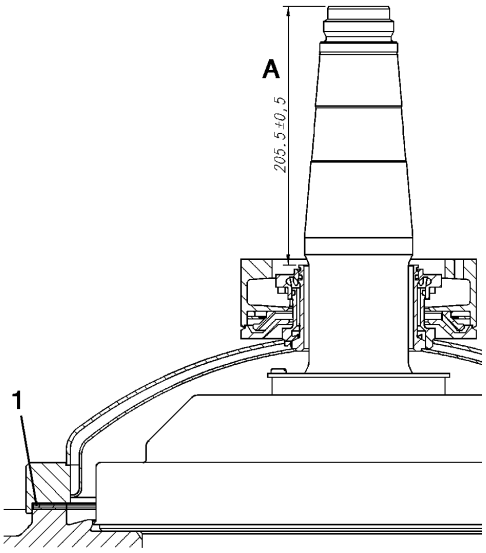
5. Check that the upper O-ring (locking the control paring disc) lies properly in its groove without being twisted.

6. In order to ensure a good sealing between the control paring disc and the O-ring, jerk a few times in the distributing ring after assembly.

7. Check the height position of the operating liquid device relative to the bowl spindle in following way:

   Alfa Laval ref. 584497 Rev. 0

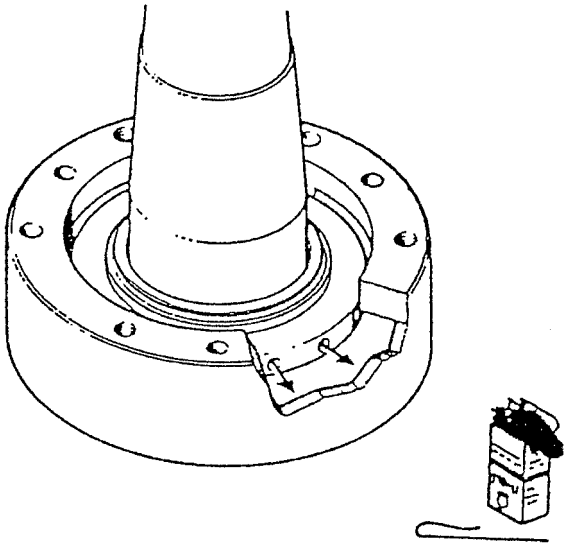
   - Use two steel rules or a depth gauge for measuring.
   - Correct measurement (**A**) is **205,5 ±0,5 mm**.
   - The height position is adjusted by adding or removing height adjusting rings (1) under the distributing cover.
     The adjusting rings have a thickness of 1,0 mm.
   - After adjustment rotate the spindle. If a scraping noise occurs, re-adjust.



g0732461

The height position (A) can be adjusted with height adjusting rings (1)

8. If possible, open the make-up water supply and check that there are weak water jets out of the ducts in the control paring disc.



g0672911

If possible, check the make-up water flow

4.4.4 Bowl

Check point

4.3.2 Corrosion on page 84,

4.3.3 Cracks on page 86,

4.3.4 Erosion on page 87,

4.3.5 Guide surfaces on page 89,

4.3.6 Bowl hood seal ring on page 92,

4.3.7 Bowl spindle taper and bowl body nave taper on page 93,

4.3.8 Lock ring; wear and damage on page 94,

4.3.10 Operating mechanism on page 96,

4.3.11 Venting screw on page 97,

4.3.12 Sliding bowl bottom on page 98,

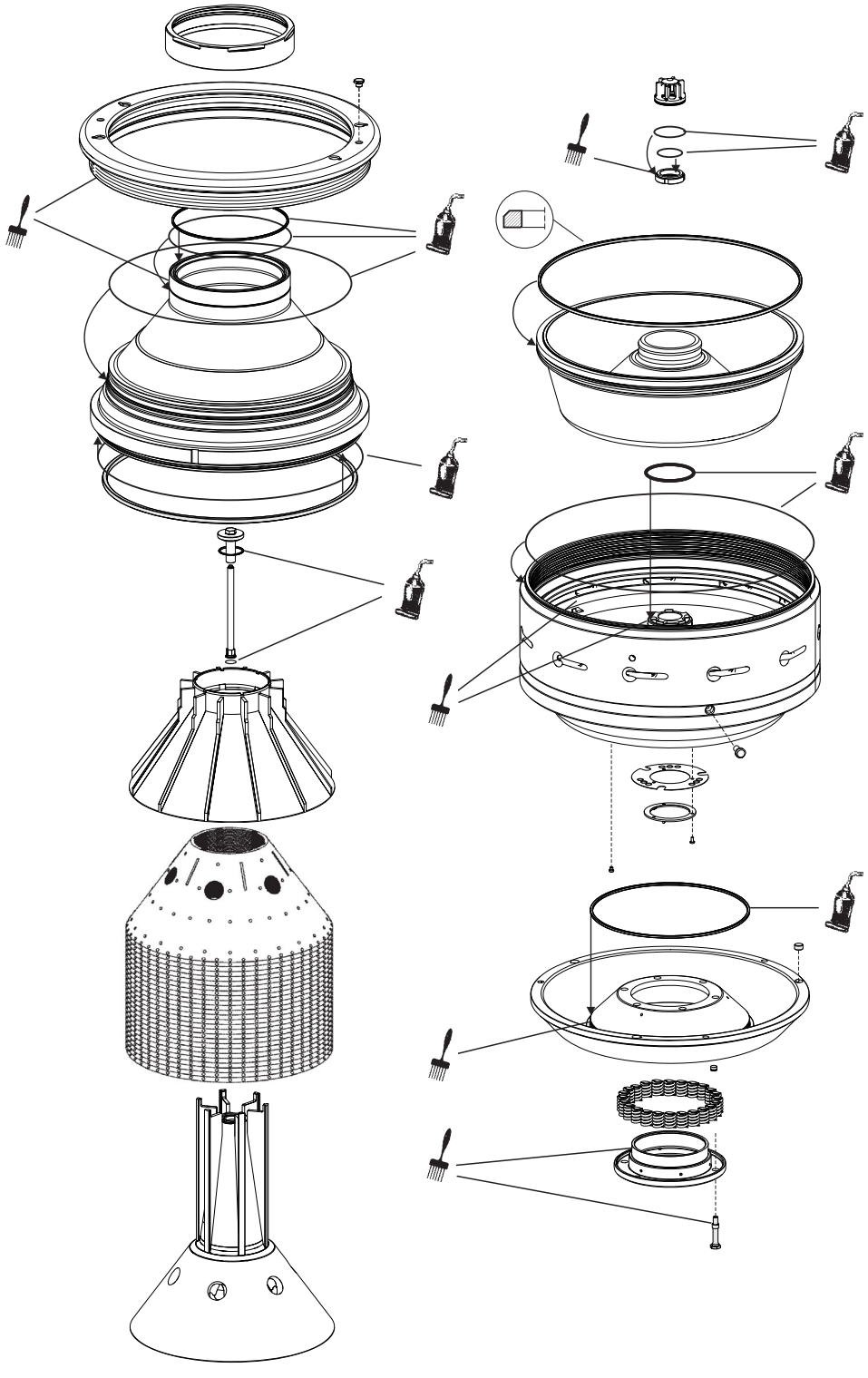
4.3.13 Springs for operating mechanism on page 98,

4.3.14 Valve plugs on page 99,

4.3.16 Outlet pipe/sleeve on page 100,

4.6.4 Lock ring; priming on page 166 (only when Major Service).

Lubrication chart



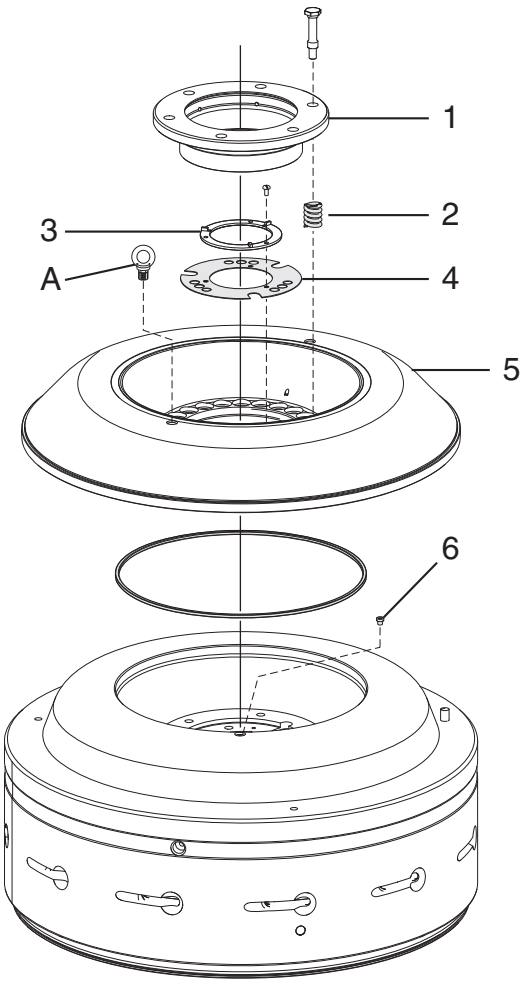
G10075j1

	Lubricate with paste		*Lubricate with silicone grease*
For further information about approved lubricants see 3.5 Lubricants on page 40.			

An exploded view of the bowl can be found on page 66.

1. Protect the nave bore in the bowl body with a rag.
2. Except lubrication of the parts mentioned in chapter 4.3.5 Guide surfaces on page 89, also lubricate the guide pin fitted in the bottom of the bowl body. See Bowl on page 66 and 3.5.2 Lubricants on page 41.
3. Assemble the plugs in the operating slide.
4. Fit the PX-nozzle (6) in bowl body.
5. Fit the operating slide (5) onto the bowl body.

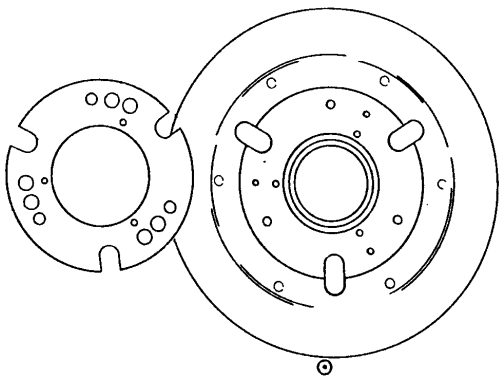
   Check that the guide pin in the bowl body enters the hole in the operating slide.



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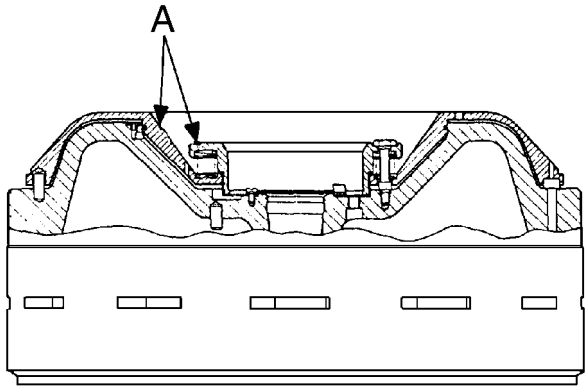
6. Fit a new gasket (4) and the sleeve with wings (3) onto the bowl body.

   Turn the gasket in the right way. A gasket turned in the wrong way could block the ducts for operating water. This gasket (illustrated beside) is used for many separator types. For the type dealt with in this manual some of the holes have no function.


G0571431

7. Lubricate the guide surface of the spring support (1) faces the operating slide. See 3.5.2 Lubricants on page 41.

   Fit springs (2) and support. Place the support in the same position as before it was dismantled. The machine number or punch marks (A) on the support and the operating slide should normally be directed towards each other, see the illustration.

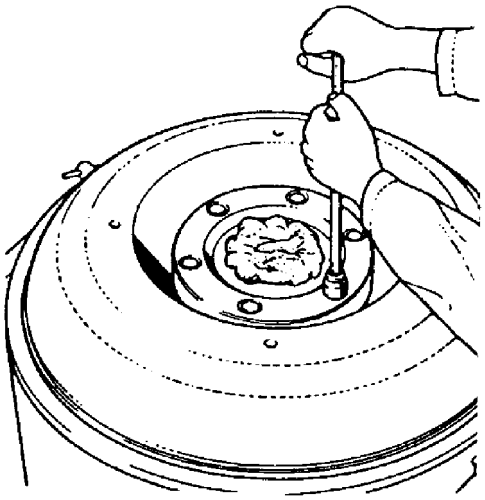


G0571621

8. Lubricate the six screws for the spring support, see 3.5.2 Lubricants on page 41.

   Start to tighten two diametrically opposite screws. Tighten the screws successively, little at a time.

   Final tightening torque: **40 Nm**



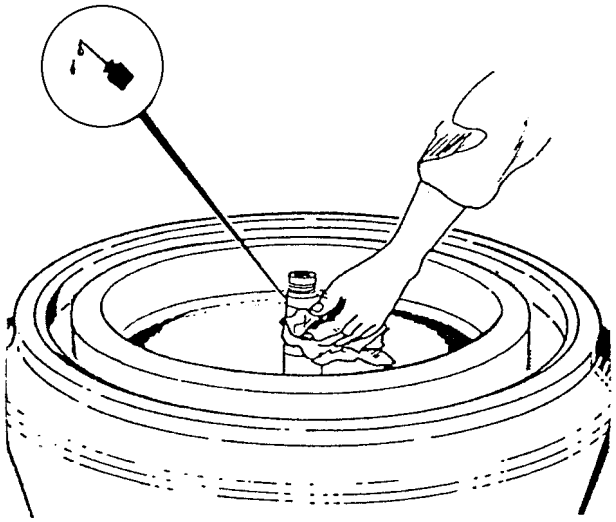
G0570311

9. Remove the lifting eyes (A) and replace protection plugs.

10. Wipe off the spindle top and nave bore in the bowl body. For rust protection, lubricate the tapered end of the spindle with a few drops of oil (**no** other lubricant shall be used). Spread it over the surface carefully. Wipe off surplus oil with a clean cloth.



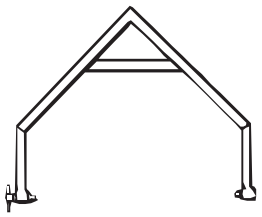
Too much oil on the surface between the spindle and the bowl body, or if other lubricant is used, will reduce the friction between the two parts. This may result in a relative rotation between the parts, which can lead to seizure, scoring, and possible welding.



G0682921

11. Fit the turning tool onto the bowl body.

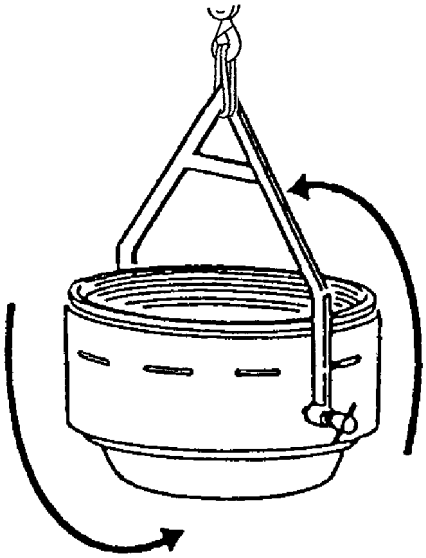
    Ensure that the screws on the turning tool are properly tightened.





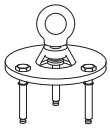
Crushing hazard Risk for jamming injury when turning the bowl body.

12. Turn the bowl body. Remove the turning tool and refit the two plugs in the bowl body wall.



G0570211

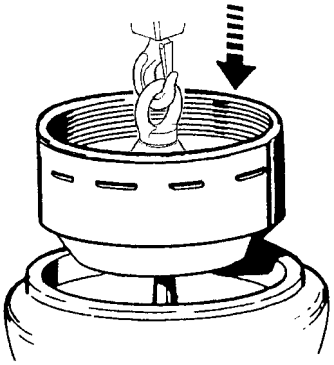
13. Fit the lifting tool into the bowl body bottom with the three screws. Turn the handle at the top of the lifting tool so that the central screw is home.



14. Remove turning tool.

15. Lower the bowl body on to the spindle using a hoist.

    Remove the tool.

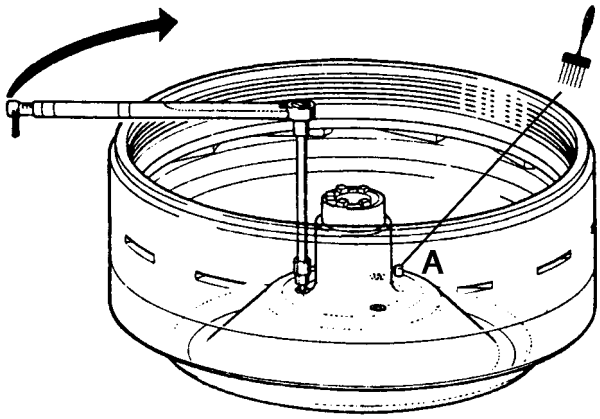


G0729141

16. Rotate the bowl body and align it so that the three screw holes in the bowl body bottom are exactly above the three holes in the distributing ring.

    Lubricate the three screws, see 3.5.2 Lubricants on page 41. Tighten the screws with a torque wrench.

    Tightening torque: **40 Nm**

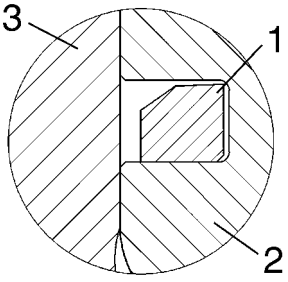


G0572131

17. Rotate the bowl body by hand and make sure that it moves freely. A scraping noise may be an indication of incorrect height position of the paring disc device under the bowl body.

18. Except lubrication of the parts mentioned in chapter 4.3.5 Guide surfaces on page 89, also lubricate the guide pin (A) fitted in the bottom of the bowl body with lubricating paste. See Lubricants on page 41.

19. Fit a new seal ring for the sliding bowl bottom. It there is a chamfer on the seal ring make sure this if facing upwards.



G0207531

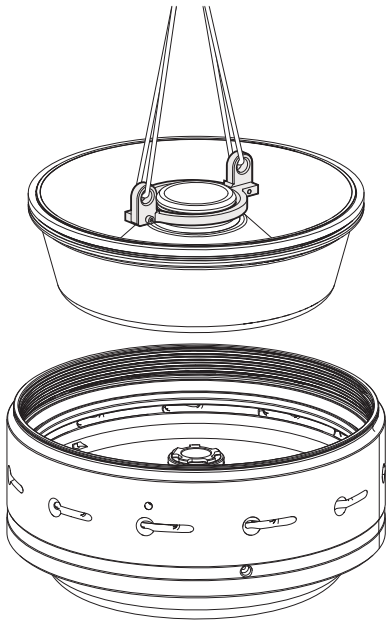
1. *Seal ring*
2. *Sliding bowl bottom*
3. *Bowl body*

20. Fit the lifting tool to the sliding bowl bottom and lift it into the bowl body using a hoist.

NOTE

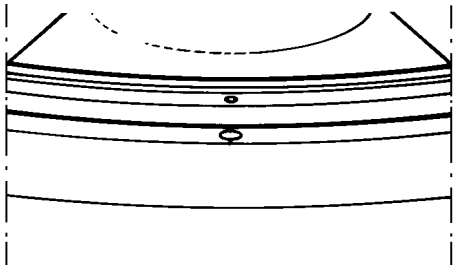
Ensure that the screws on the tool are properly tightened.

For correct position of the sliding bowl bottom, see below.



G1007231

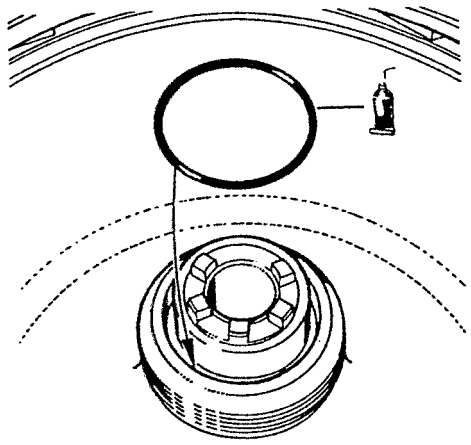
21. Bring the assembly mark on the sliding bowl bottom in line with the guide lug on the bowl body to ensure that the sliding bowl bottom enters into the correct position (guide pin in the bottom).



G0535711

22. Fit the O-ring in the groove between the bowl body nave and sliding bowl bottom.

    It is important that the O-ring is fitted after the sliding bowl bottom is fitted to avoid the risk of deforming the O-ring. As the bowl in operation is completely filled with process liquid under pressure, a defective seal ring can cause leakage of process liquid into the operating liquid system.



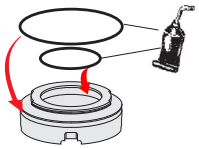
G0672111

23. Check that the cap nut thread and the thread on the bowl spindle are clean.

    Apply silicone grease on the two O-rings for the cap nut and put the O-rings in their grooves.

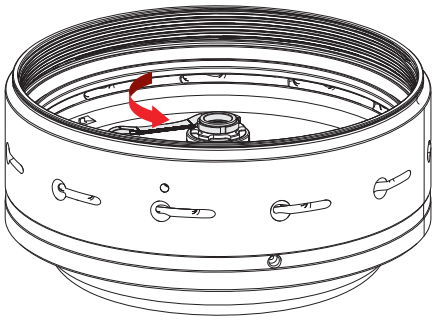
    Apply lubricant and tighten the cap nut firmly by using the spanner.

    Left-hand thread!



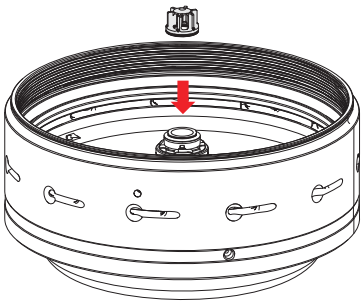
G1007161

Note! assemble cap nut the right side up.



G1007121

24. Assembly wing crown on cap nut, fit and turn 90°, (bayonet fitting).



G1007151

25. When assemble the discs on to the distributor; handle carefully.



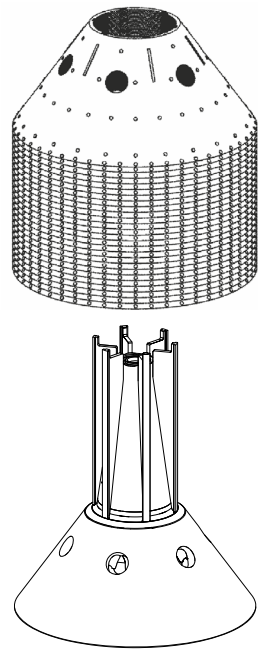
Cut hazard

Sharp edges on the separator discs may cause cuts.

26. **Concentrator**

Assemble the discs one by one, on the distributor. The distributor has one guide rib for the correct positioning of the discs.

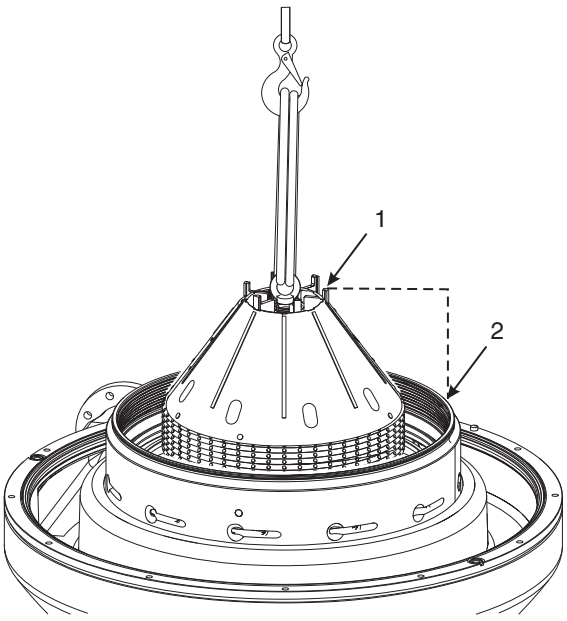
Start with the bottom disc which has caulks also on its underside. Continue with the rest of the smaller discs followed by an intermediate disc, bottom disc, disc stack and one upper disc which has thicker caulks than the others.



G1025591

27. Fit the lifting tool to the distributor and lift the distributor with disc stack into the sliding bowl bottom using a hoist.

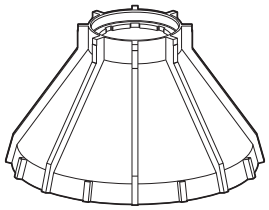
Check that the drill mark (1) on the distributor is in line with the guide key (2) on the bowl body. The recesses on the bowl body nave will then fit into the recesses on the underside of the distributor.



G10068g1

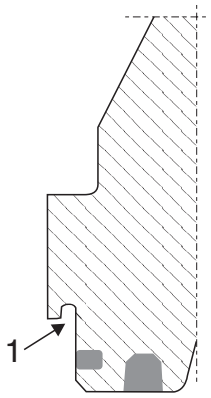
The illustration may not show the actual disc stack

28. Fit the top disc.



g10068i1

29. Check that the rectangular ring and the seal ring of the bowl hood are properly fitted and lubricated. Make sure that the slot (1) is well cleaned.

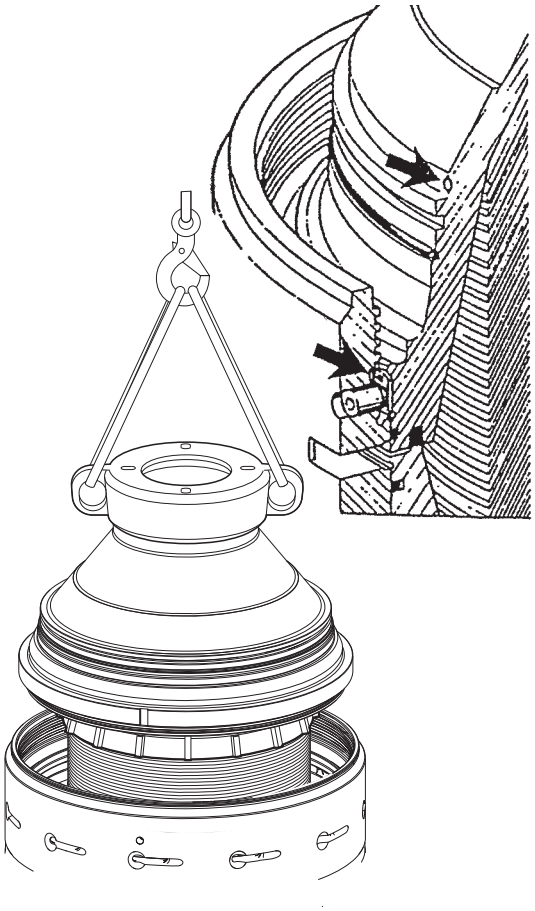


g07322c1

30. Lift the bowl hood using a hoist and carefully lower it straight down onto the disc stack, otherwise it may get stuck.

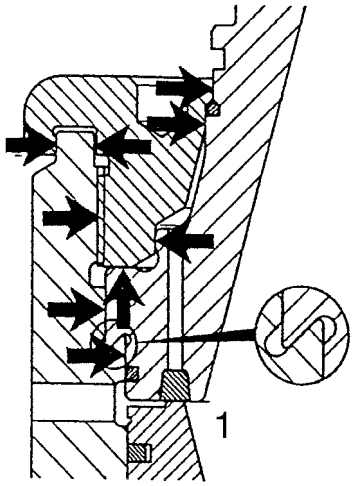
    Be careful not to scratch the bowl hood seal ring. Check that the guide recess on the bowl hood enters the guide lug in the bowl body.

    Make sure bowl hood rests on the disc stack.



g0672651

31. Lubricate the lock ring threads, contact and guide surfaces with lubricating paste, see 3.5.2 Lubricants on page 41.

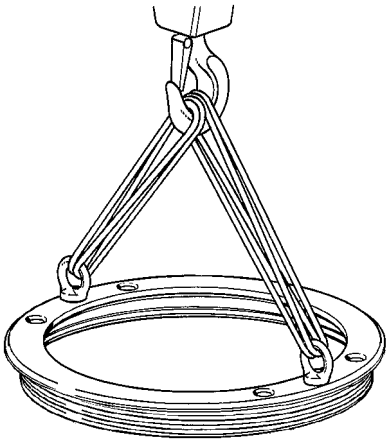


g0670711

1. Dovetail slot

32. Lift the lock ring by using eye bolts and a hoist.



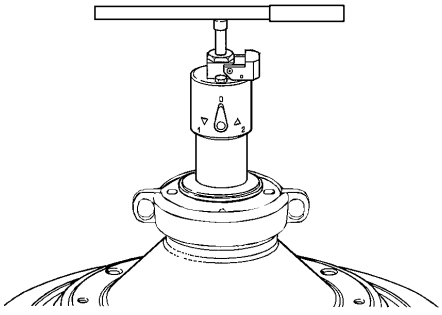


g0531541

33. Tighten the lock ring using the compressing tool and lifting tool as described below.

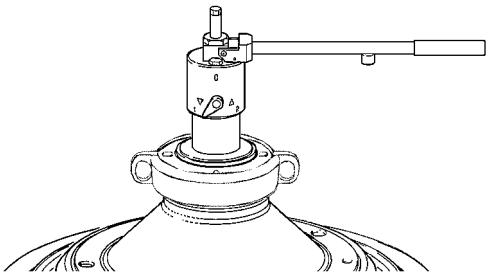
    a. Fit the compressing tool by screwing the pole of the tool into the threads of the distributor by the horizontal handle.

       The control lever on the compressing tool, should be in position 0.



g0531321

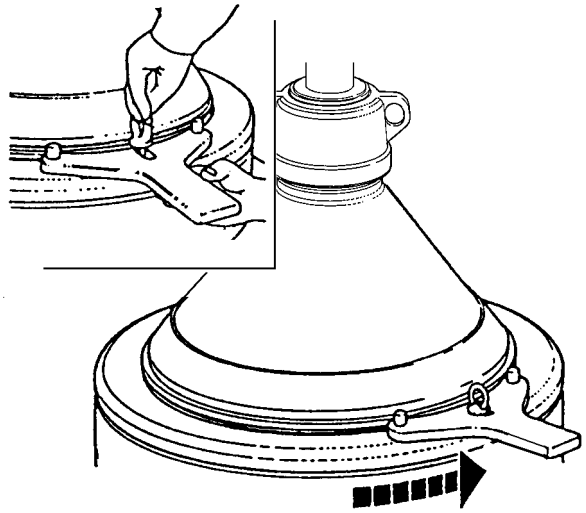
b. Turn the control lever to position 1 for compression.



g0533651

c. Fit the lock ring spanner and tighten the lock ring by hand.

Left hand thread!

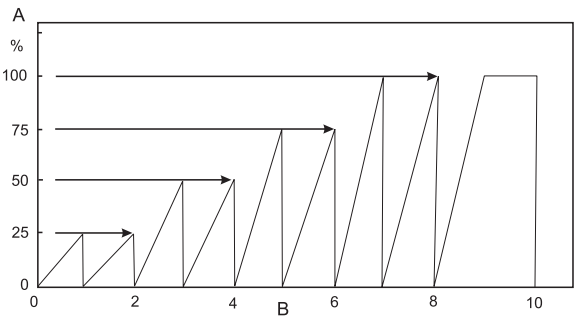


g05711q1

d. Compress the disc stack with the compressing tool using approx. 25% of max. compressing power.

e. Continue tightening the lock ring by hand and then release the pressure from the compressing tool by turning the control lever to position 0.

f. Repeat step **b** to **d** one time and then continue the compressing cycle and increase the compressing power for each cycle with approx: (see diagram) 2 x 50% compressing power 2 x 100% (or until the lock ring can not be turned by hand).

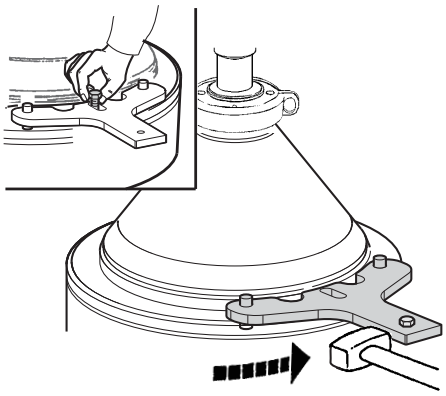


G1024911

A. Power
B. Cycles

g. When the lock ring can not be turned by hand, advance the lock ring by giving the spanner handle some blows until the Φ-marks are in line or passed.

Left-hand thread!



g05711p1

h. Check of disc stack pressure

- If the disc stack pressure is correct it should be possible to tighten the lock ring so far by hand that the Φ-mark on the lock ring is positioned 20-30 mm before the mark on the bowl hood when the compressing tool is used.
- To achieve this an appropriate number of discs in the disc stack beneath the top disc must be fitted. Add or remove discs if necessary.

NOTE

When checking the disc stack pressure in this way, the threads of the lock ring and the bowl body must be well cleaned.

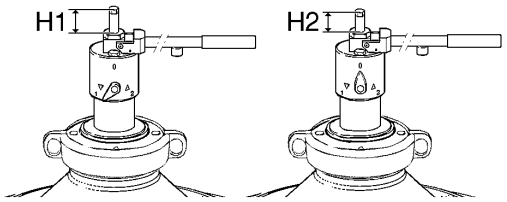
If the Φ-marks do not reach or pass each other after giving the spanner handle some blows, the reason could be an incorrectly assembled bowl or too many discs in the disc stack. Reassemble and check.

NOTE

Ensure that the disc stack pressure is sufficient to maintain bowl balance. Insufficient pressure in the disc stack can cause vibration and reduce lifetime of ball bearings and discs.

- With the large lock ring correctly tightened and the compressing tool mounted on the separator bowl, turn the control lever to position 1 for compression.

- Compress the disc stack by pumping the horizontal handle until the oil pressure is released through the relief valve.
- Measure the height (H1) of the piston rod (see illustration) with the slide calliper depth gauge. Make a note of the reading obtained.
- Release the pressure in the compressing tool by turning the control lever to position 0. The piston rod will now move downwards slightly when the disc set is released inside the bowl.
- Measure once again the height (H2) of the piston rod with the slide calliper and make a note of the reading obtained. If the difference between **H1** and **H2** is less than **1,5 mm**, the disc stack pressure is correct. If it exceeds 2 mm, the number of discs is insufficient. Add one or more discs and repeat the above procedure until the correct disc stack pressure is obtained.

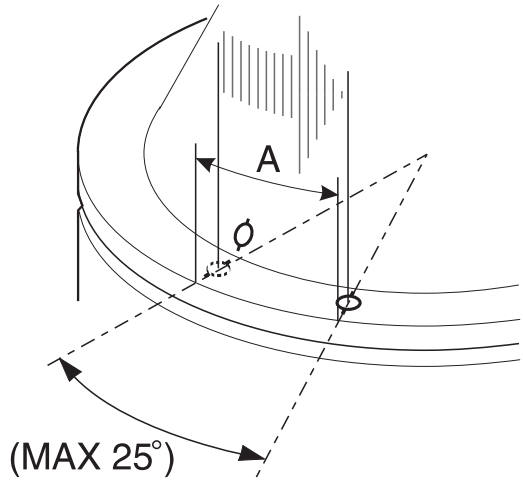


g0533661

i. If the assembly marks have passed each other by more than 25° after tightening the lock ring, contact your Alfa Laval representative.

NOTE

The assembly marks must never pass each other more than 25° which corresponds to A=150 mm.

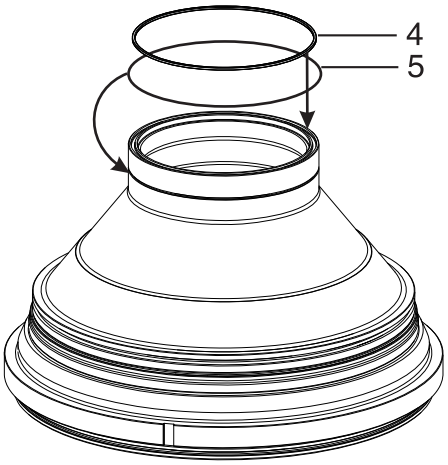


g0578161

25° corresponds to A=150 mm

j. Release the pressure in the compressing tool by turning the control lever to position 0 and then remove the compressing and lifting tools.

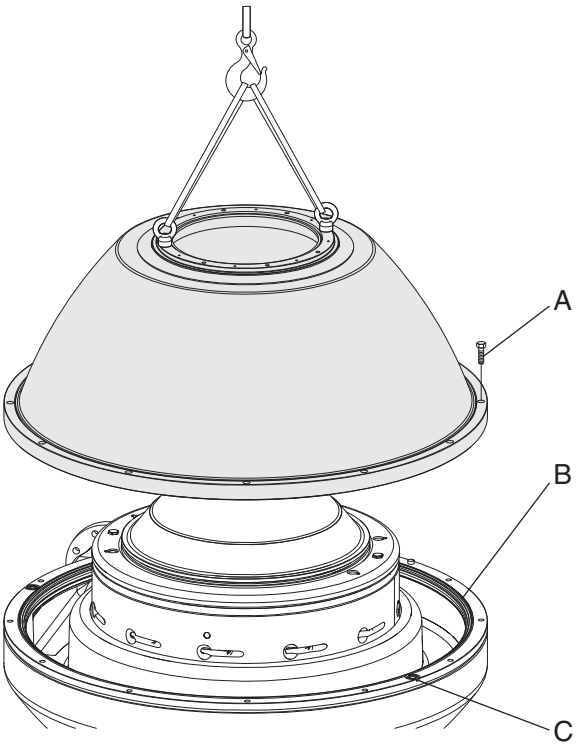
34. Fit O-ring (4) and (5) on bowl hood.



g10239c1

35. Fit seal ring and O-rings.

36. Put the frame hood in place and tighten it **100 Nm** with the twelve screws. Note the angular position. A guide pin in the frame ring should enter a hole in the hood.

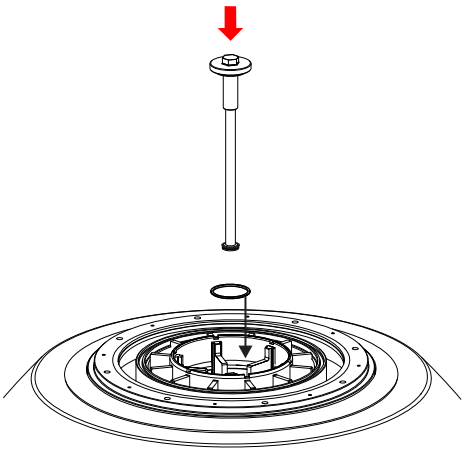


g1006911

A. Screw
B. Seal ring
C. O-ring

37. Fit the venting screw with O-ring and place in the centre of distributor.

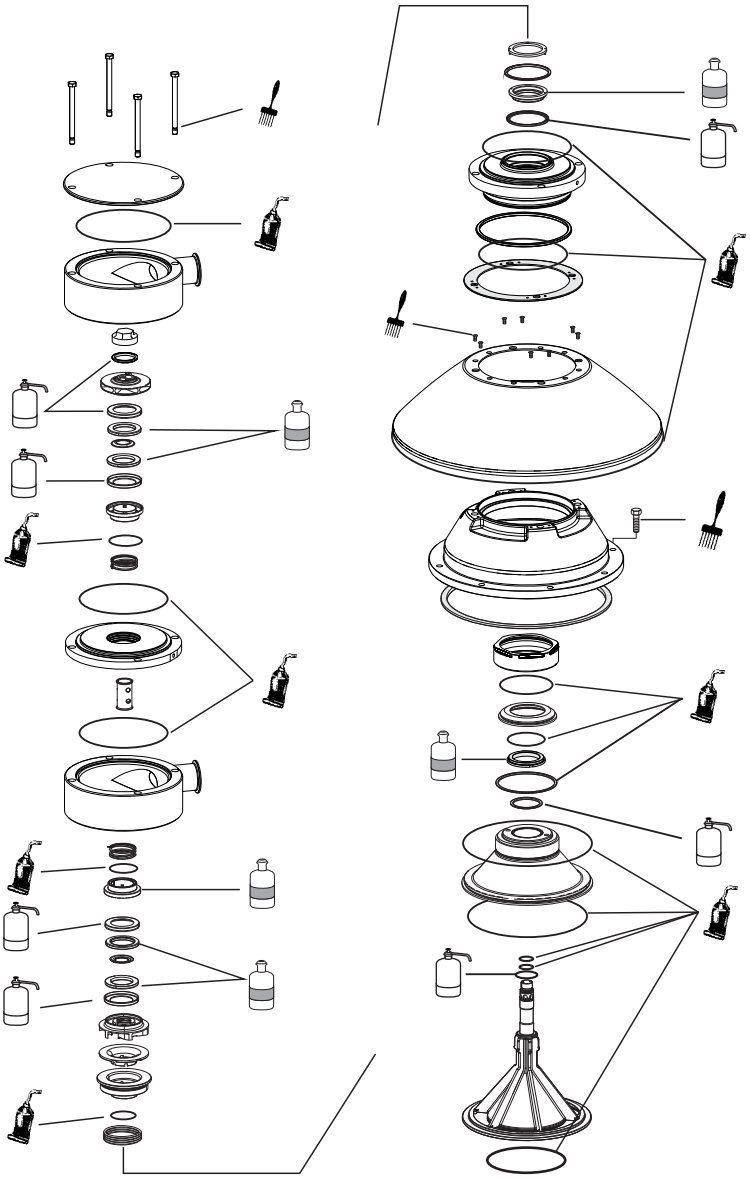
    Left-hand thread!



G1006871

4.4.5 Outlet device

Lubrication chart

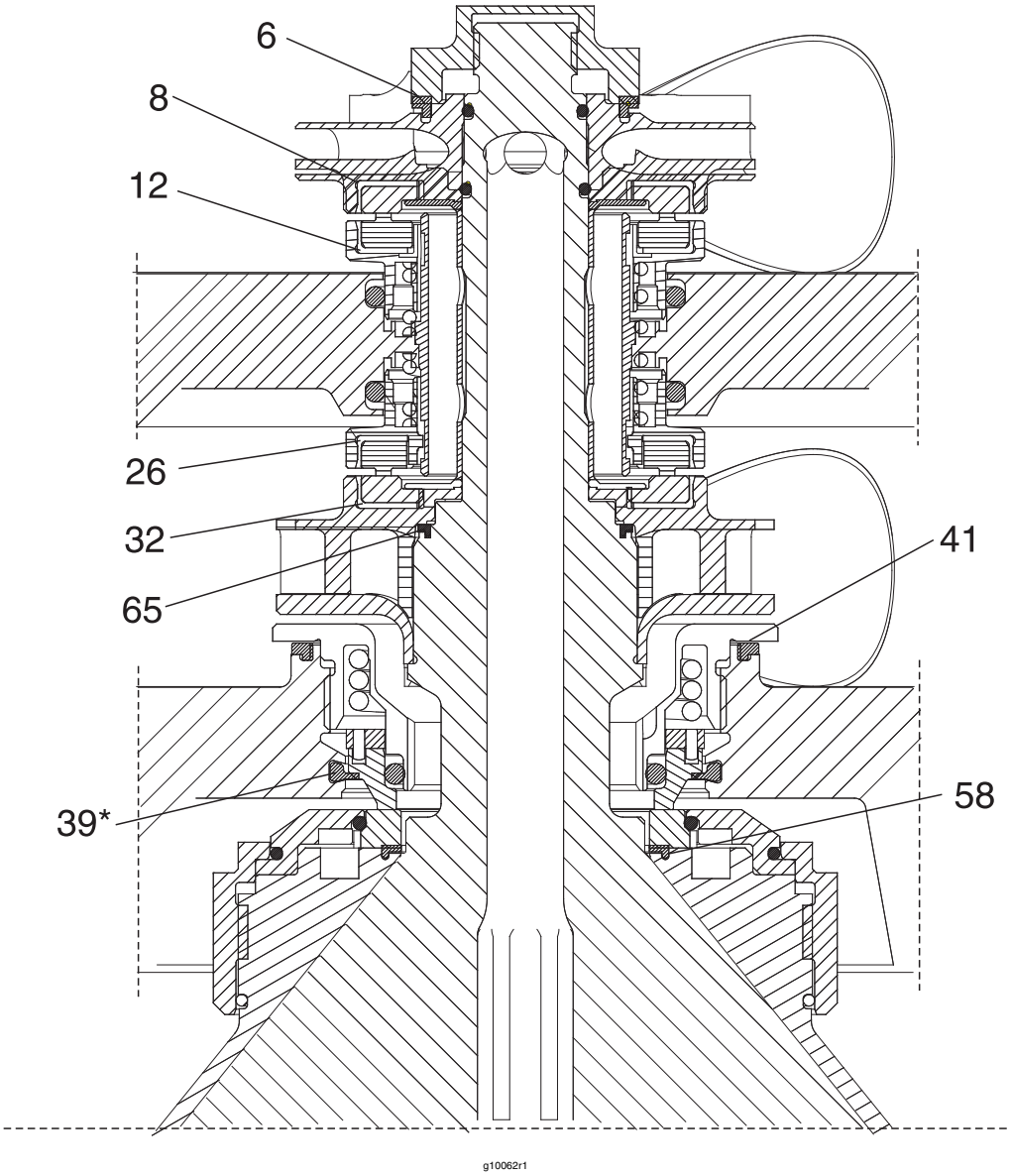


			
Lubricate with paste	*Lubricate with grease*	*Lubricate with soapy water*	*Use alcohol for cleaning*
For further information about approved lubricants see 3.5 Lubricants on page 40.			

NOTE

Avoid grease on wear ring sealing surface.

Location of packings to be lubricated with soapy water



** 39 Only for 3A applications*

1. Renew and lubricate with silicone grease or soapy water (see Lubrication chart) the O-rings and L-packings on all parts

2. Fit the O-ring/rectangular ring (67)

3. Apply soapy water and fit the L-packing (65). Apply grease and fit O-rings (63, 64) to the outlet pipe (66) and fit outlet pipe to distributor.

4. Fit the L-packing (51).

5. Assemble O-rings (59, 61) and rotor holder (60) and fit to the outlet pipe (66).

6. Fit bowl lock ring (A).

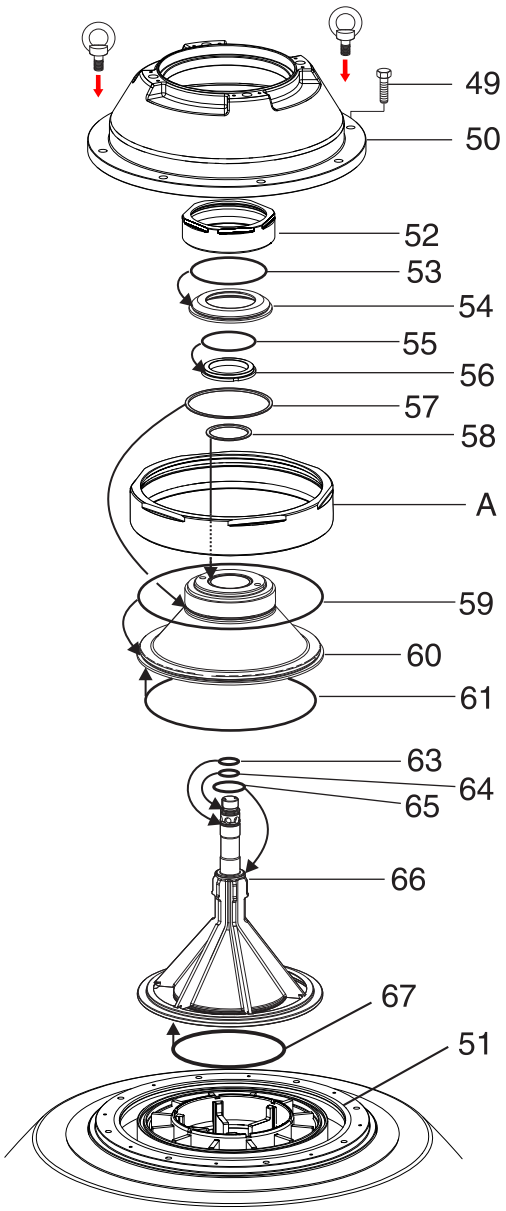
   Left-hand thread!

7. Assemble lock ring (52), rotor holder (54), O-ring (53, 55, 57), wear ring (56), apply soapy water and fit L-packing (58) and fit to the outlet pipe (66).

   Lock ring (52) **Left-hand thread!**

8. Fit the connection piece (50) using lifting eyes and turn the screws (49) so they sit loosely in place.

9. Fasten the screws (49) with tightening torque 57 ± 5 Nm.



10. **Height adjustment**

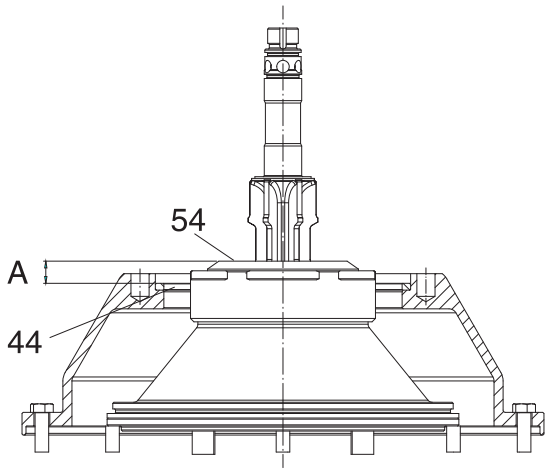
Alfa Laval ref. 586084 Rev. 1

The height position of the outlet device is decided by the position of the top edge of the rotor holder (54) in relation to the height adjusting ring (44).

The height position should normally not be checked at Intermediate Service but when the bowl spindle has been removed (each Major Service) or when the bowl has been replaced.

The tolerances are narrow and therefore it is of great importance that the parts are well cleaned, free from burrs, correct assembled and screws tightened.

The height adjusting ring is mounted in such a way that the dimension 20 ± 0,5 mm is obtained for "**A**".



G1010821

NOTE

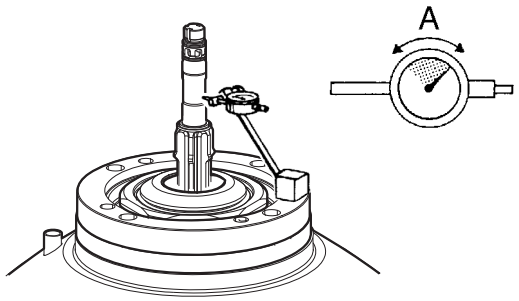
Make sure that only one height adjusting ring is fitted.

The height adjusting ring (44) is attached to the intermediate part (43) with O-ring (45).

11. To check the radial wobble, fit a suitable support to the top of the frame hood as illustrated.

Place the support of the dial indicator on the support.

Measure the wobble by starting and stopping the separator for a short time just enough to get the outlet pipe to turn slowly. Permissible wobble (A) is max. 0,3 mm.



G1008721

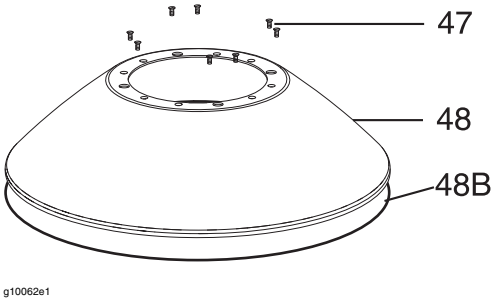
If the wobble exceeds the max. permissible value, turn the feed tube to another position. Check that it is not riding on the distributor or bowl hood, thus being forced into an incorrect position.

If a new position is found where the wobble is acceptable, make a marking for correct assembly after the O-ring has been fitted.

If an unacceptable wobble can not be remedied in this way, the bowl spindle and bowl body nave must be checked for defects. See check point 4.3.7 Bowl spindle taper and bowl body nave taper on page 93.

12. Fit the hood (48) with its sealing (48B) and screws (47) to the connection piece (50).

    Fit gasket (46) on the frame hood.



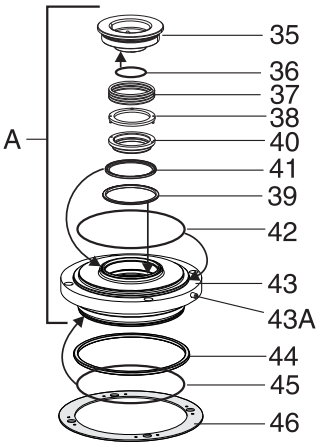
g10062e1

13. Fit O-ring (45) to intermediate part (43).

14. Renew and lubricate with silicone grease or soapy water (see Lubrication chart) the O-rings included in the IS-kit.

NOTE

Cleanliness and accuracy is of greatest importance when handling mechanical seals. Never expose the seal to blows or other careless handling.
Check that all contact surfaces for rubber gaskets, seal rings and wear rings in outlet housing, intermediate part and holders are free from deposits and defects which can give rise to leakage and exceptionally rapid wear.



G10062j1

35. Stator holder
36. O-ring
37. Compression spring
38. Driver
39. Lip seal (only for 3A applications)
40. Seal ring
41. L-packing
42. O-ring
43. Intermediate part
44. Height adjusting ring
45. O-ring
46. Gasket
A. Complete intermediate part

15. Apply soapy water and fit the L-packing (41).

16. **Assemble the seal.**

    Lubricate the O-ring (36) with grease and fit to the stator holder (35).

17. Place the compression spring (37) onto the stator holder (35). Make sure that the guide pin on the spring enters the hole in the holder.



Risk for injury by flying parts
To avoid accidental release, be very careful when compressing the spring. The spring power can rip parts.

18. Place the driver (38) onto the spring. Note that the guide pins should face upwards.

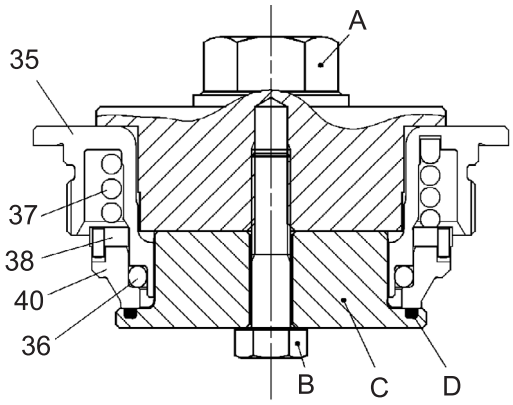
19. Place the seal ring (40) onto the driver (38).

20. Fit the O-ring (D) to tool part spanner (C) and mount both parts (spanner + support) of the compression tool to the seal, tighten the screw (B) on the tool until the complete seal is compressed.

    Mount the stator holder with seal parts together with the tool into the intermediate part.

21. Remove the tool from the sealing by unscrewing the screw (B). Check that the spring is working by pressing down the seal. After the assembly, check once again that the sealing surfaces are free from deposits.

22. Fit the intermediate part (complete with seal) onto the connection piece (50).



G10062g1

A. Spanner
B. Screw
C. Support
D. O-ring
35. Stator holder
36. O-ring
37. Compression spring
38. Driver
40. Seal ring

23. Assemble the upper intermediate part (19).

    First renew and lubricate with silicone grease the O-rings (16, 18, 21, 24). L-packings (12, 26) should be greased with soapy water before fitted.

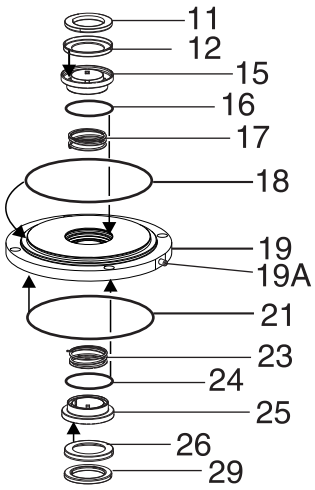
24. Fit L-packings (12) and (26) to each spring holder (15 / 25) together with seal rings (11 / 29).

25. Mount each compression spring (17 / 23) into its spring holder (15 / 25). Make sure that the spring end enter corresponding hole in the spring holder and that correct spring is placed on the correct side on the intermediate part. Spring with one end pointing outward is the bottom spring.

26. Fit O-rings (16 / 24) to the intermediate part (19).

27. Mount each assembly (spring, spring holder, O-ring) with bayonet-fitting to the intermediate part (19). Make sure that the spring ends enters the corresponding hole in the intermediate part.

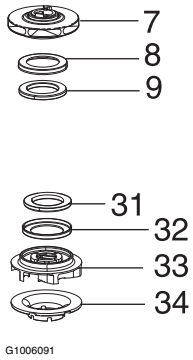
28. Assemble the upper and lower impellers and make sure O-rings sits properly in place.



NOTE

Make sure not to get grease on wear ring sealing surface.

Apply soapy water to gaskets (8 / 32) and mount with wear rings (9 / 31).



7 / 33, 34.Impeller
8 / 32.Gasket
9 / 31.Wear ring

29. Fit the O-ring (42) onto the intermediate part.

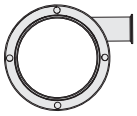
30. Assemble the lower complete impellers (33 and 34).

31. Fit the washer (30), note shape and position.



g10060d1

32. Assemble the lower discharge housing (22). Make sure it is turned the right side up.



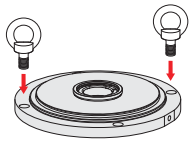
G1008731

33. Fit the spacing sleeve (20).

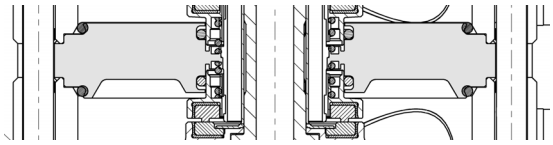
34. Fit the O-ring (21) and assemble complete intermediate part (19). Use lifting eyes.

NOTE

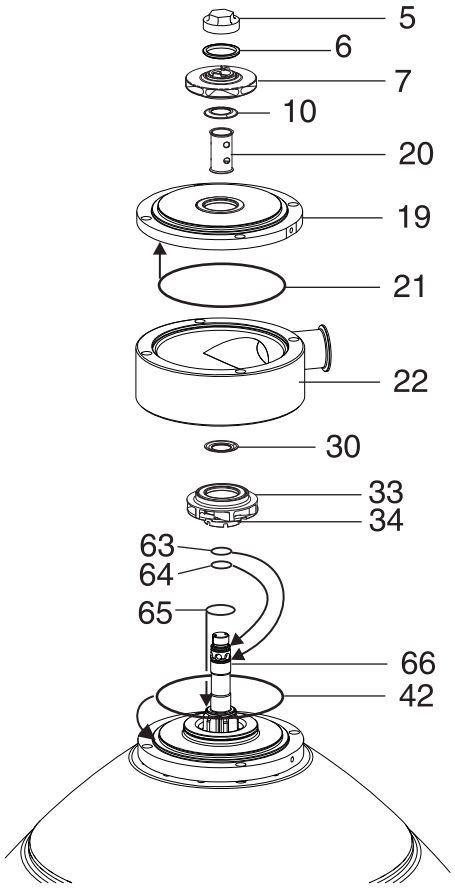
Make sure it is turned the right side up and the connections are facing the right way.



G1006041



g10062k1

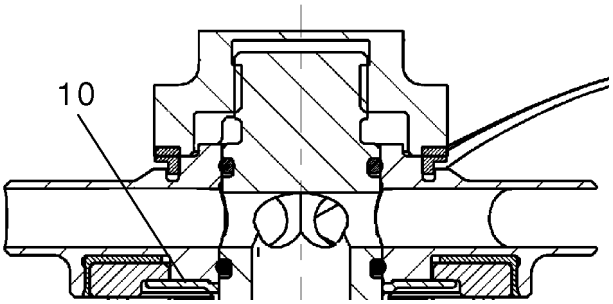


G1006081

35. Fit the washer (10), note shape and position.



g10060c1



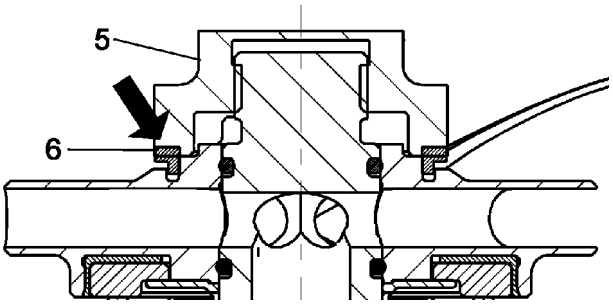
g10060b1

36. Assemble the complete upper impeller (7).

37. Fit the L-packing (6) and tighten nut (5). Tightening torque: 40 Nm. **Left hand thread!**

NOTE

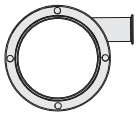
Apply soapy water on upper side of L-packing (6) to decrease torque from nut (5).



g10060a1

38. Fit O-ring (18).

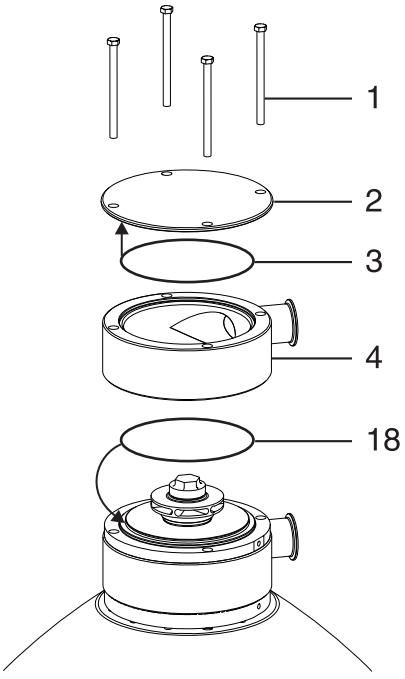
39. Assemble the upper discharge housing (4). Make sure it is turned the right side up.



G1008731

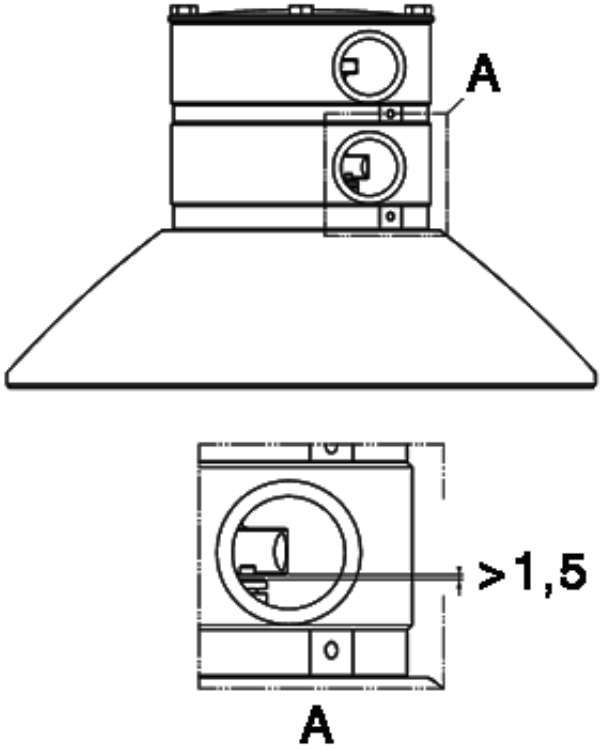
40. Fit O-ring (3).

41. Assemble the cover (2) and tighten screws (1) crosswise. Tightening torque: 100 ± 5 Nm.



G1006011

42. When the outlet device is assembled check distance between Impeller and Stator holder. If less than 1,5 see Height adjustment on page 131



43. Add the piping for cooling water and check for scraping noise

    Check for scraping noise by starting and stopping the separator for a short time just enough to get the outlet pipe to turn slowly. If a scraping noise is heard, wrong height adjustment of the outlet device or wrong fitting of the outlet feed tube may be the cause.

44. Check direction of rotation.

    NOTE

    This can be done by checking the rotation on motor fan or by looking that the impeller in the outlet turns clockwise seen from above.

45. Attach the piping for process liquid.



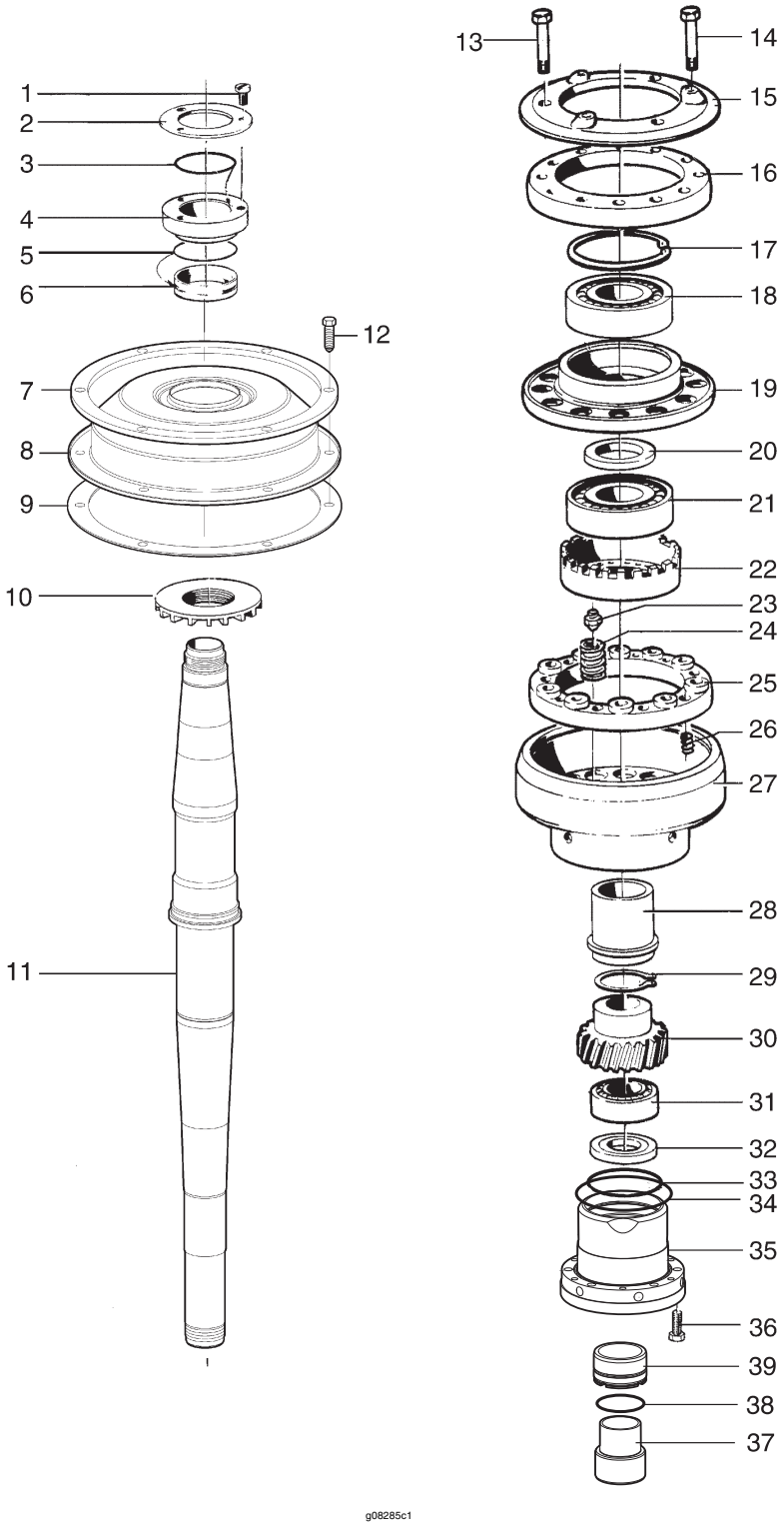
When starting a separator after finishing the maintenance work follow the directions given in chapters *Ready for start* **and** *Start* **in the** *Operator´s Manual*.

4.5 Major Service (MS), dismantling

When performing a Major Service, an Intermediate Service should also always be performed. For that reason, it is assumed that the dismantling for Intermediate Service starting on page 55 is already done.

4.5.1 Vertical driving device

For single sealing inlet

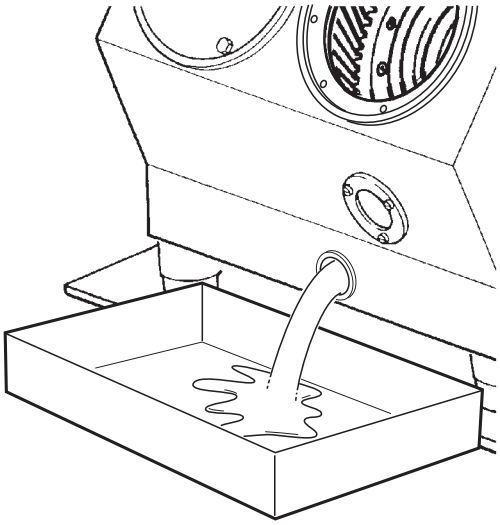


1. *Screw*
2. *Protecting plate*
3. *O-ring*
4. *Protecting collar*
5. *O-ring*
6. *Seal ring*
7. *Fixing ring*
8. *Guard*
9. *Gasket*
10. *Oil fan*
11. *Bowl spindle*
12. *Screw*
13. *Screw*
14. *Screw*
15. *Top bearing cover*
16. *Rubber buffer*
17. *Snap ring*
18. *Ball bearing*
19. *Ball bearing housing*
20. *Spacing sleeve*
21. *Ball bearing*
22. *Bearing housing*
23. *Guide pin*
24. *Compression spring*
25. *Rubber buffer*
26. *Spring*
27. *Top bearing support*
28. *Sleeve*
29. *Snap ring*
30. *Worm*
31. *Ball bearing*
32. *Protecting collar*
33. *O-ring*
34. *O-ring*
35. *Bottom bearing housing*
36. *Screw*
37. *Rotor holder (sleeve), (part of inlet)*
38. *O-ring (part of inlet)*
39. *Throttle ring (part of inlet)*

NOTE

Clean the space in the bowl casing thoroughly before starting to dismantle the bowl spindle to prevent contaminations falling down into the oil gear housing.

1. Place a collecting tray under the oil drain hole. Remove the cover and the drain plug and let the oil be drained from the worm gear housing.



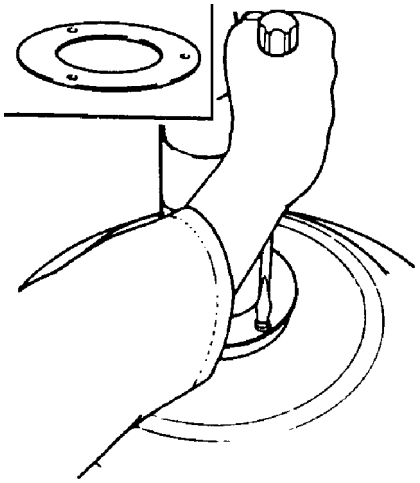
g0484241

CAUTION

Burn hazard

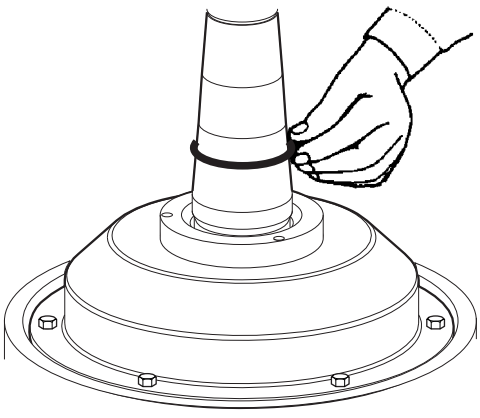
Lubricating oil and various machine surfaces can be hot and cause burns.

2. Unscrew the screws and remove the protecting plate.



g0575441

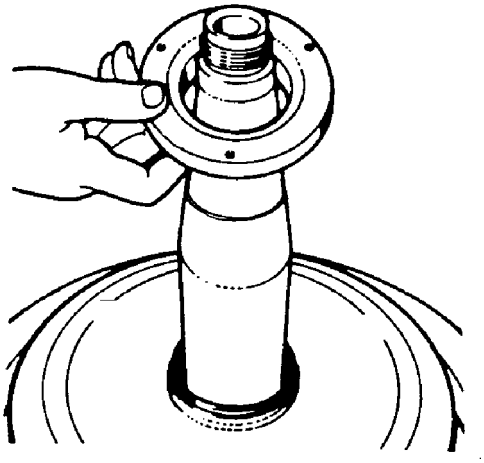
3. Remove the O-ring fitted above the protecting collar.



g0575331

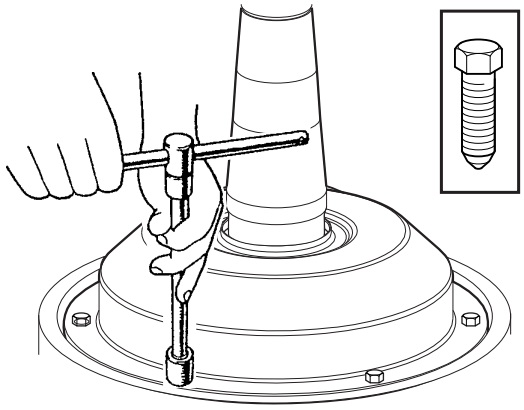
4. Pull off the protecting collar.

   Note! No threads.

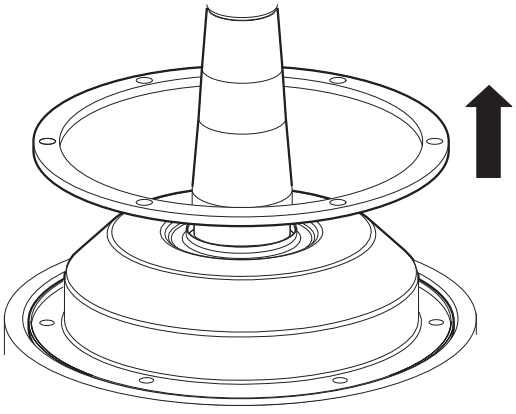


g0575221

5. Unscrew the screws and remove the fixing ring.

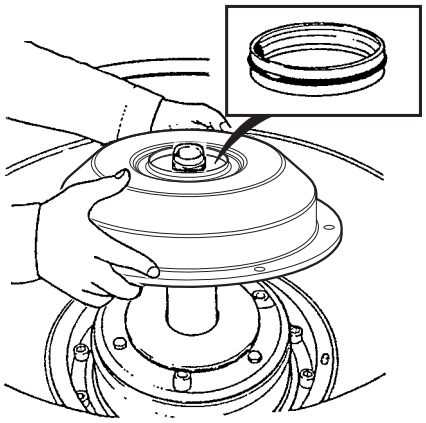


g0674121



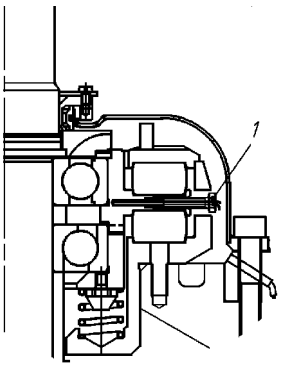
g0575351

6. Remove the seal ring fitted in the guard, as well as the guard together with the gasket. If the guard sticks, use screws as pullers in the three larger holes.



g0674221

7. Remove the temperature sensor (if fitted) located under the guard.

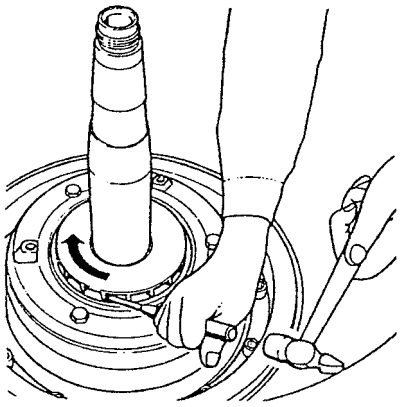


g09377n1

1. Temperature sensor (If no ATEX)

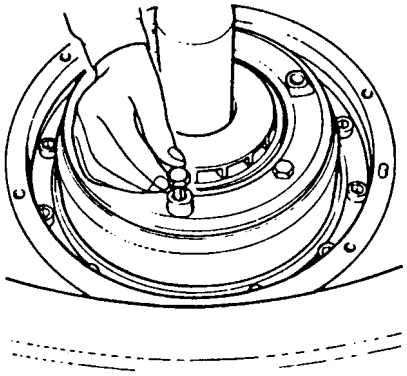
8. Remove the oil fan by hitting with light blows on the wings.

   Left-hand thread!



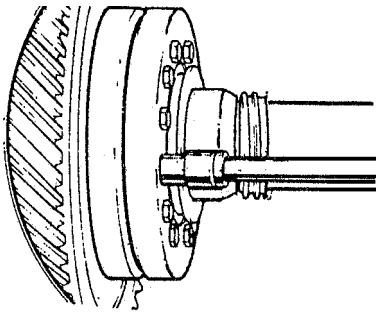
g0674311

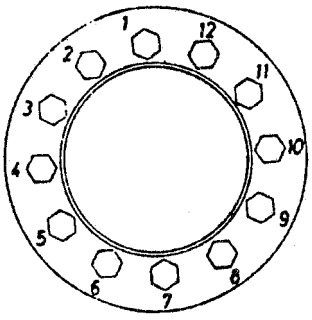
9. Remove the three screws which hold the spindle and it's components in place.



g0574811

10. On the horizontal driving device, loosen the screws in the clamping element uniformly and successively in the order shown in the illustration. In the first step, do not loosen the screws more than ¼ turn to avoid distortion in the clamping element. Do not unscrew the screws entirely.





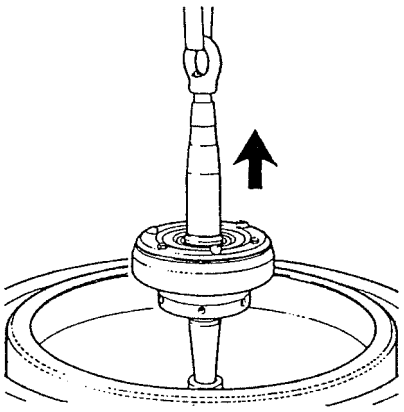
g0207821

11. Push the worm wheel to one side before lifting the spindle.

12. Fit the lifting tool onto the spindle and lift it out by using a hoist.

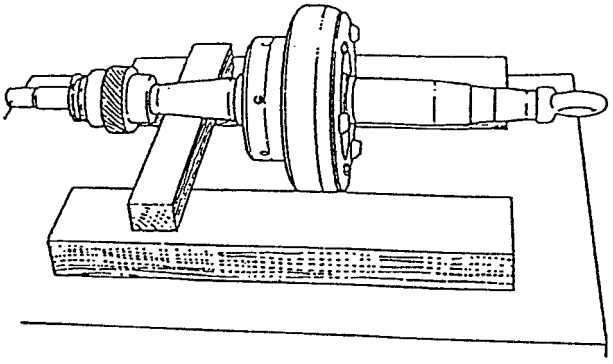
    To avoid damaging the teeth, lift slowly and with great care.





g0674411

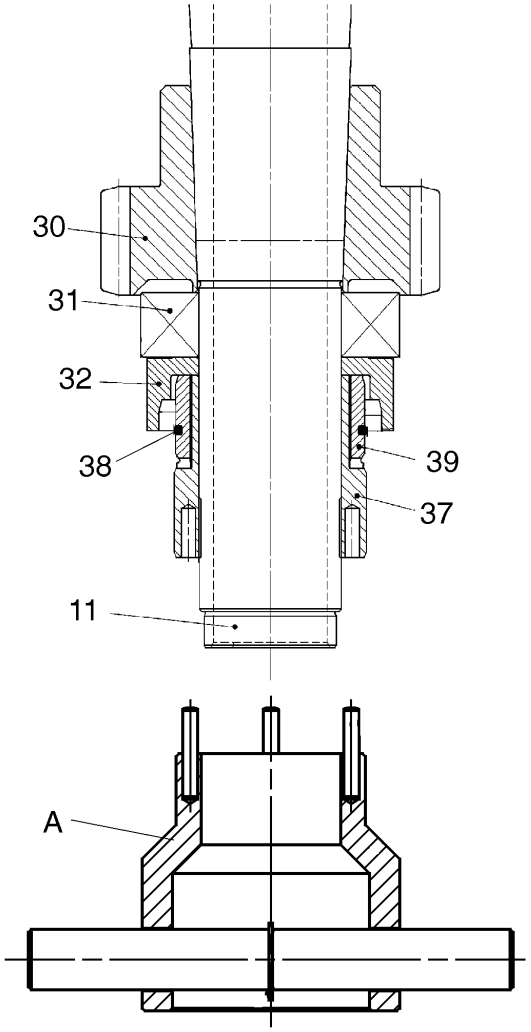
13. Place the spindle on a wooden support, which will be useful during certain sub-operations.



g0674511

14. **If single sealing**

    Remove the throttle ring (39), rotor support (37) from the spindle (11) using the spanner (A).

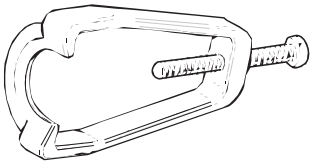


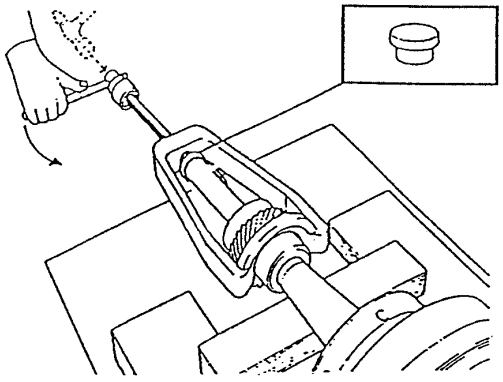
g08300i1

15. Place the plug (included in the tool kit) in the end of the hollow spindle.

    Pull off the worm together with the roller bearing and protecting collar.

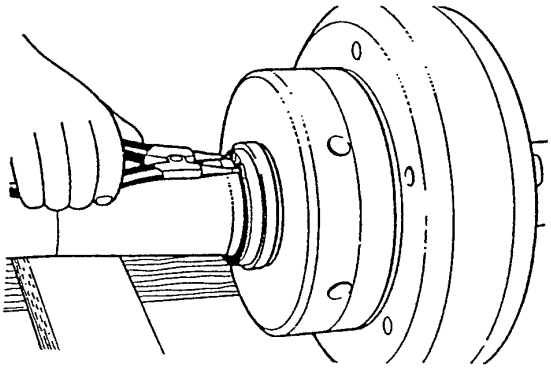
    Now and then hit on the head of the centre screw.





g0674631

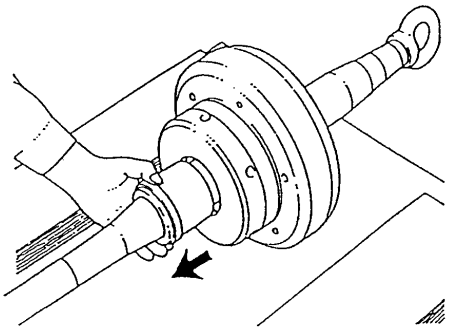
16. Remove the snap ring.



g0674711

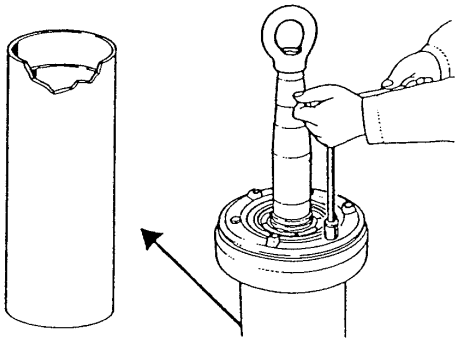
17. Pull off the sleeve.

    Note! No thread.



g0674811

18. Lift the spindle into the mounting tube.



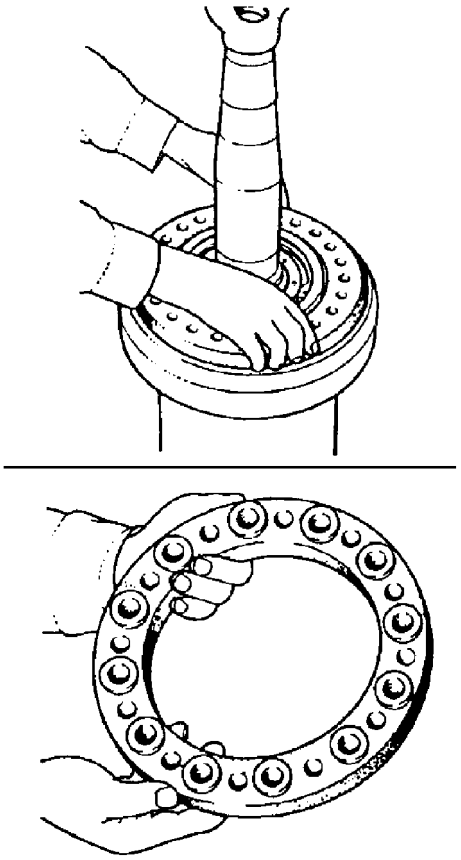
g0674911

19. Remove the three screws fixing the top bearing cover to the top bearing support.

    Loosen the screws alternately and a little at a time.

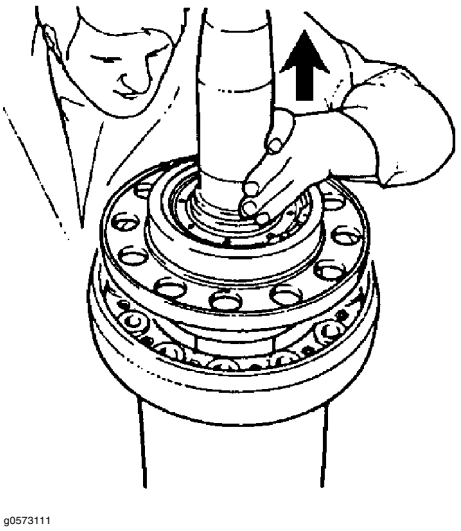
20. Remove the top bearing cover.

21. Remove the upper rubber buffer (not provided with springs).



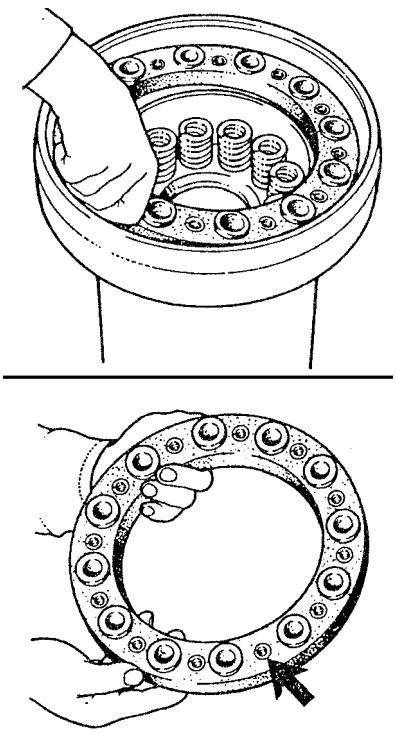
g0573011

22. Lift the spindle out of the spring support.



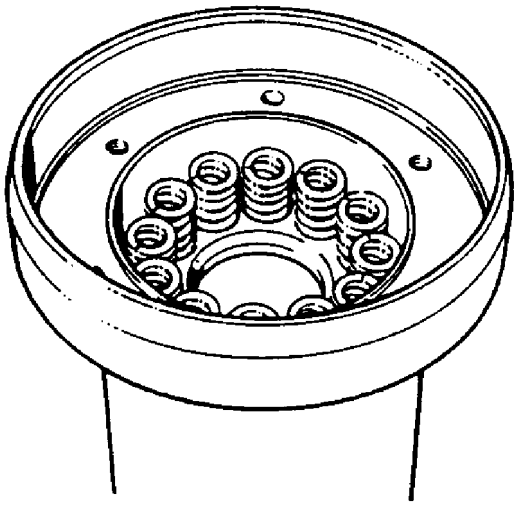
g0573111

23. Remove the lower rubber buffer (provided with springs) from the top bearing support.



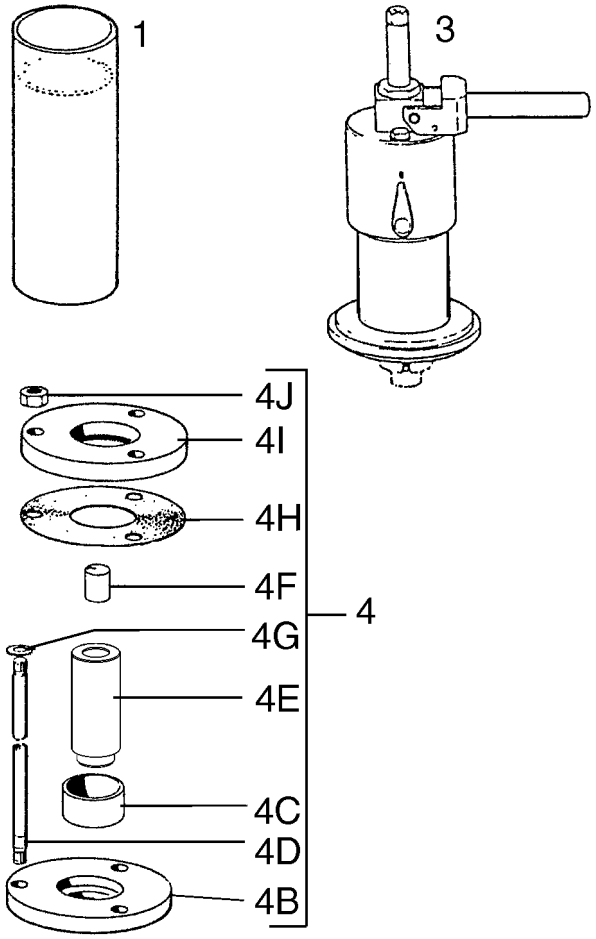
g0573211

24. Remove the springs from the top bearing support.



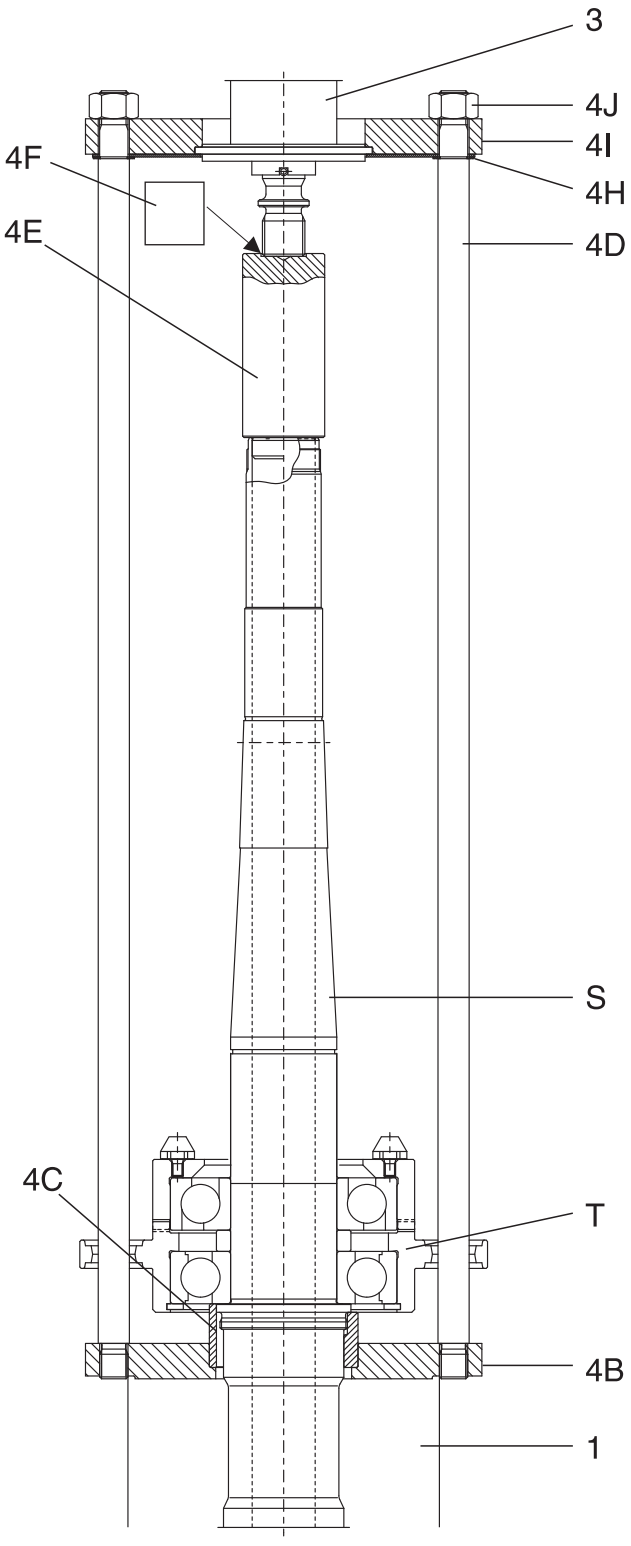
g0573311

25. Then remove the top bearing support from the mounting tube.



g0675941

1. Tube
3. Compressing tool
4. Dismantling and assembly tool
4B. Plate, lower
4C. Sleeve
4D. Bar
4E. Shaft
4F. Intermediate part
4G. Snap ring (normally mounted on the bar)
4H. Washer
4I. Plate, upper
4J. Nut
S. Bowl spindle
T. Bearing support
. Dismantling tools



g0675341

26. Dismantle the top bearing support from the spindle in the following way:

    a. Arrange the tube (1) on a firm support. Fill the tube with rags to protect the spindle from damage when pressing out.

    b. Fit the bottom plate (4B) on the tube (1).

    c. Fit the sleeve (4C) with inside diameter Ø95 mm on the bottom plate (4B).

    d. Place the spindle (S) upside down in the bottom plate (4B). Check that the inner race of the ball bearing is in contact with the face of the sleeve (4C).

    e. Mount the three bars (4D) by fitting them through the holes in the top bearing support (T) and screwing them into the bottom plate (4B).

    f. Fit the shaft (4E) over the spindle (S).

    g. Check that the snap rings (4G) is fitted. Then fit the washer (4H) for the compressing tool (3) onto the rods (4D).

    h. Fit the compressing tool (3).
    Note! The piston must be in top position.

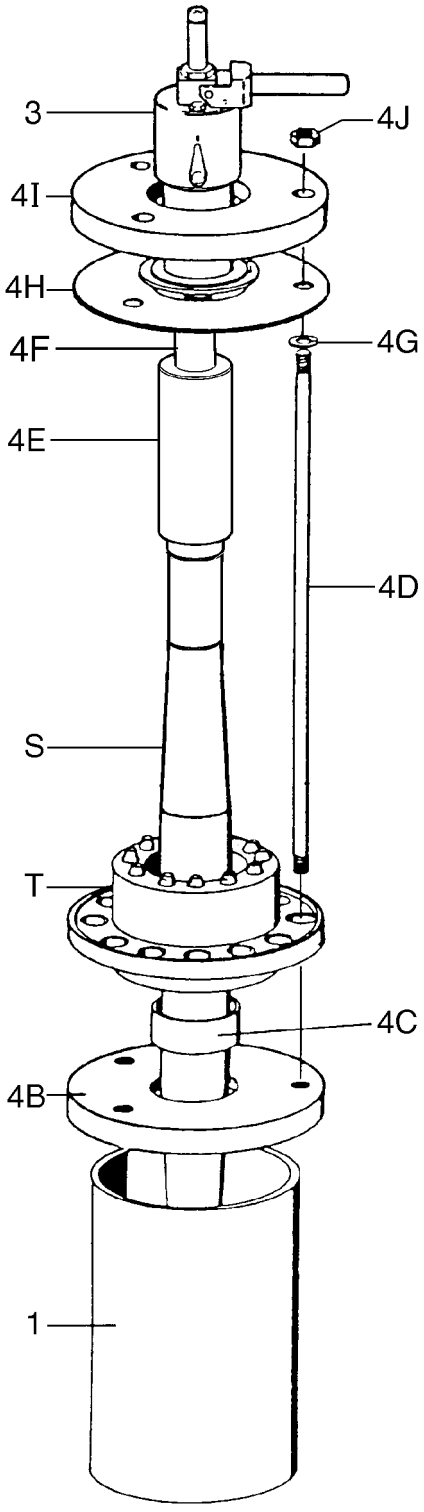
    i. Fit the top plate (4I) and secure the assembly with the three nuts (4J).

    j. Set the control lever of the compressing tool (3) in position 2. Then pump until the piston has reached the bottom position.

    k. Set the control lever in position 1. Pump until the piston reaches its upper position.

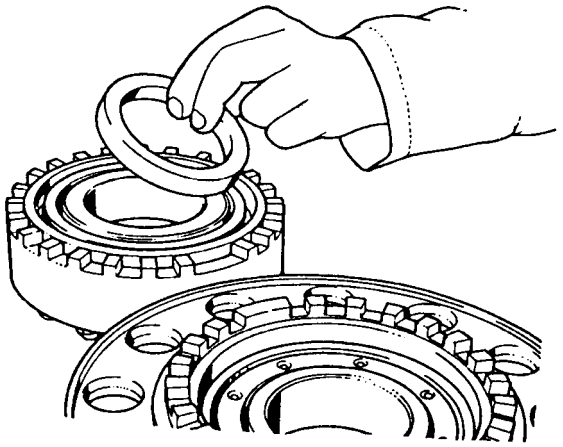
    l. Place the intermediate part (4F) between the piston and the shaft (4E).

    m. Set the control lever in position 2 again and continue to pump until the spindle is pressed out of the ball bearings.
    Note! Pump slowly during the final stage of pressing out to avoid damage to the spindle when it falls down.



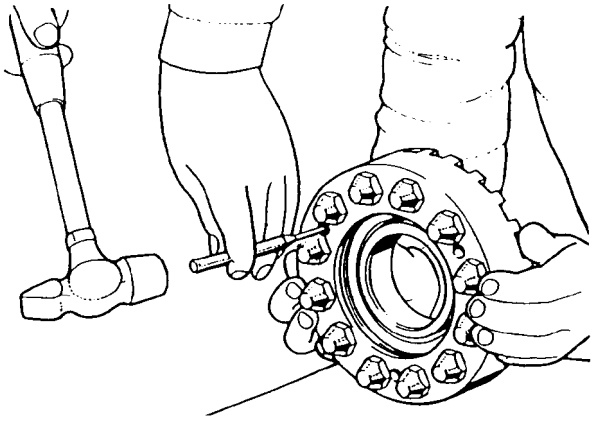
g0675831

27. The parts pressed off the spindle are the upper and lower ball bearing housings and the spacing sleeve.



g0573411

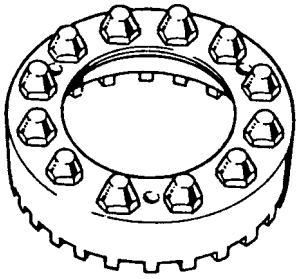
28. Force out the ball bearing from the lower ball bearing housing.



g0573521

29. Check the guide pins.

    Replace any damaged pins but do not loosen the others.



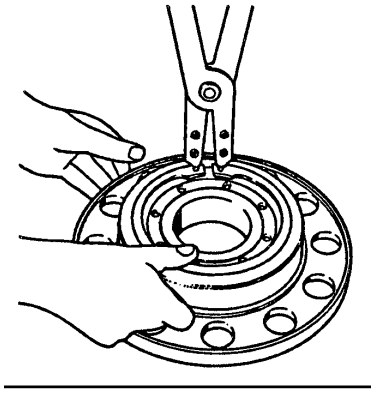
g0573611

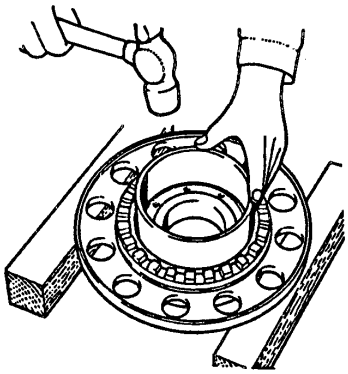
30. Remove the snap ring from the upper ball bearing housing.



Risk for eye injury

Use the correct pliers for the snap ring to avoid accidental release.





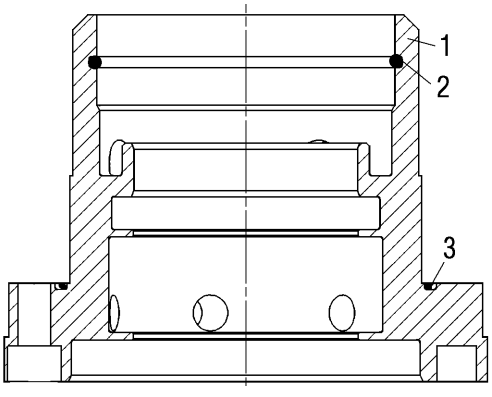
g0573711

31. Force out the ball bearing.



32. Remove the bottom bearing housing fitted in the frame.

33. Remove O-ring (2, 3) from the bottom bearing housing (1).

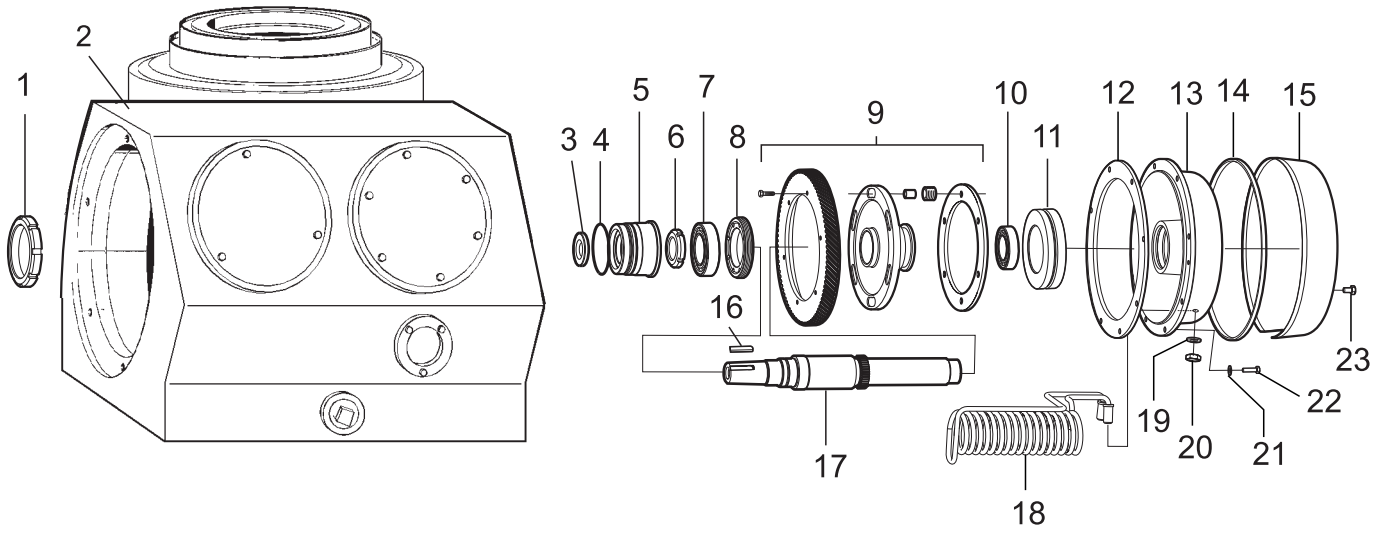


G08358d1

For single sealing

1. *Bottom bearing housing*
2. *O-ring*
3. *O-ring*

4.5.2 Horizontal driving device



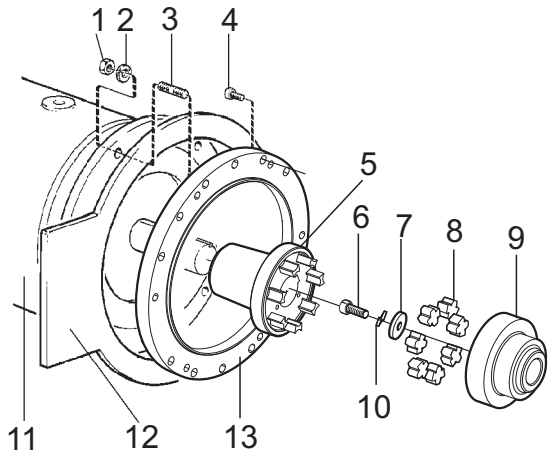
g02465x1

Worm gear end

1. Round nut
2. Frame bottom part
3. Seal ring
4. O-ring
5. Bearing housing
6. Round nut
7. Ball bearing
8. Lock ring
9. Worm wheel
10. Ball bearing
11. Clamp element
12. Gasket
13. Bearing shield
14. Seal strip
15. Guard
16. Flat key
17. Worm wheel shaft
18. Cooling coil
19. Washer
20. Nut
21. Washer
22. Screw
23. Screw

The bearing housing should normally remain sitting in the frame. It should be dismantled only when it is necessary to replace it or the O-ring (4), or when the separator is to be reconditioned. If it is to be removed, observe that the round nut (6) is locked with Loctite. The nut is therefore easier to unscrew when heated. The bearing housing is also fixed with Loctite. When fitting a new bearing housing, apply Loctite 603 on its guiding surface against the frame and Loctite 243 on the threads.

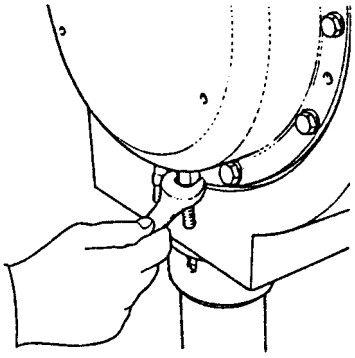
Drive motor end



g07782f1

1. Nut
2. Washer
3. Stud bolt
4. Screw
5. Coupling drum
6. Screw
7. Washer
8. Flexible elements
9. Coupling pulley
10. Spring washer
11. Electric motor
12. Guide ring
13. Motor adapter

1. Shut off the water supply and disconnect the cooling water connections to the cooling coil in the worm gear housing.

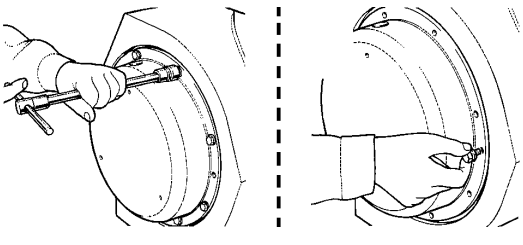


g0797911

2. Remove the guard covering the bearing shield.

3. Remove the nuts and washers fixing the cooling coil to the bearing shield and press the two tube ends up into the bearing shield.

4. Remove the bearing shield: ease it off by means of two of the fastening screws.



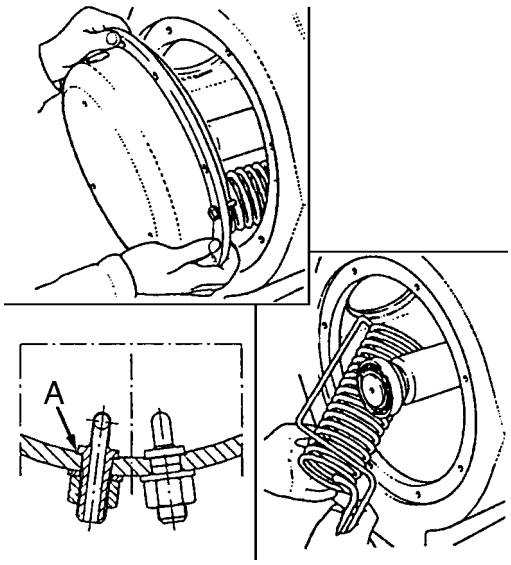
g0212421



Crush hazard

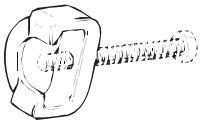
The shield is quite heavy (15 kg cast iron). Hold the shield firmly or use two longer screws as guide pins to prevent dropping it during dismantling.

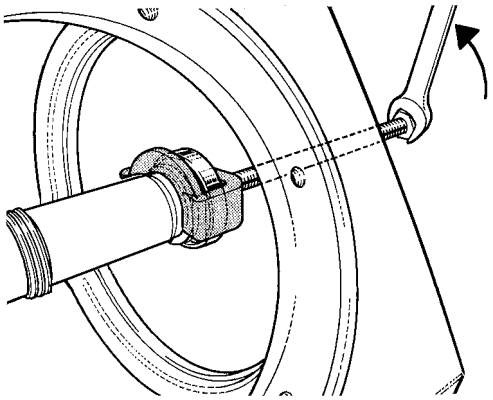
5. Remove the protecting cover and lift out the cooling coil. Take care of the gaskets (A).



g0798011

6. Fit the puller tool and pull off the ball bearing from the worm wheel shaft.





g0212521

7. Remove the clamping element and worm wheel. It is presumed that the clamping element is already loosened as described in chapter 4.5.1.



Crush hazard

The worm wheel is quite heavy. Hold it firmly when dismantling. Risk for jamming injury.

8. Remove the protecting housing covering the electric motor.

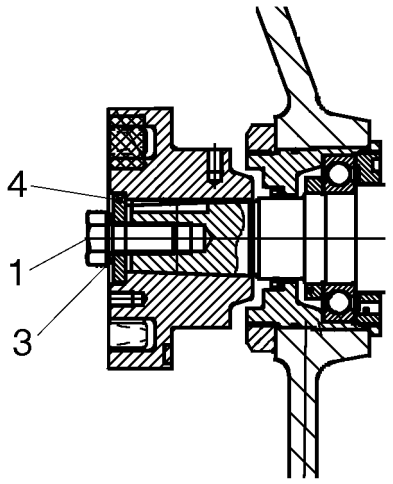
9. Disconnect the motor cables. Note the positions of cables in the terminal box to re-connect correctly (for correct direction of rotation).

10. Hook up the motor in a hoist and loosen the motor from the separator frame.
Pull out the motor carefully.

11. Take care of the guide ring.

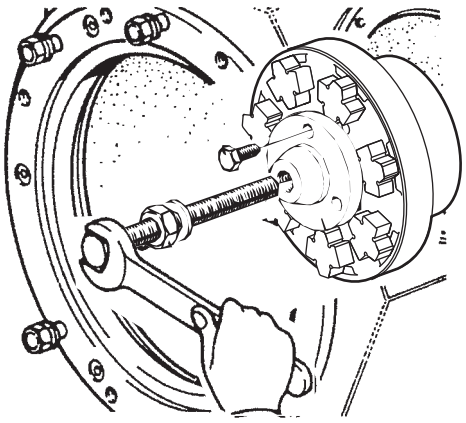
12. If the coupling drum has to be dismantled, use a washer to protect the threaded hole in the motor shaft.

13. To remove the coupling disc from the horizontal driving shaft, unscrew the centre screw (1) and remove the spring washer (3) and washer (4). Then tighten the screw (1) again to protect the worm wheel shaft during next operation.



g0462751

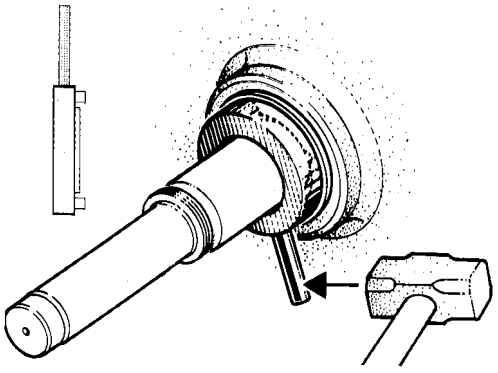
14. Fit the puller tool illustrated below and pull off the coupling disc.



g0484431

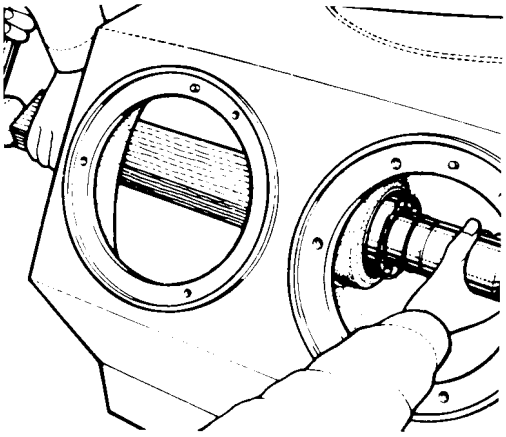
15. Remove the lock ring on the worm wheel side.

    Left-hand thread!



g0192311

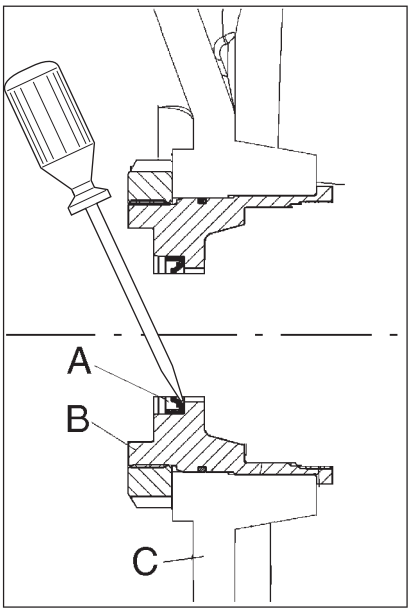
16. Knock loose the worm wheel shaft by means of a piece of wood and a tin hammer. Use light blows from the motor side.



g0213421

17. Remove the lip seal (A) from the bearing housing (B) in the frame (C).

    Use a screwdriver.

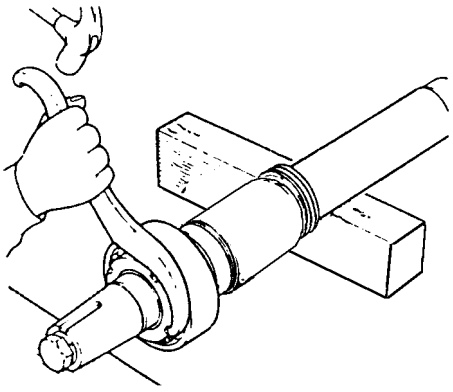


g0462781

18. Unscrew the round nut fixing the ball bearing.

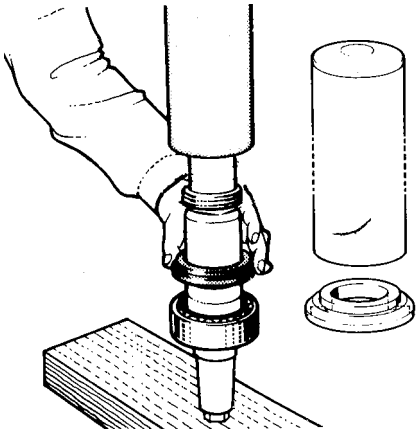
    Use of a device may be necessary to prevent shaft from rotating.





g0477611

19. Remove the ball bearing. Put some cotton twist into the tool to avoid damage to the shaft. The pressure should be applied to the inner race of the ball bearing.



g0212711

After dismantled all parts for Major Service, remove any deposits from the internal of the frame bottom part and clean all other parts thoroughly in a suitable cleaning agent. See chapter 3.3 Cleaning on page 31.

4.6 Major Service (MS), check points

4.6.1 Introduction

This chapter consists of check points that can be done when the separator has been dismantled for Major Service but before it is assembled. Other check points that can be done only in conjunction with the assembly are described in the assembly sections.

NOTE

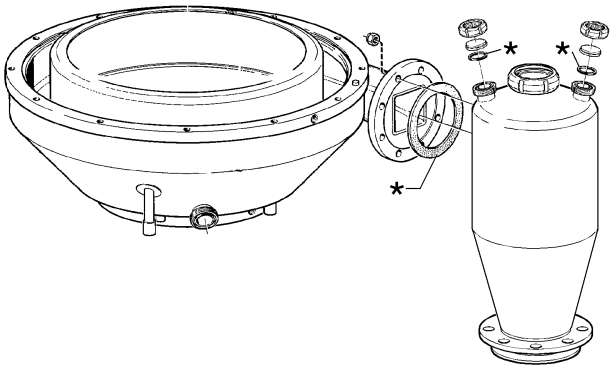
At Major Service the check points for Intermediate Service starting on page 84 should also be carried out in conjunction with the check points in this chapter.

4.6.2 Cyclone; sealing rings

Dismantle and clean the cyclone and the adjoining pipes.

When assembly, renew the sealing rings marked in the illustration.

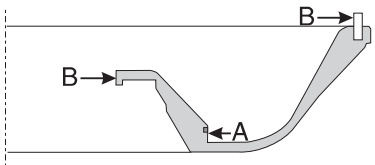
The new sealing rings are included in the Major Service (MS) kit.



G0778541

4.6.3 Guide surfaces

Check surfaces of bowl parts for burrs or galling. Rectify when necessary, see 4.3.5 Guide surfaces on page 89.

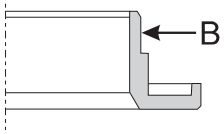


G03782g1

Operating slide

Treat the guide surfaces indicated B with slide lacquer as described below. Recommended slide lacquer (varnish or spray) is found in 3.5.2 Lubricants on page 41.

This instruction describes how to treat with varnish. How to treat with spray is described in 4.6.4 Lock ring; priming on page 166.



G03782h1

Spring support

A & B.	Surfaces to lubricated each Intermediate Service, see 4.3.5 Guide surfaces on page 89 and 3.5.2 Lubricants on page 41
B.	Surfaces to treat with slide lacquer at each Major Service

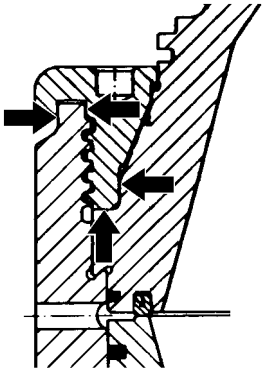
1. Carefully degrease the contact surfaces (B) between the operating slide and spring support. Also degrease the guide pin in the operating slide. Dry the surfaces well.
2. Apply slide lacquer with a well cleaned brush. Protect the surfaces which should not be treated.
3. Air-cure the treated surfaces for 15 minutes.
4. Use a smooth fibre brush to polish to an even, homogeneous contact film.
5. Apply slide lacquer a second time.
6. Air-cure the lacquer for a further 15 minutes.
7. Polish the film to a shiny surface. The film should look like well-polished leather when properly finished.
8. Finish the treatment by lubricating the contact surfaces, see 3.5.2 Lubricants on page 41. Use a well-cleaned brush. Rub it into the surface, do not leave any excess paste.

4.6.4 Lock ring; priming

The arrows indicate positions of threads, guide and contact surfaces to be primed.

Recommended agents for priming procedure:

- Degreasing agent
- Slide lacquer (varnish or spray), see 3.5.2 Lubricants on page 41
- Small power drill
- 2 fibre brushes

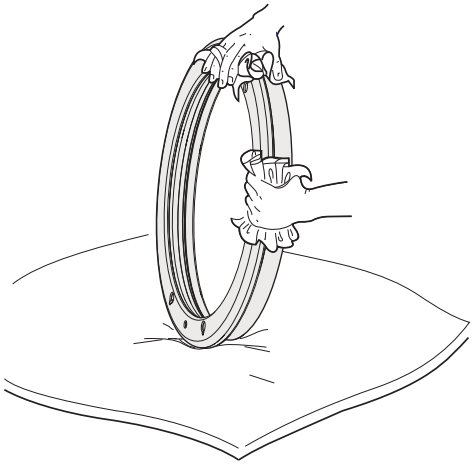


G0732241

Threads, guide and contact surfaces to be primed

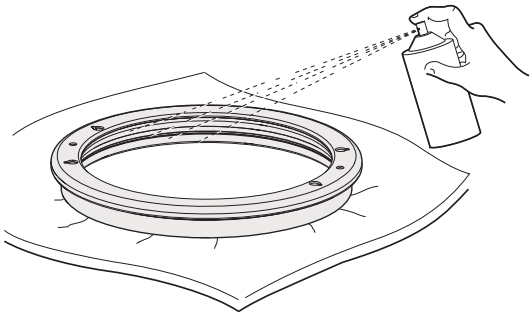
This instruction describes how to treat with Molykote spray. How to treat with varnish is described in chapter 4.6.3 Guide surfaces on page 165.

1. Clean the lock ring thoroughly with a degreasing agent and wipe it off.



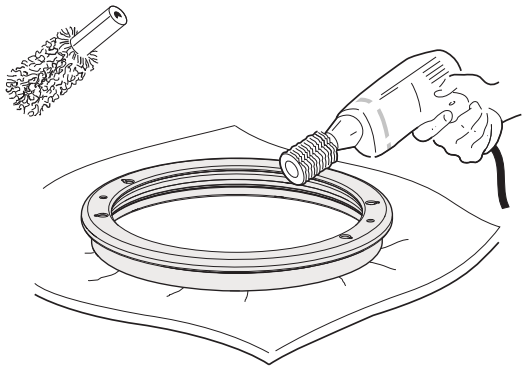
G0206931

2. Spray the threads, guide and contact surfaces with slide lacquer (see 3.5.2 Lubricants on page 41). Let the lacquer air-cure for about 15 minutes.



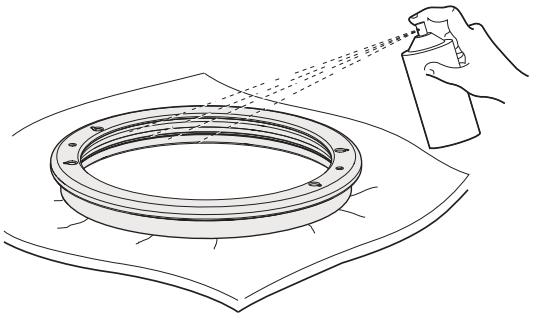
G0207031

3. Use a fibre brush to polish the slide lacquer into the surface. The black spray will look like well-polished leather when properly finished.



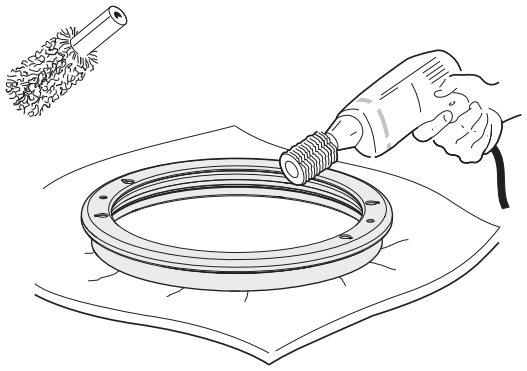
G0207231

4. Spray the lock ring a second time and let it dry for about 15 minutes.



G0207031

5. Polish the slide lacquer to a black shiny surface which will now last about a year. Proceed in the same way with the threads of the bowl body and with the guide surfaces of the bowl hood and bowl body.



G0207231

4.7 Major Service (MS), assembly

4.7.1 Introduction

Before starting the assembly first carry out the Intermediate Service check points starting on page 84 and Major Service check points starting on page 164.



Renew all parts included in the IS- and MS-kits. The O-rings and other sealing rings should be lubricated with grease of silicone type, see 3.5 Lubricants.

When mounting some of the bearing housings on the bowl spindle and worm wheel shaft as described in this chapter, these must be heated in oil to **max. 125 °C**.



Burn hazard
Use protective gloves when handling the heated bearings.



If any doubt how to mount roller bearings in a correct way, see the detailed description in chapter 3.7.1 Ball and roller bearings on page 47.



Since roller bearings are normally treated only with rust protection oil from the factory, an initial lubrication of new bearings must always be performed whenever bearings are replaced. This is, however, not valid for bearings with seals because they are already filled with grease at delivery.

The initial lubrication implies adding a few drops of lube oil to the bearings.

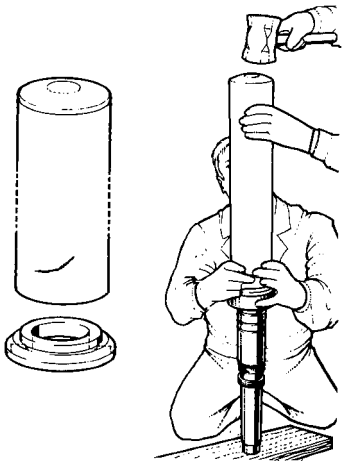
4.7.2 Horizontal driving device

An exploded view of the horizontal driving device can be found in chapter 4.5.2.

1. Clean and oil the seat of the large ball bearing on the worm wheel shaft.

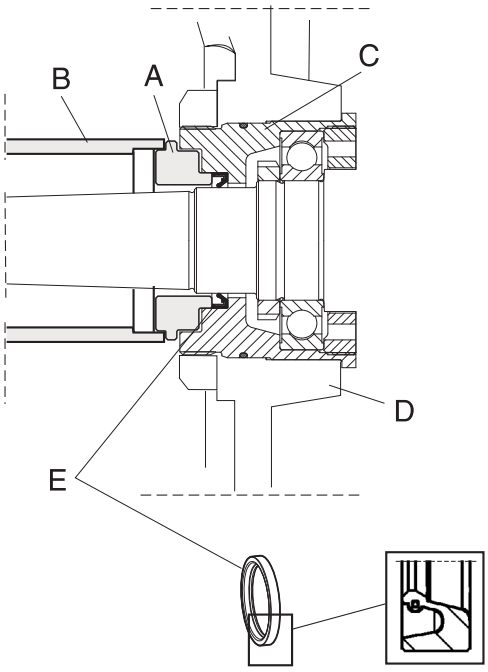
2. Fit the large ball bearing. The bearing is pre-lubricated and sealed with two seals. It should therefore **not** be heated before fitting.

   If necessary, knock the ball bearing into its seat with the driving-on sleeve tool and the ring.



G0192411

3. Fit a new seal ring (E) inside the bearing housing. Use soapy water to facilitate mounting. Note correct mounting!

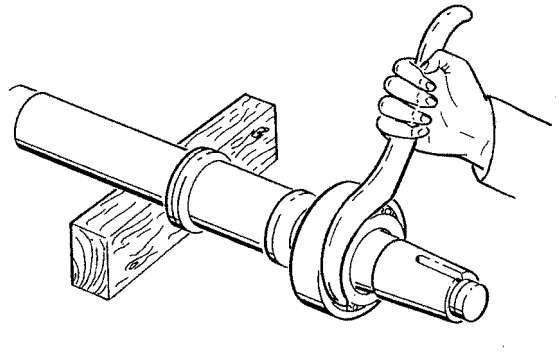


G0191631

A. Mounting tool
B. Tube
C. Bearing housing
D. Frame
E. Lip seal

4. Lock the ball bearing in its position by tightening the round nut.





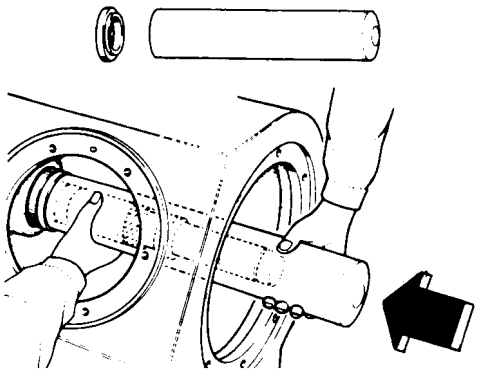
G0191611

5. Clean the ball bearing housing in the frame and oil the outer race of the ball bearing.

NOTE

The bearing must cool down before fitting the worm wheel shaft into the frame. Otherwise the tolerance between the outer diameter of the bearing and the bearing housing will be too narrow.

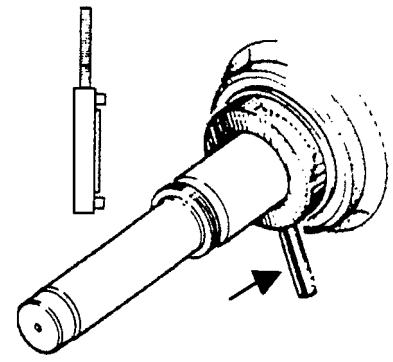
6. Force the worm wheel shaft into its position in the frame so that the ball bearing enters correctly into its seat. Use the driving-on sleeve and the ring forcing the outer race of the ball bearing.



G0213521

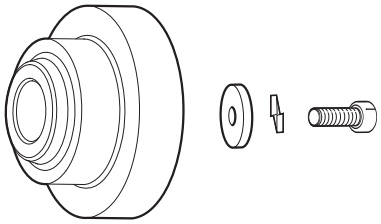
7. Fit the lock ring. Tighten it with the pin spanner.

Left-hand thread!



G0246011

8. Fit the coupling disc. Check that the key in the worm wheel shaft enters into the recess in the nave of the disc.

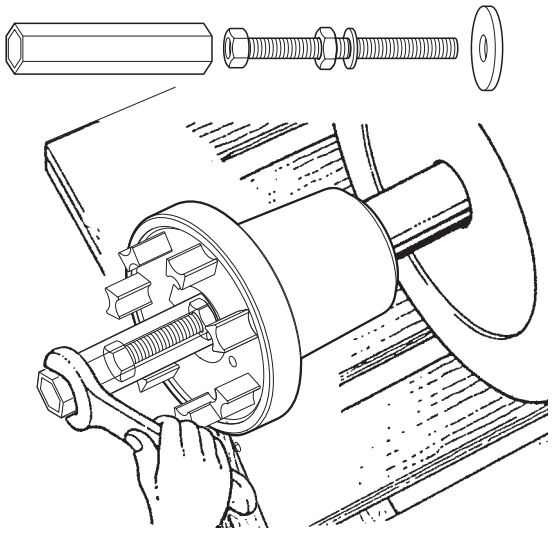


G0777721

9. Lock the coupling disc in its position by means of the plain washer, spring washer and centre screw.

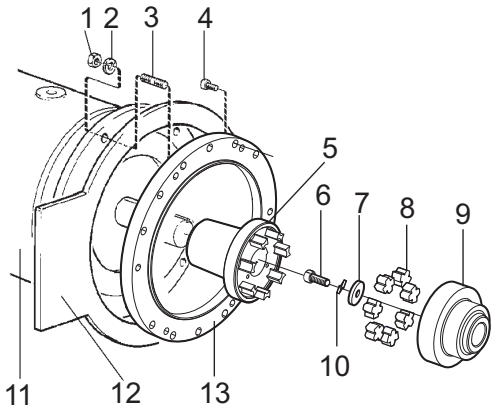
10. If the pulley has been removed, first lubricate the motor shaft with Molykote Paste 1000. Then knock the disc on to the motor shaft as far as possible using a piece of wood and a hammer.

    Screw the tool illustrated into the motor shaft as far it goes and apply some grease to its washer. Then turn the tool until the pulley is in position. Lock with the lock screw.



G0485941

11. Check and fit the elastic elements. Clean or renew, if needed.



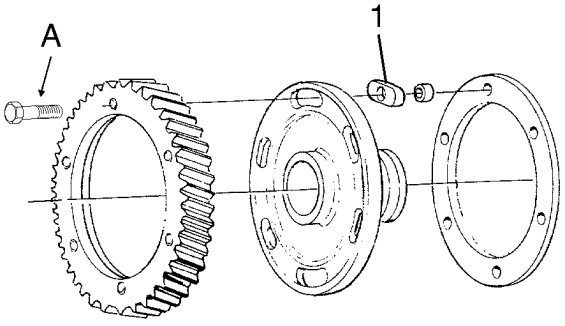
G07782f1

1. Nut
2. Washer
3. Stud bolt
4. Screw
5. Coupling drum
6. Screw
7. Washer
8. Flexible elements
9. Coupling pulley
10. Spring washer
11. Electric motor
12. Guide ring
13. Motor adapter

12. Fit the electric motor, using a hoist.

13. Worm wheel assembly:

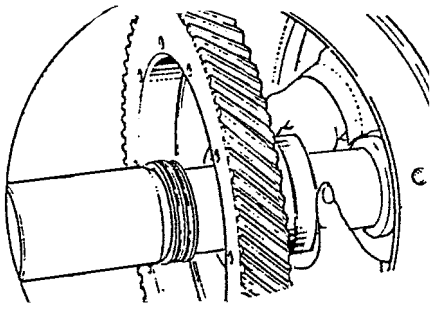
    If the rubber buffers (1) have been replaced in the worm wheel, apply some Loctite 270 on the six screws (A). Then tighten crosswise with **33 Nm**.



G0191941

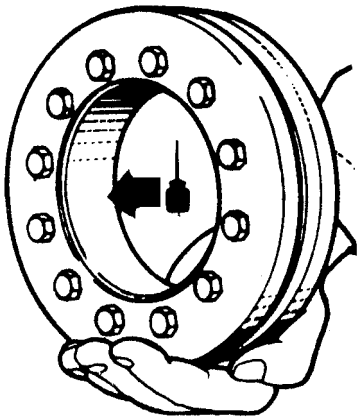
14. Clean the worm wheel shaft and the inner surface of the worm wheel nave thoroughly with a clean cloth. Then oil the surfaces. The oil must be of the same quality as used in the worm gear housing.

    Carefully push the worm wheel as far as possible onto the shaft.



G0571831

15. Clean the inner surface of the clamping element and oil it. The oil must be of the same quality as is used in the gear housing. Slip the clamping element onto the worm wheel. The tightening is described in conjunction with mounting the bowl spindle (found in chapter 4.7.3).

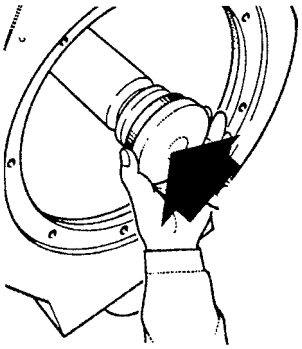


G0213811

16. Mount the **heated** ball bearing onto the free end of the worm wheel shaft. If necessary, apply the mounting tool and hit a few blows on the bearing to get it in the correct position.

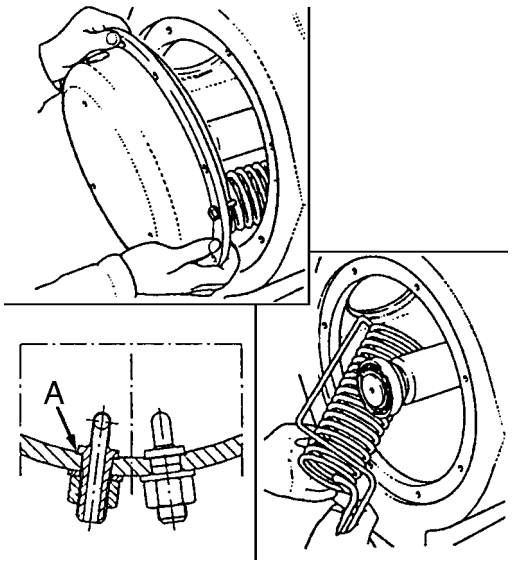
NOTE

Hitting with heavy strokes can damage the inner bearing on the worm wheel shaft.



G0485611

17. Fit gaskets (A) onto the cooling coil tubes and place the cooling coil in the worm gear housing.



G0798011

18. Clean the bearing seat in the bearing shield (17).

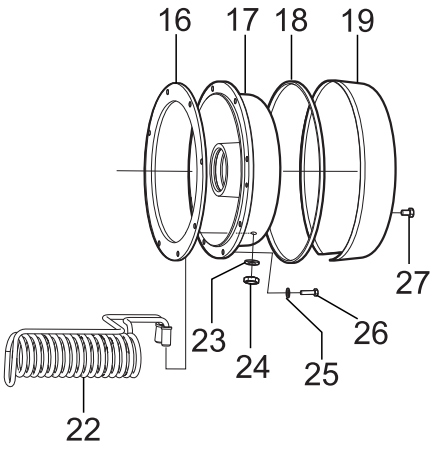
NOTE

Check that the end bearing on the shaft has cooled down. Otherwise the tolerance between the outer diameter of the bearing and the seat in the bearing shield will be too narrow.

19. Renew the gasket (16) and fit the bearing shield using the two guide pins in the tool set. Note that the shield can be fitted in one position only.

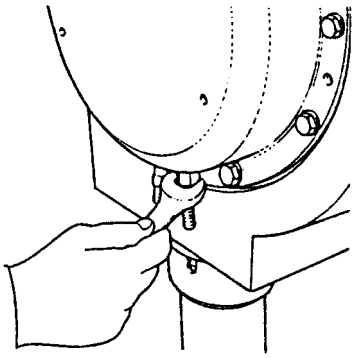
    If necessary, pull it into position using the screws or tap its centre with a tin hammer.

20. Press the two tube ends of the cooling coil (22) into the bearing shield.



G08286g1

21. Fit the washers (23) and nuts (24) and tighten the coil to the shield.


G0797911

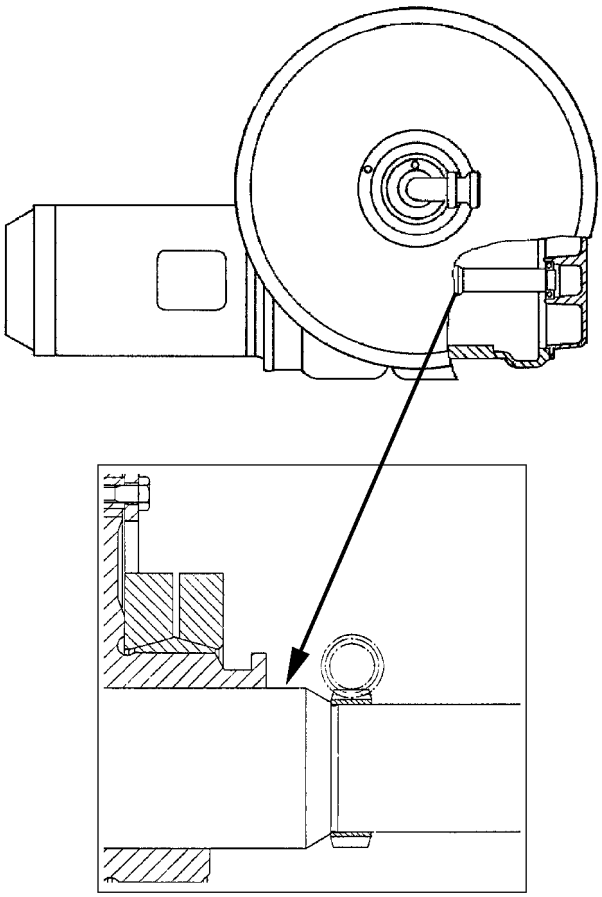
22. Connect the cooling water to the coil. Supply the cooling water and check for leakages.

23. Fit the seal strip (18) and the guard (19) covering the bearing shield.

24. Check the radial wobble of the worm wheel shaft by first camping a dial indicator in a magnetic support and fasten it to the surface for the worm wheel guard. Turn the worm wheel shaft by hand.

    Permissible radial wobble is **maximum 0,10 mm**.

    If the wobble is greater, the worm wheel shaft must be removed from the frame for closer examination. Get in touch with your Alfa Laval representative as the worm wheel shaft may need to be renewed.



G0246181

NOTE

Excessive wobble on the worm wheel shaft may cause vibration and noise.

4.7.3 Vertical driving device

Check point

3.4.1 Worm wheel and worm; wear of teeth on page 35.

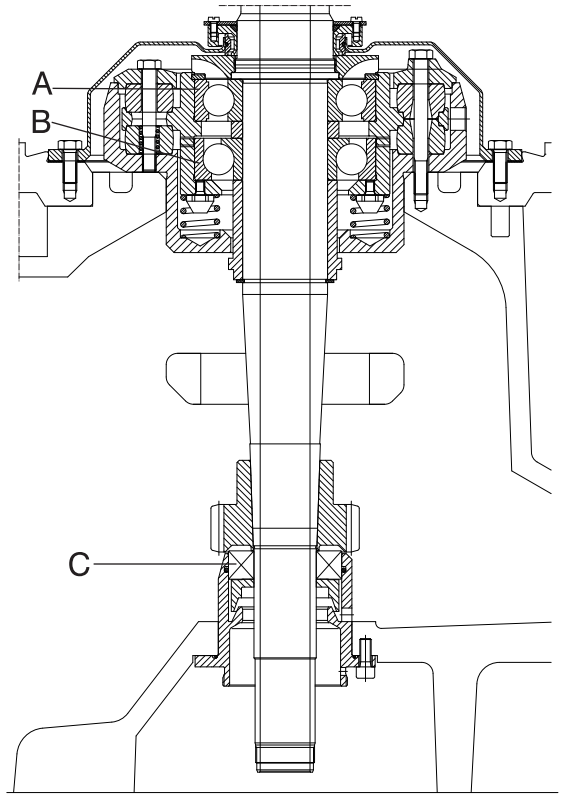
An exploded view of the vertical driving device can be found on page 142.

All three bearings on the bowl spindle are off different types as follows:

A. Deep groove ball bearing to be fitted in the upper housing.

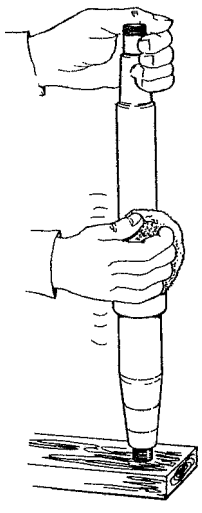
B. Angular contact ball bearing to be fitted in the lower housing.

C. Self-aligned roller bearing to be fitted at the bottom end of the spindle.



g0830631

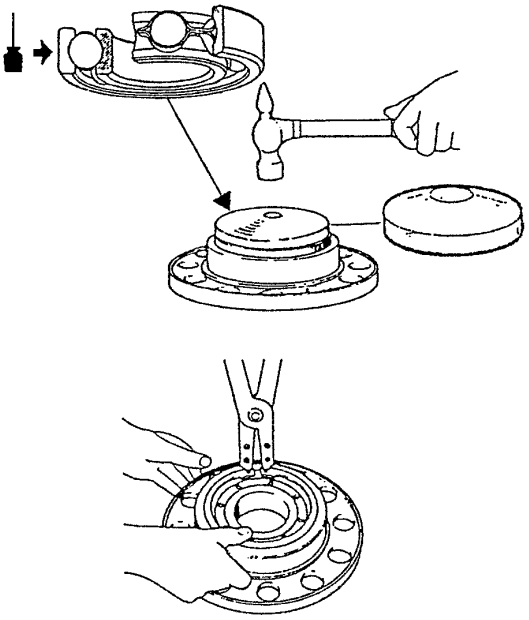
1. Wipe off and oil the bearing seats before fitting the bearing support and ball bearings.



g0189011

2. Fit the **cold** deep groove ball bearing into the **heated** upper housing using the special mounting tool included in the set of tools.

3. Lock the bearing with a snap ring.



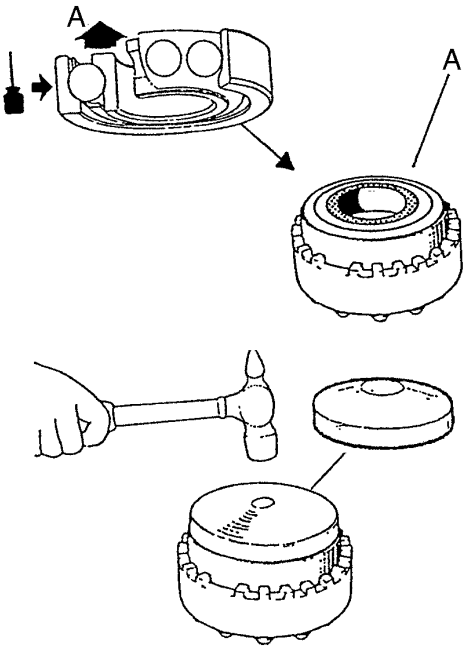
g0675521

WARNING

Risk for eye injury

Use the correct pliers for the snap ring to avoid accidental release.

4. Fit the **cold** angular contact ball bearing into the **heated** lower housing using the special mounting tool.

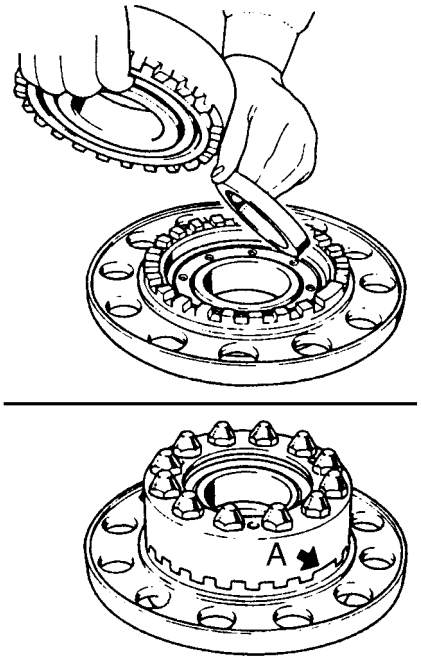


g0675621

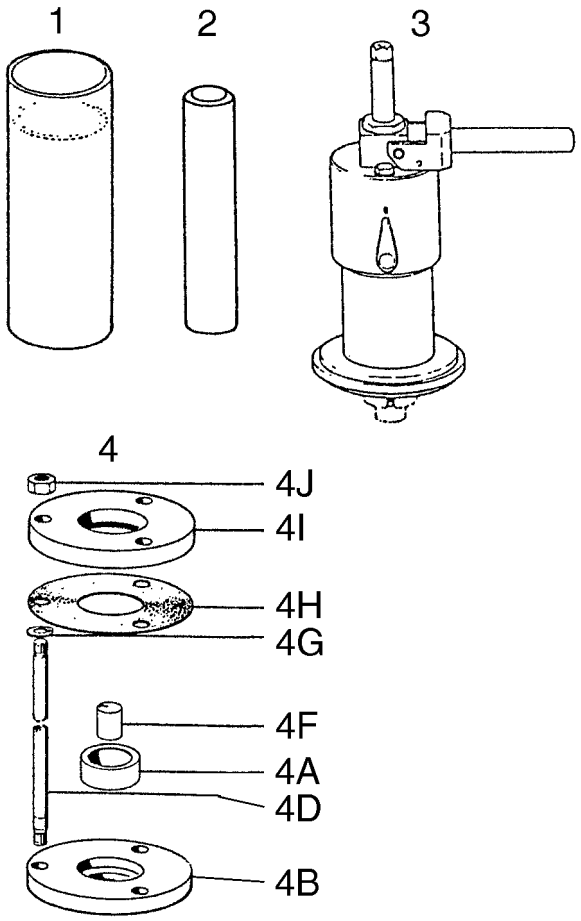
NOTE

Turn the angular contact ball bearing the right way - the wide shoulder of the inner race must face upwards (A). A bearing of this kind turned upside down cannot carry any load. It collapses when loaded resulting in breakdown.

5. Assemble the two bearing housings and the space sleeve into a unit. Note that one tooth and the corresponding recess (A) is wider than the others.

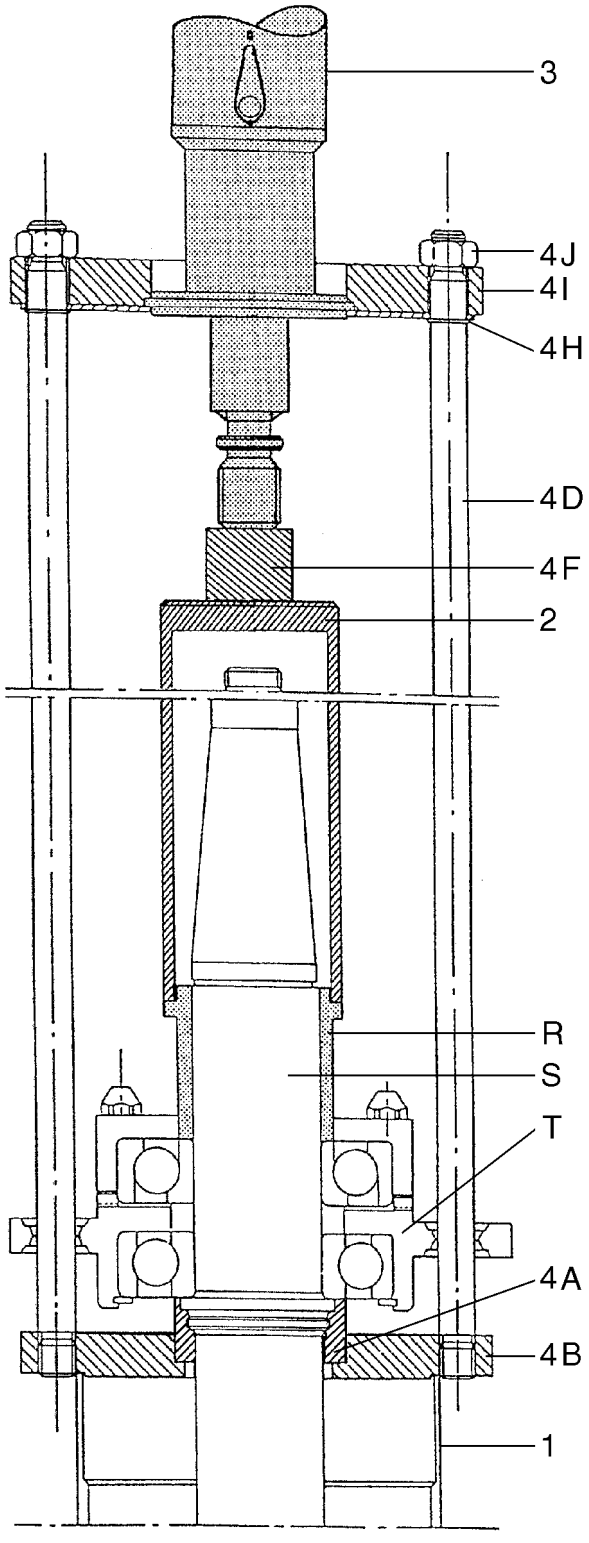


g0574121



g0675951

1. Tube
2. End tube
3. Compressing tool
4. Dismantling and assembly tool
4A. Ring
4B. Plate, lower
4D. Bar
4F. Intermediate part
4G. Snap ring (normally mounted on the bar)
4H. Washer
4I. Plate, upper
4J. Nut
R. Sleeve
S. Bowl spindle
T. Bearing support



g0675731

6. Assemble the top bearing support on the spindle in the following way:

   a. Arrange the tube (1) on a firm support.

   b. Fit the bottom plate (4B) on the tube (1).

   c. Fit the ring (4A) with inside diameter Ø85 mm in the bottom plate (4B).

   d. Wipe off and oil the bearing seats of the spindle (S).

   e. Place the spindle (S) upside down in the bottom plate (4B).
   Note! The collar on the spindle (S) must be resting on the ring (4A).

   f. Fit the **heated** ball bearing housing (T) onto the spindle (S).

   g. Fit the sleeve (R), which must be in contact with the inner race of the ball bearing.

   h. Fit the end tube (2) on the sleeve (R).

   i. Screw the three bars (4D) into the bottom plate (4B).

   j. Check that the retaining rings (4G) have been fitted. Fit the washer (4H), compressing tool (3) and top plate (4I). Secure the assembly by tightening the three nuts (4J).

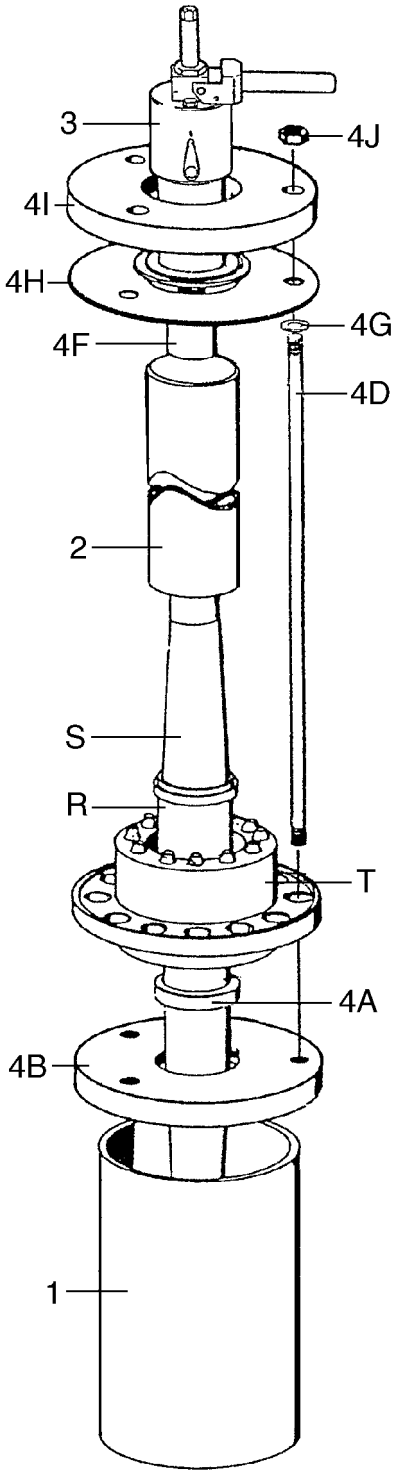
   k. Set the control lever of the compressing tool (3) in position 2 and pump until the piston reaches the bottom position.

   l. Set the control lever in position 1 and pump until the piston reaches its upper position.

   m. Place the spacer (4F) between the end tube (2) and the piston of the compressing tool (3).

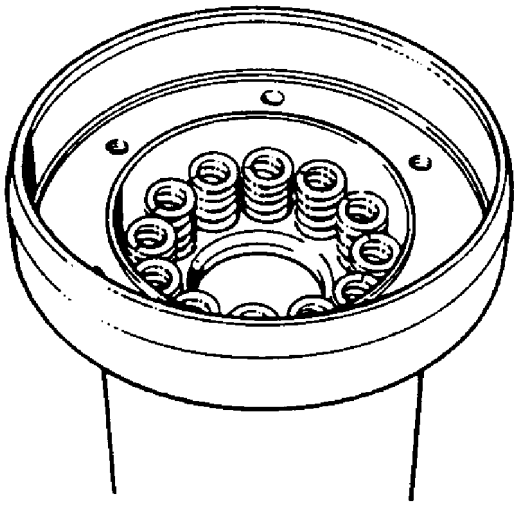
   n. Set the control lever in position 2 again and continue compressing until the inner race of the ball bearing is in contact with the collar on the spindle (S).

   o. Remove the tool and continue with the assembly of the other parts for the vertical driving device.



g0675811

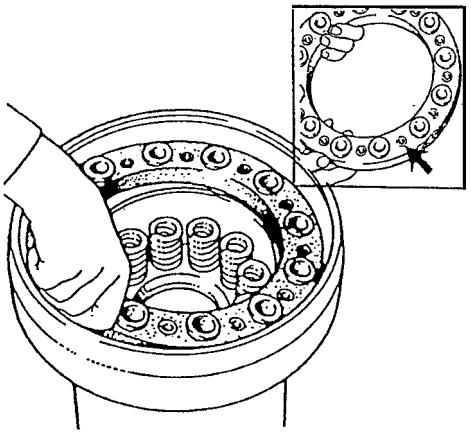
7. Remove the spindle from the tube and instead fit the top bearing support in the tube.



g0573311

8. Fit the top bearing support in the tube and put the springs in place.

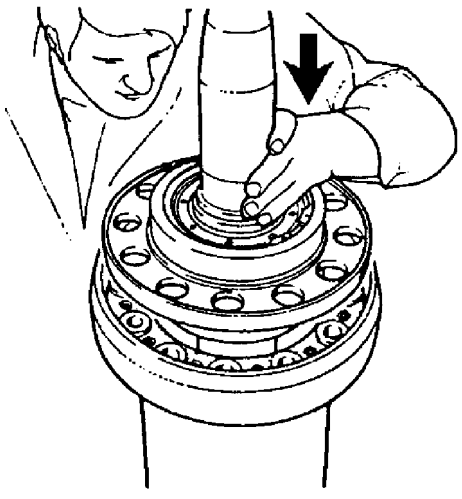
9. Fit the rubber buffer **with** springs.



g0676021

10. Place the bowl spindle in upright position in the bearing support.

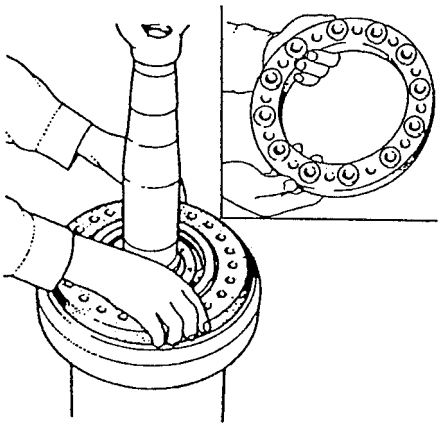
    Ascertain that the guide pins enter the springs when lowering.



g0573131

11. Pour a few drops of oil in the ball bearings (of the same type as used in the worm gear housing).

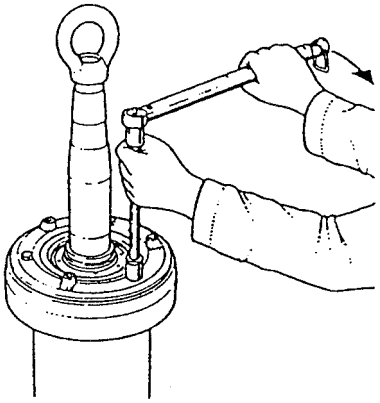
12. Fit the rubber buffer **without** springs.



g0676111

13. Fit the cover and tighten its screws alternately, a little at a time.

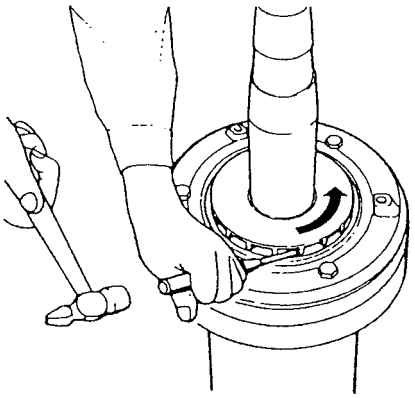
    Final tightening torque: **60 Nm**



g0676211

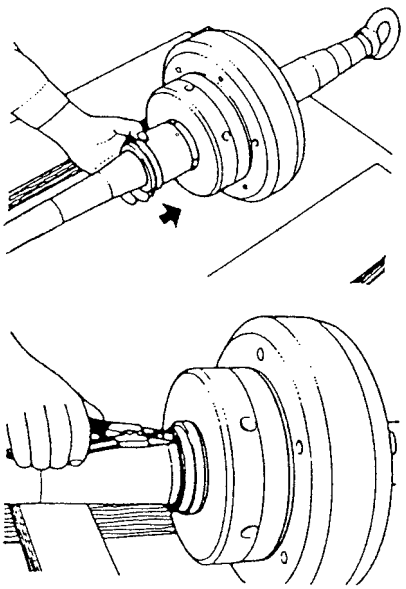
14. Fit the oil fan. Hit with light blows on the wings.

    Left-hand thread!



g0676311

15. Lay down the spindle, fit the sleeve and lock it with the snap ring.

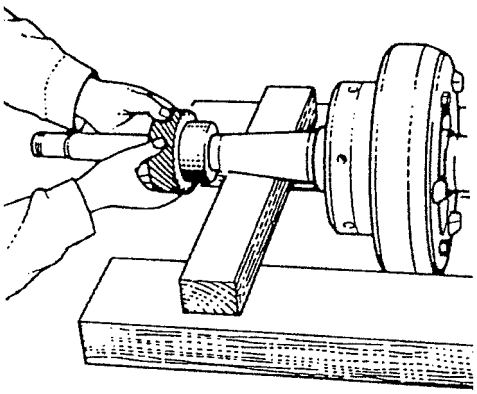


g0676411

16. Make sure that the conical surfaces inside the worm and on the spindle are clean and free from oil before fitting the worm.

NOTE

The worm should not be heated before assembly.

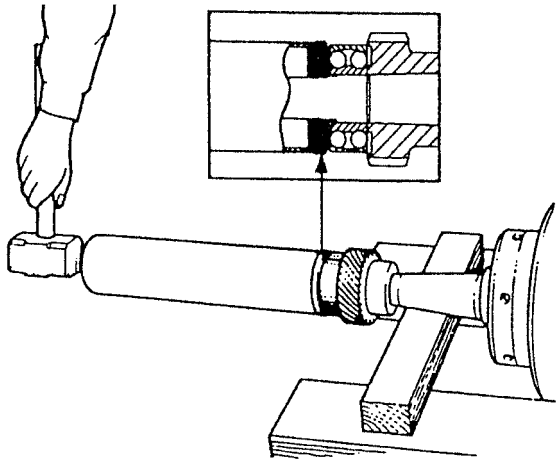


g0676511

17. Wipe off and grease the bearing seat before fitting the ball bearing.

18. Fit the heated bearing.

    When it has **cooled**, fit the ring and the driving-on tool as shown in the illustration. Hit a few times to ascertain that the bearing is in correct position.



g0676731

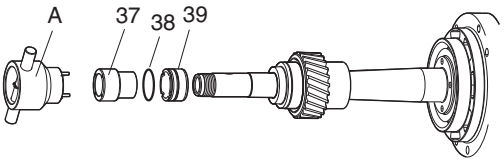
19. Fit the heated protecting collar. Proceed in the same way as for the bearing above.



20. **For single sealing inlet**

    Fit the throttle ring (38), O-ring (38) and rotor support (37) using the spanner (A).

    Secure the rotor support (37) with a few drops of Loctite 222 on the threads.



g01899a1

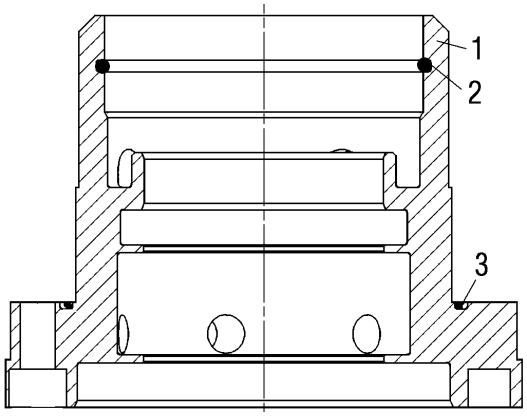
NOTE

Make sure the draining holes in the throttle ring (39) face away from the spindle worm wheel.

21. Wipe off the contact surfaces for frame and spindle assembly.

22. **For single sealing inlet**

    Fit the O-rings (2,3) to the bottom bearing housing (1).



g08358d1

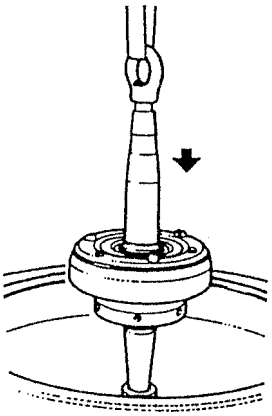
1. Bottom bearing housing
2. O-ring
3. O-ring

23. Mount the bottom bearing housing to the frame.

24. Lower the spindle with great care to avoid damaging the worm teeth.

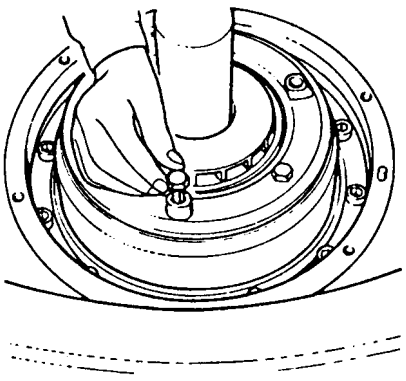
    Guide the spindle into the bottom bearing housing. Also guide the spindle so the screw holes in the bearing housing are in line with the holes in the frame, see next suboperation.

    If the spindle assembly does not quite bottom in its seat, knock lightly on the spindle top with a tin hammer.



g0676811

25. Make sure that the top bearing assembly is in correct angular position by means of one of the screws that fastens the assembly. Then lower the spindle to the bottom. Assembly and tighten the three screws to secure spindle to frame. Final tightening torque: **40 Nm**



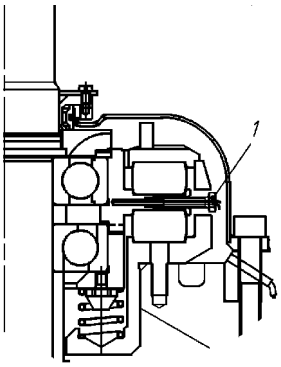
g0574811

NOTE

Mount spindle with the shortest distance for sensors cables

26. Only for non ATEX protected machines:

    Fit the temperature sensor, see page 103 for further information. For technical data see chapter *Monitoring kit* in the *Installation Manual*.



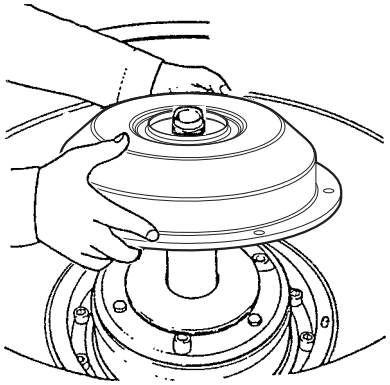
g09377n1

1. Temperature sensor

27. Fit the gasket and the guard into position.

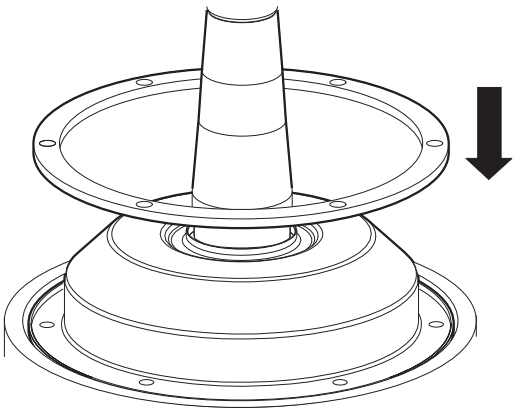
NOTE

Be sure not to jam sensors cables.



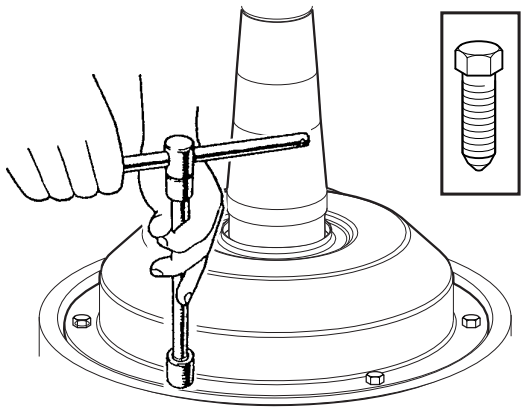
g0674231

28. Fit the fixing ring



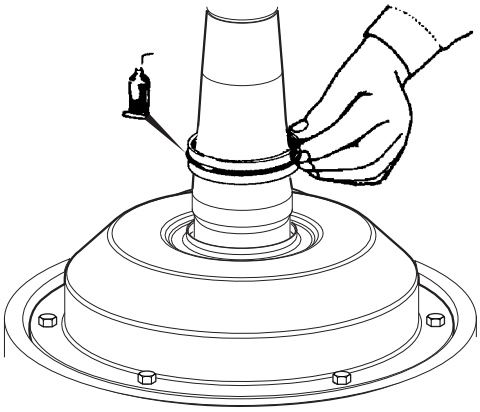
g0575361

29. Tighten the screws alternately, a little at a time.



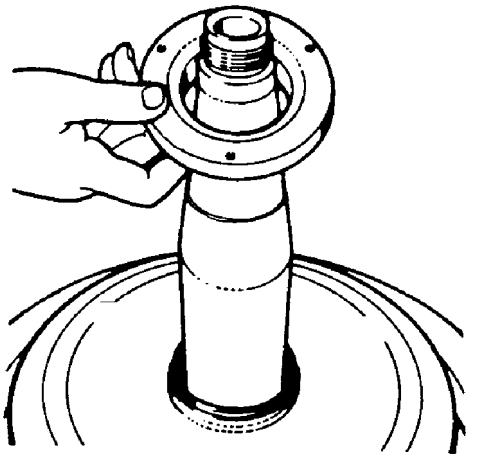
g0674121

30. Fit the seal (seal ring and O-ring).



g0575341

31. Fit the protecting collar and push it firmly down against the oil fan.

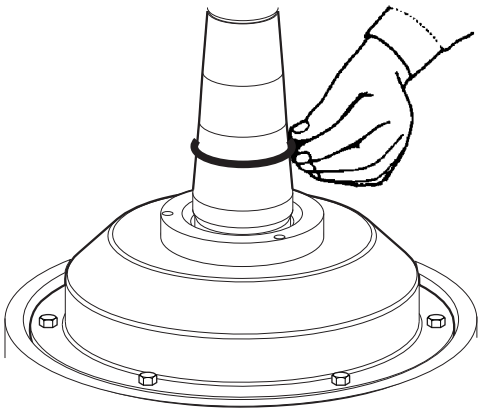


g0575221

NOTE

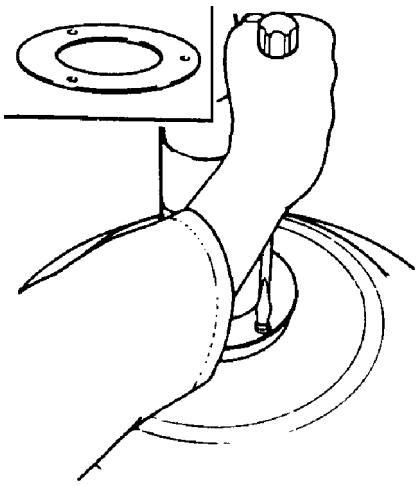
Check that the protecting collar is in the bottom position (resting against the oil fan) before tightening the protecting plate.

32. Fit the O-ring **dry** (do not grease).



g0575331

33. Fit the protecting plate with the screws.



g0575441

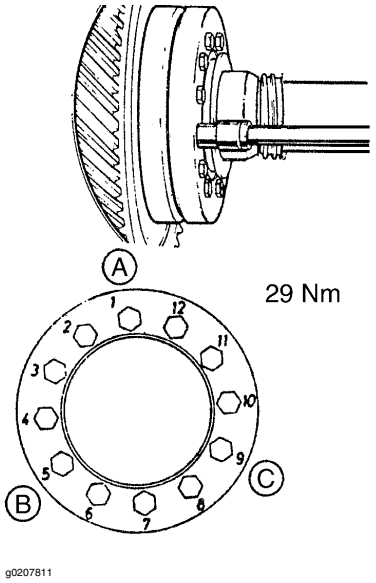
34. Clean and oil the worm wheel shaft, the nave of the clamping element and the nave and outer surface of the worm wheel. The oil must be of the same quality as used in the worm gear housing.

35. Push the worm wheel on the horizontal shaft into position for driving the bowl spindle and then slip the clamping element onto the worm wheel.

36. Fix the worm wheel by first tightening the three clamping element screws A, B and C (see illustration), but only such that the clamping element just sticks on the worm wheel.

37. Then tighten all the screws uniformly and successively around the clamping ring in the order indicated in the illustration (1-12). Do not tighten crosswise.

    Tightening torque: **29 Nm**
    The tightening must be repeated several turns around the clamping element until the screws are fully tightened.



NOTE

Check continuously that the ring of the clamping element fits evenly.

38. Check the radial wobble of the bowl spindle.

NOTE

Spindle wobble will cause rough bowl running. This leads to vibration and reduces lifetime of ball bearings.

Example:

a. Set up a dial indicator on a magnetic stand. Use the key for the large lock ring (if not in stainless steel) as a support for the stand, see the illustration.

b. Check for smooth run. No scraping or other jarring sounds must be heard.

c. Measure the wobble at the top of the tapered end of the spindle. Permissible radial wobble is **maximum 0,05 mm**.

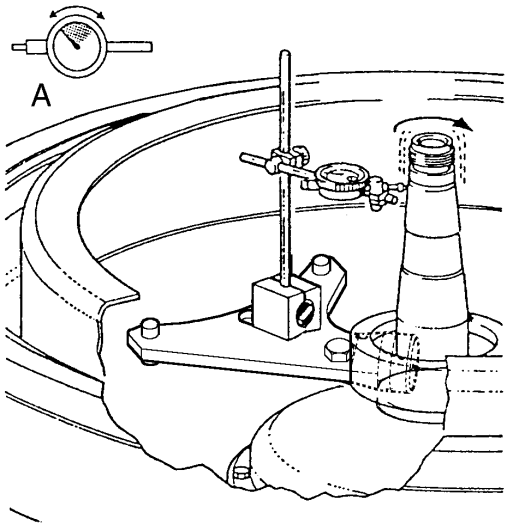
   Because this is a hollow spindle, the wobble should also be checked at the cylindrical part right at the bottom of the spindle above the thread.

   Permissible radial wobble is **maximum 0,05 mm**.

   If any of the wobbles is too large, renew all the ball bearings on the spindle.

   Excessive wobble can cause abnormal wear of the axial seal and result in leakage.

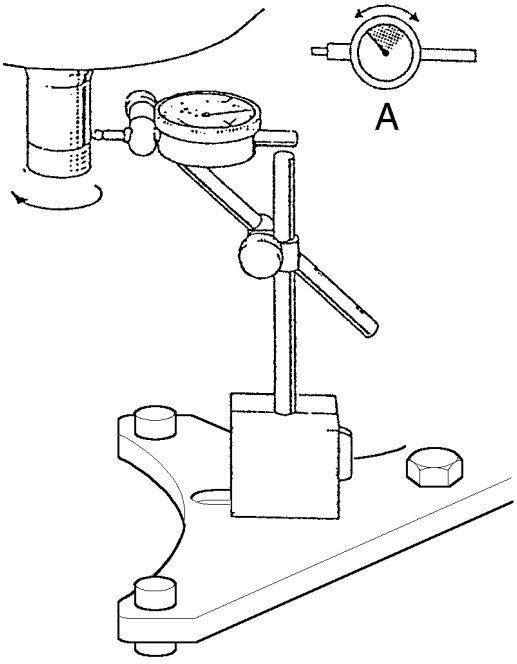
d. Measure the wobble again after assembly. If it is still excessive, the spindle is probably damaged and must be renewed.



g0681451

Measurement of the radial wobble

A. Max. permissible radial wobble = 0,05 mm

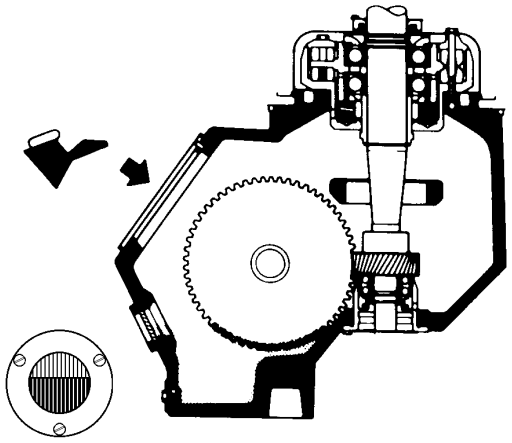


g0683341

Measurement of the radial wobble in bottom end of the bowl spindle.

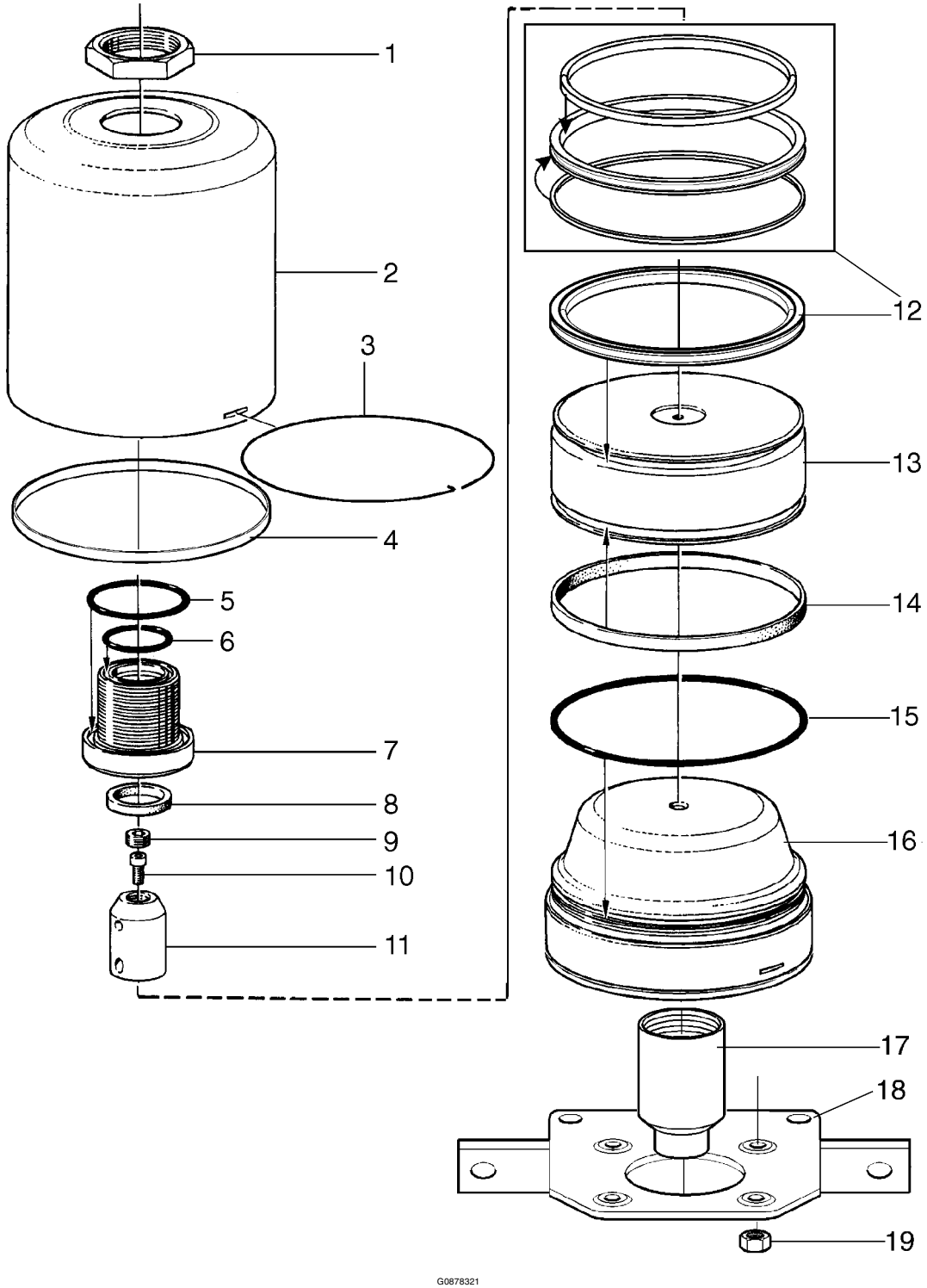
A.. Max. permissible radial wobble = 0,05 mm

39. Fit the oil drain plug and pour oil into worm gear housing. The oil level should be slightly above middle of the sight glass.
Oil volume: Approx. **12 litres**
Suitable oil brands can be found in 3.5.4 Recommended oil brands on page 44.



g0826911

4.8 Operating water module (OWMC)



1. *Nut*
2. *Cylinder*
3. *Locking wire, upper*
4. *Garter strap*
5. *O-ring*
6. *O-ring*
7. *Outlet*
8. *Turcon variseal “M”*
9. *Nozzle*
10. *Screw*
11. *Two-pulse adapter*
12. *Turcon AQ-seal (3 pieces)*
13. *Piston*
14. *Turcite slide ring*
15. *O-ring*
16. *Air tank*
17. *End protection*
18. *Bracket*
19. *Nut*

4.8.1 Dismantling (MS service)

The figures within brackets refer to the exploded view 4.8 Operating water module (OWMC) on page 194.

When dismantling, the OWMC Service kit is needed.

1. Shut off the air and operating water supply to the OWMC.

WARNING

Crush hazard

Never dismantle the OWMC when pressurized.

2. Remove the connections for operating water.

NOTE

The Air tank (16) must only be dismantled by Alfa Laval personnel.

3. Turn the cylinder (2) anti-clockwise relative to the air tank (16). The upper locking wire is thereby forced out.

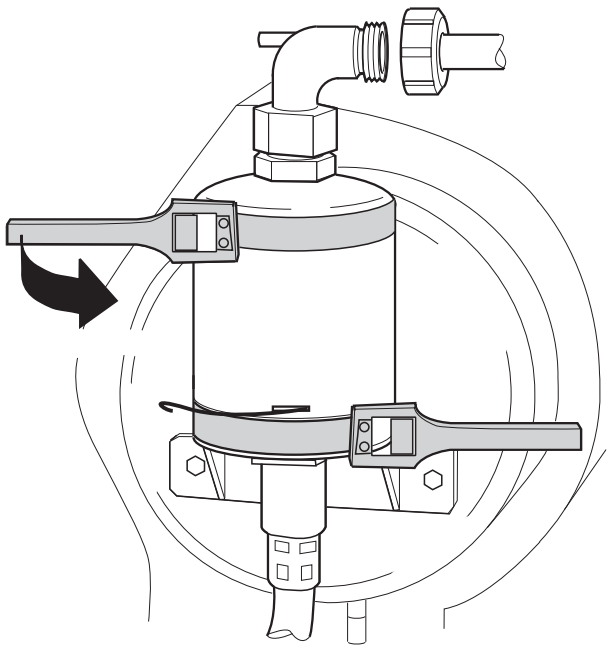
   Use two belt wrenches when turning the cylinder, see the illustration. The lower tool prevents the air tank from rotating.

NOTE

Be careful to keep the cylinder straight against the air tank.

NOTE

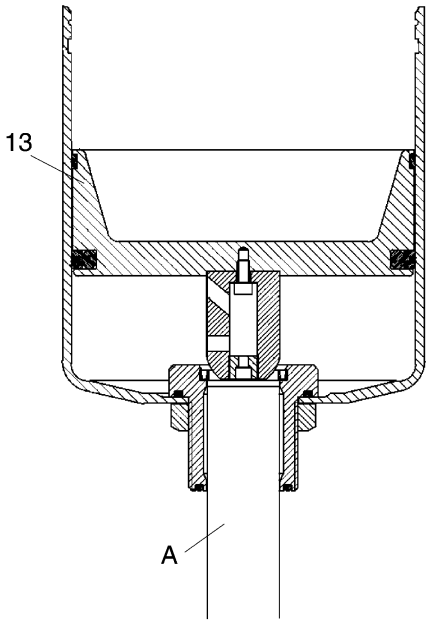
In order not to damage the water tank, make sure to place the upper wrench at the top of the water tank, as illustrated.



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4. Pull off the cylinder (2)

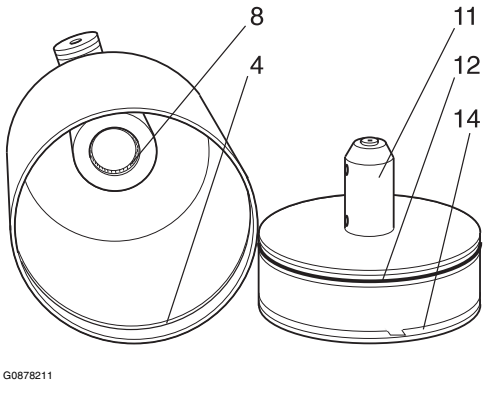
5. Carefully press the piston (13) out of the cylinder using a soft rod (A) or similar.



4.8.2 Check points

Clean and check the condition of the dismantled parts.

- Check the cylinder (2), piston (13) and two-pulse adapter (11) for scratches and scuffing marks.
- Renew the garter strap (4) fitted inside the cylinder.
- Renew the piston seal rings (12 & 14) and the seal (8) which are included in the service kit for the module.
- Renew all other parts included in the service kit.



4.8.3 OWMC assembly (MS service)

1. Check that the piston and inside of the cylinder are well cleaned.
   Lubricate the inside of the cylinder with the grease included in the Service kit for OWMC.

2. Assemble the OWMC unit opposite the dismantling.

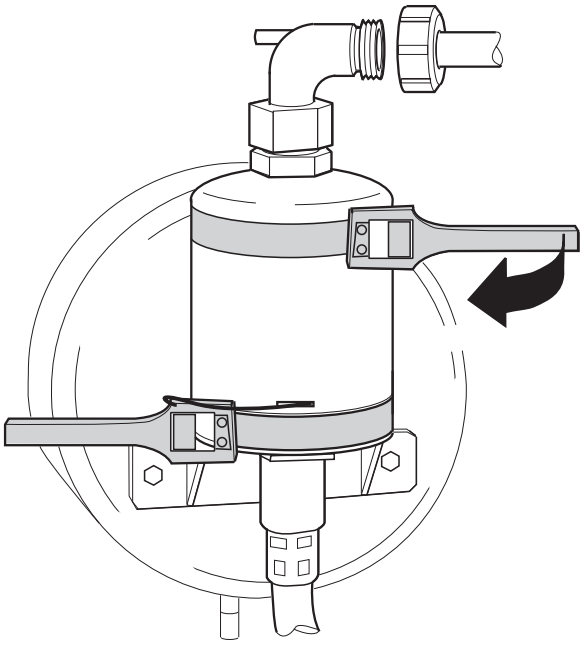
NOTE

Make sure that the hole in the groove (for the locking wire end) on the air tank can be seen through the slot on the cylinder.

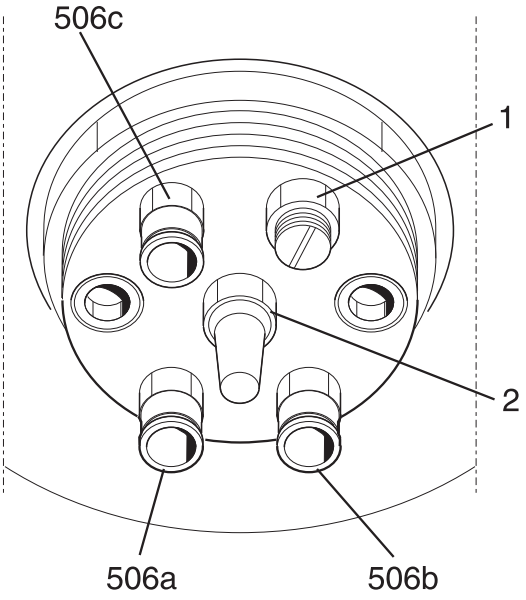
3. Lubricate the locking wire with the grease included in the Service kit for OWMC.

4. Place the locking wire end in the hole in the air tank. Secure the cylinder to the air tank with the locking wire by turning the cylinder clockwise relative to the air tank until the hook on the locking wire reaches the groove.

5. Fit water and air connections.



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1. Needle valve
2. Silencer
506a .Inlet for compressed air to air tank
506b .Inlet for activating a small discharge
506c .Inlet for activating a large discharge

6. Turn on the air and operating water supply.

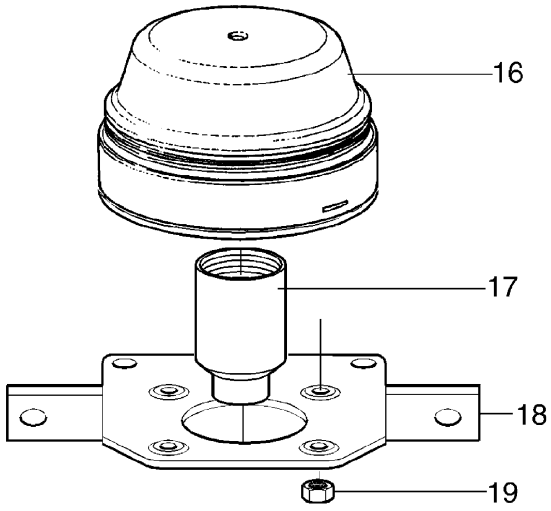
   Check that there are no leakages.

4.8.4 Air tank

If the air tank has to be dismantled (i.e. repair) it is removed by removing the nuts (19).

NOTE

If problems are related to the Air tank (16), always contact Tetra Pak representative.



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