ÚDRŽBA + OPRAVY

MR

MAINTENANCE REPAIR

SEPARATOR

B BRPX 714HGV-34C

Alfa Laval

Self-cleaning Hermetic Separator

B BRPX 714HGV-34C

Book No.:	MR	SO 12672E	3/9501

Alfa Laval Separation AB - S-147 80 TUMBA - SWEDEN

CONTENTS

FOREWORD

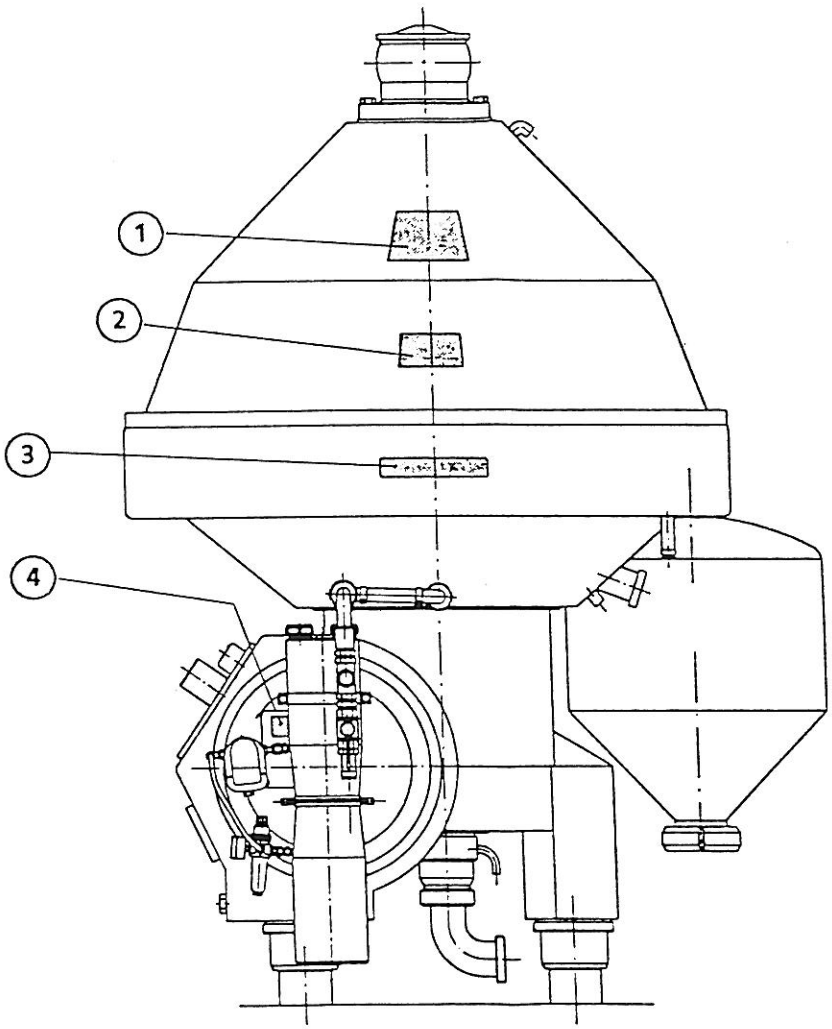
This manual is intended primarily for the Maintenance Personnel. It deals with the preventive maintenance as well as the disassembly and assembly of the machine.

The purpose of the manual is to enable the reader to overhaul the machine and make necessary repairs, with the exception of jobs requiring machining, heat treatment or balancing.

Knowledge of the safety precautions is important.

The manufacturing company reserves the right to make changes in design or add any improvements on its products without any obligations to provide notice thereof or to install same on units previously delivered by it.

Alfa Laval Separation AB
Instruction Manuals



1 Safety sticker

2 Any local safety regulation are stated here on one or more stickers

3 Name plate

4 Type plate

SAFETY PRECAUTIONS
FOR HIGH SPEED SEPARATORS

The bowl of a centrifugal separator rotates at a very high speed and great forces are generated.

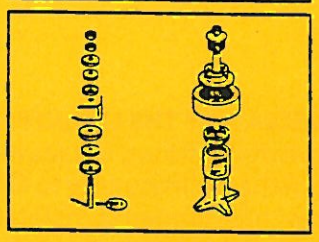
To ensure the safety of personnel and equipment:

- Always carefully follow the safety instructions and precautions.
- Always carefully follow the instructions in the instruction manuals concerning installation, assembly of the components, operation and regular maintenance.
- Always use genuine Alfa Laval spare parts and tools.
- Ensure that all operators who run and service a separator are well trained and knowledgeable about the machine and its mode of operation.

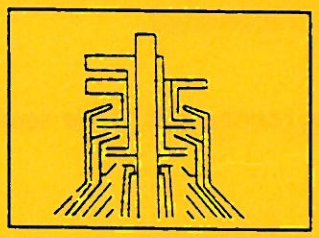
NONCOMPLIANCE MAY CAUSE A SERIOUS ACCIDENT

BEFORE INITIAL START OF NEW / OVERHAULED MACHINES

- Never transport or lift a separator with its bowl installed. This may cause bearing and bowl spindle damage.

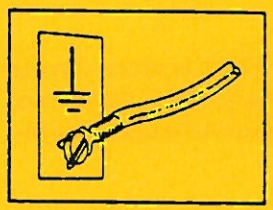


- Make sure that the gear housing has been filled with the correct quantity of specified oil.
- Check that installation and tightness of rubber vibration dampers between frame and foundation is according to instructions.

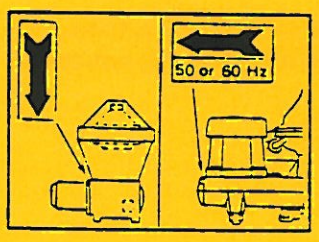


- It is important that the inlet and outlet devices have correct height adjustment and are securely tightened before the machine is operated. See instruction manual for detailed instructions.

- Be sure to check that the frequency and voltage of the current to be connected agrees with machine specifications, see figure on the arrow sign on the frame.

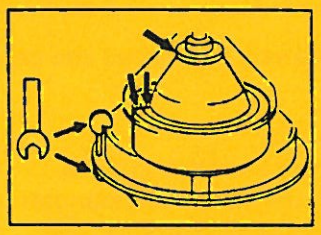


- Make sure that the separator frame, control boxes and cabinets are connected to earth (ground) in accordance with local regulations.
- Note that a separator must never be started without its bowl. This may damage its bearings.



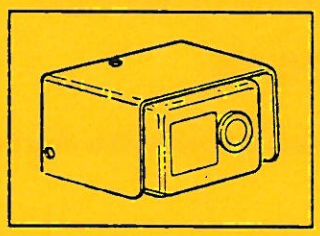
- Be sure that the motor rotates in the same direction as the arrow on the separator frame. The lock ring(s) of the bowl may unscrew if it rotates in the wrong direction. Check the operating rpm with an empty bowl against the value specified in the instruction book. Self-cleaning separators are to be checked before the operating water is introduced (open bowl).

OPERATION



- **NEVER** start the machine before the lock rings of the bowl, inlet and outlet devices, frame hood, clamps, pipe couplings and other fastenings have been securely tightened. Note that the assembly mark Ø on the main lock ring must be aligned or pass the Ø-mark on bowl body or bowl hood when lock ring is fully tightened. In this position there must be proper compression of disc stack.

- The brake should always be released before start.



- If machine is equipped with vibration alarm unit check the setting and adjust it if necessary to individual process conditions.

- If unusual vibration occurs **INCREASE IMMEDIATELY THE LIQUID FEED, PRODUCT OR WATER TO A MAXIMUM.** Switch off motor, but leave the program controls on. If possible, turn the discharge frequency to OFF position and apply the brake. After the bowl has stopped completely, dismantle, clean and check all parts carefully. Do not operate until the cause of the vibration has been located and eliminated.

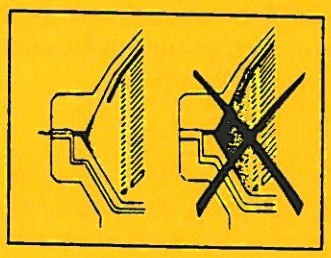
- Check that there is no leakage from piping connections on the separator and to/from the separator.

- **NEVER** loosen any parts of the machine until the bowl has come to a **COMPLETE STANDSTILL**

- **NEVER** use the machine for separating liquid which is more corrosive or has higher density, higher temperature, different characteristics of the solids, etc. than originally specified. Consult your Alfa Laval representative.

- Follow local safety regulations concerning inflammable, toxic, or corrosive process media. Affix information and warning notices in prominent places.

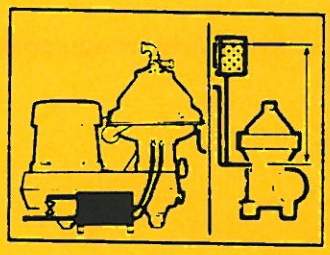
TO BE OBSERVED FOR SAFE OPERATION OF SOLIDS-EJECTING SEPARATORS OF PX-TYPE



- The bowl has to discharge solids at intervals which depend on feed rate, feed solids content of the entering product and characteristics of the solids. To avoid excessive vibration and risk of damage the solids must be discharged before the solids space is overfilled or hard packed.

  Always consult your Alfa Laval representative, if possible before increasing feed rate or solids content of feed.

- **NEVER** program a machine with a variable discharge program for total discharge before consulting your Alfa Laval representative.



- The function of the bowl´s discharge mechanism is vital for safe operation of the separator. It is therefore absolutely necessary to have an uninterrupted flow of clean, soft (dehardened) water / liquid at a prescribed **constant** pressure . Ensure that the **entering pressure cannot fall** below the minimum level required and does not exceed the maximum level allowed.

- At manual operation always stop the machine with a liquid filled bowl and run it down filled until the bowl opens by itself. If your separator has been equipped with an automatic safety liquid system to ensure that the bowl is filled at feed power failure, run-down or heavy unbalance – make sure that the liquid supply is always available whenever the machine is operated. This is very important to avoid heavy vibrations / damages.

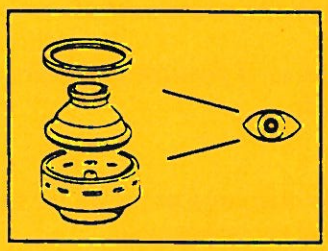
MAINTENANCE

- Switch off and if possible, lock out the power to the machine and allow it to stop completely before starting any dismantling work. Hang up a warning sign against turning on power.

- A separator bowl is balanced as a complete unit. Do not interchange the components of a bowl with those of any other bowl. Make sure that no parts are left out during assembly. All major parts are marked with the full serial number or the last three digits for identification purposes.

- **NEVER** heat rotating bowl parts, such as bowl body, bowl hood, lock rings, etc. with a naked flame or attempt repairs by welding.This could destroy the mechanical and structural strength of the material.

- **NEVER** operate the machine when the Ø assembly mark on the large lock ring can pass the corresponding mark on bowl body / bowl hood too far. Acceptable lock ring thread wear: See "Separator bowl - Check points - threads of large lock ring and bowl body" in the Maintenance Repair book or Instruction book.
  Consult your Alfa Laval representative.



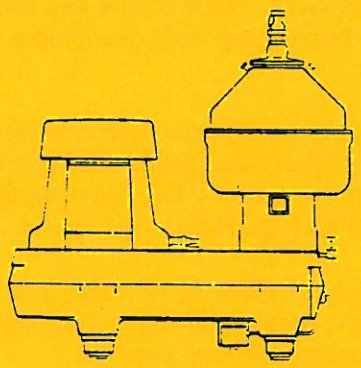
- The disc stack gradually settles and loses compression force. At each maintenance occasion check whether more discs are to be added in order to assure correct compression. **NEVER** remove a disc without replacing it with a new one. When reassembling, be sure to assemble slotted discs in the same order that they previously had.

- At each service occasion, yet at least every third month the most important parts should be checked for damage. Special attention should be given to bowl pillars at sediment discharge ports, threads of bowl body / main lock ring as well a the frame and the upper frame parts which are permanently hit by ejected solids and / or operating water. If process liquids are corrosive or erosive the frequency must be increased.

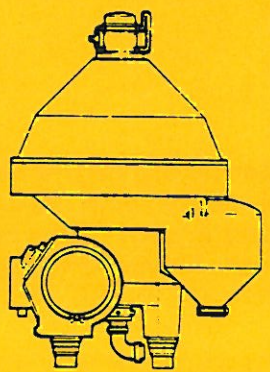
- Make sure that the brake is in good condition on machines equipped with a brake.

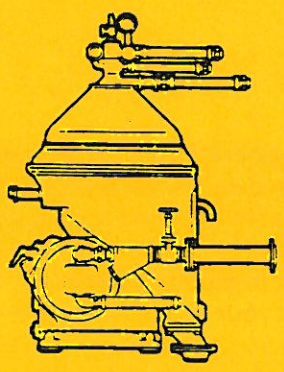
IF YOU ARE UNCERTAIN OF ANY POINTS, CONTACT YOUR Alfa Laval REPRESENTATIVE

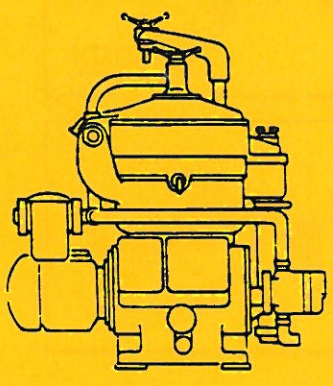
Alfa Laval Service



For reliability and safe operation we recommend that your separator is inspected at regular intervals by Alfa Laval service engineers. These inspections will also ensure that your separator is working efficiently and economically.







INSTRUKTIONSBOK MANUAL INSTRUKTIONSBUCH MANUEL MANUAL

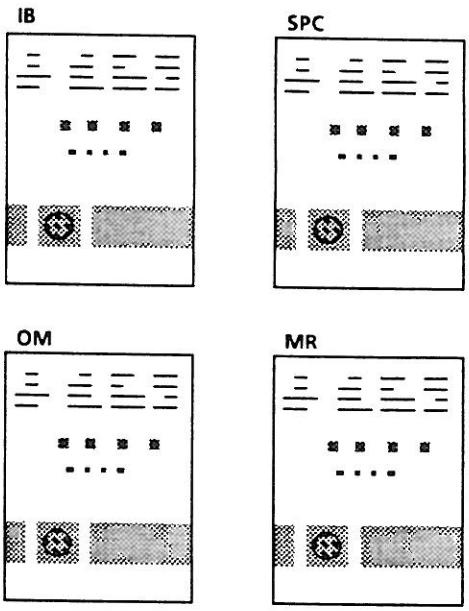
Vid beställning av instruktionsböcker ange **boknr**. Om Ni inte har det, ange separatortyp och tillverknings-, spec- eller produktnr.

When ordering manuals, please state **Book No**. If you dont´t know that, state separator type and Manufacturing, Specification or Product No.

Bei Bestellung von Instruktionsbücher **Buchnummer** anzugeben. Wenn Sie das nicht kennen, dann Separatortyp und Herstellungs-, Spezifikation oder Produktnummer anzugeben.

Lors de commande des manuels veuillez indiquer **Manuel No**. Si vous ne connaissez pas ce numéro, veuillez indiquer le type de séparateur ainisi que le numéro de fabrication, spécification ou de produit.

Al cursar pedidos de manuals sírvanse indicar **Manual No**. Si lo desconoce, indique el tipo de separadora así como el número de fabricación, especificación o producto.



Instruktionsbok	Innehåll	Avsedd för
IB Instruktionsbok	**OM** + **MR** (se nedan)	Se nedan
OM Driftsinstruktion **MR** Underhållsanvisning	Körning och daglig skötsel Översynsschema, demontering, montering, inställningsmått, reparation	Driftspersonal Servicepersonal
SPC Reservdelskatalog	Illustrerad reservdelsförteckning	Inköpare
Manual	**Contents**	**Intended for**
IB Instruction book	**OM** + **MR** (see below)	See below
OM Operator's Manual **MR** Maintenance Repair	Operation and daily maintenance Maintenance schedule, disassembly, assembly, adjusting measurements, repair	Machine operators. Service personnel
SPC Spare Parts Catalogue	Spare parts lists	Purchasing dept.
Instruktionsbuch	**Inhalt**	**Beabsichtigt für**
IB Gebrauchsanweisung	**OM** + **MR** (siehe unten)	Siehe unten
OM Betriebsanleitung **MR** Wartung Reparatur	Betrieb, tägliche Wartung Wartungsschema, Zerlegung, Zusammenbau, Einstellungsmasse, Instandsetzung	Bedienungspersonal. Wartungspersonal
SPC Ersatzteilkatalog	Ersatzteilverzeichnis	Einkäufer.
Manuel	**Contenu**	**Destiné aux**
IB Manuel d`instructions	**OM** + **MR** (voir ci-dessous)	Voir ci-dessous
OM Manuel de l´opérateur **MR** Entretien et réparation	Utilisation et entretien quotidien Planning de révision, démontage, assemblage, mesures de réglage, réparation	Utilisateurs des machines. Personnel d'entretien
SPC Catalogue de pièces de rechange	Listes de pièces de rechange	Service d'achats
Manual	**Contenido**	**Prevista para**
IB Libro de instrucciónes	**OM** + **MR** (véase abajo)	Véase abajo
OM Instrucciónes de funciónamiento **MR** Mantenimiento y reparación	Funciónamiento y mantenimiento diario Esquema de supervisión, desmontaje, montaje, dimensiónes de ajuste, reparación	Operarios de las máquinas Personal de servicio
SPC Catálogo de piezas de recambio	Lista de piezas de recambio ilustrada	Sección de compras

THE MAINTENANCE CONCEPT

A centrifugal separator is capable of generating great forces in all directions and is subject to the law of centrifugal force.

The separator, like any other machine is subject to wear. Corrosion, erosion and just ordinary wear due to normal operation, all take their toll.

To ensure safe and efficient operation over a long period, certain parts will by and by have to be replaced. Proper care and maintenance will prolong the life of the separator and ensure good performance.

If the parts of the machine are worn, eroded, or improperly assembled, the forces generated may cause machine breakdown and injury to personnel.

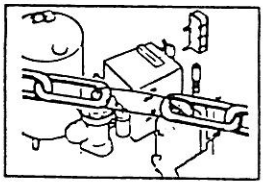
Forms of maintenance

Two forms of maintenance exist: PREVENTIVE MAINTENANCE and CORRECTIVE MAINTENANCE. Preventive maintenance can be defined and planned, corrective maintenance cannot. This instruction book takes primarily preventive maintenance into consideration, but it also covers the normal requirements for corrective maintenance.

Maintenance strategy

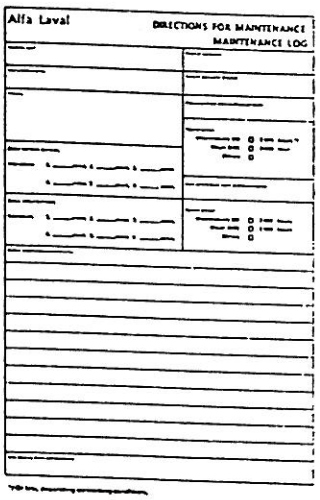
The customer decides what form of maintenance or combination of forms shall be put into practice, depending on local conditions. The following specification shows the different forms of maintenance in relation to the SYSTEM EFFECTIVENESS.

SYSTEM EFFECTIVENESS	PREVENTIVE MAINTENANCE Predictable	CORRECTIVE MAINTENANCE Uncertain
Economy	High availability/production. Maintenance costs according to budget.	Uncertain availability/production. Maintenance costs unknown.
Production availability	Service according to plan.	Unexpected production brake.
Reliability	Maintenance at known intervals.	Maintenance at unforeseeable intervals.
Maintainability	Easy to disassemble.	Disassembly made difficult by dirt and lack of lubrication.
Service preparedness	Personnel and spares available (either at customer or by service-agreement with Alfa-Laval).	Preparedness uncertain.
Performance	Known. Performance checked periodically.	Deterioration of performance identified too late.
Safety	Periodically checked safety by properly trained personnel.	Checking of safety must be carried out according to a separate programme for inspections to be found in the Directions for Maintenance.



Preventive maintenance reduces the risk of unexpected stoppages to a minimum. The different forms of maintenance are often used in combinations to give the best SYSTEM EFFECTIVENESS for the customer.

Directions for maintenance / maintenance log



With preventive maintenance the directions for maintenance state what is to be checked and replaced at recommended intervals.

The directions also state what is to be checked from a safety point of view.

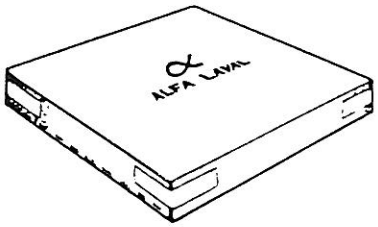
The directions serve as a check list for different sub-actions when used for corrective maintenance.

The directions for maintenance can be used as a maintenance log and a work sheet for performing the actions recommended by Alfa Laval.

IS Intermediate service.
Includes inlet, outlet, bowl and friction linings.

MS Major service
Includes the actions taken for intermediate service (IS) as well as the driving device.

Kits of spares



The kits of spares available for intermediate service (IS) and major service (MS) include the spares that are to replace the corresponding existing parts in the separator with preventive service (periodically).

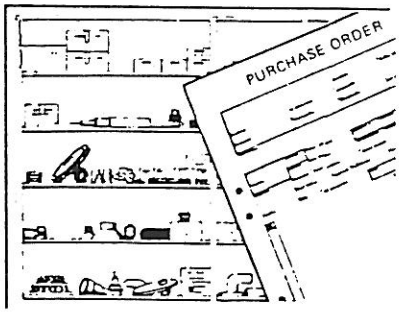
IS-set contains:
- Seals
- Friction linings

MS-set contains:
- Seals
- Ball bearings
- Locking elements

The kit of spares can also be used at corrective maintenance from a preparedness point of view. With preventive service the parts included in the kits are to replace corresponding existing parts in the separator to safeguard an operation free of problems till next overhaul.

Stock of spares at the customer

IS-kit shall always be available at the operation place.
MS-kit should always be available at the operation place.



If special difficulties exist, such as

- a long distance to the service unit
- commercial problems
- demands for a high production availability

both kits should be available.

Safety inspections

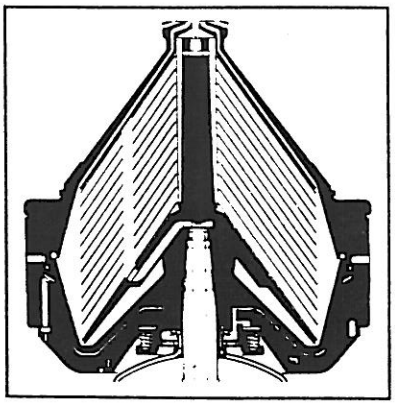
Preventive maintenance

The directions for maintenance prescribe the safety inspections which, with preventive maintenance, are periodically followed up by the user. In doing so he will discover any defects before safety is jeopardized.

Corrective maintenance

With corrective maintenance the safety inspections according to the directions for maintenance must be carried out specially from a separate program by the user.

MAJOR BOWL PARTS

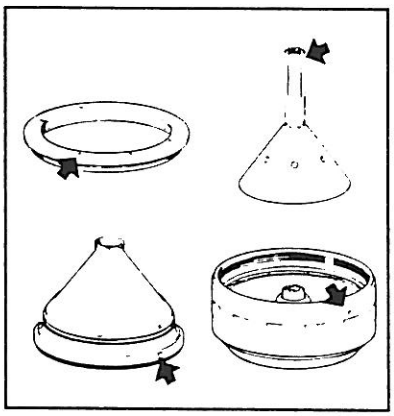


Balancing

Alfa Laval separator bowls are statically and dynamically factorybalanced only as ***complete*** bowl assemblies.

- Therefore, major bowl parts cannot be replaced without rebalancing the ***entire*** bowl.

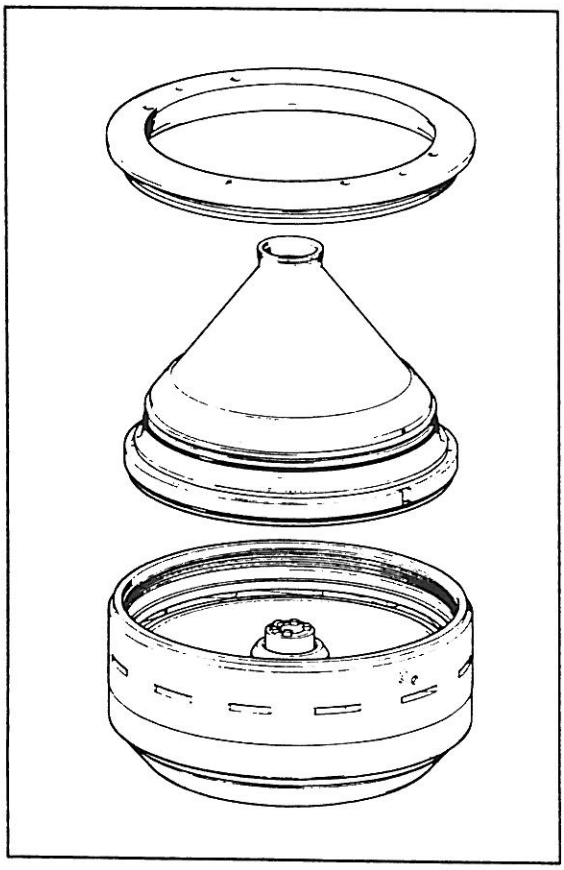
Bowl parts must never be interchanged from one machine to an other. This is just as imperative where machines of the same or a similar type are concerned. The bowl parts of each machine are stamped with the machine manufacturing number or the last three digits of that number.



Locating means

The bowl parts are assembled in a certain relative position to each other. Alignment marks, guide pins and lugs are provided on major parts and must be undamaged and legible.

- Never operate the machine when these locating means are not in the proper relative position, or are illegible.

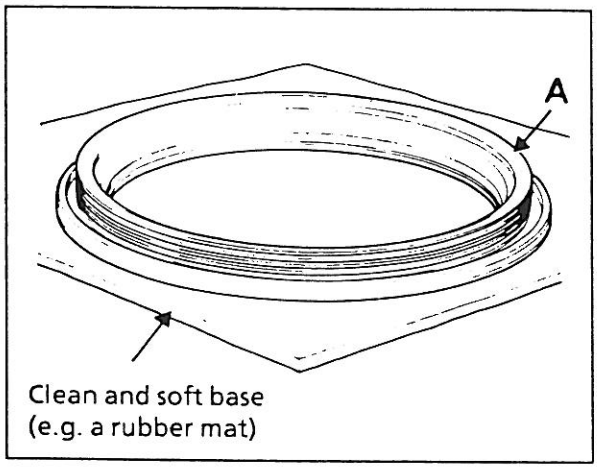


Handling

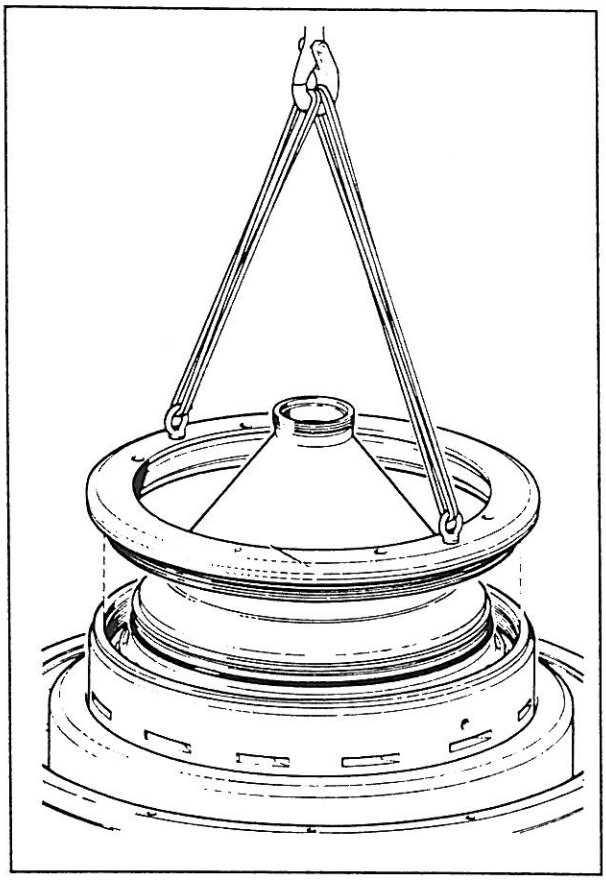
Great forces are generated when a separator bowl rotates. Its parts must, therefore, be high-precision- made to ensure perfect relative fit. The size of the bowl parts may easily give the impression that they need not be handled with the care that is, in fact, essential where precision-made articles are concerned. Any carelessness in this respect will very likely result in seizure damage.

Besides, the risk of seizure will increase when two or more parts in contact with each other are made of stainless steel and not properly lubricated.

(Major Bowl Parts)



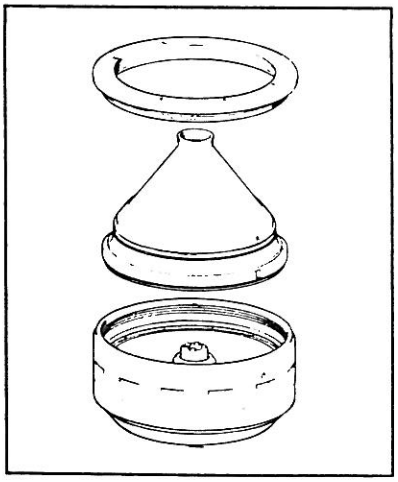
Handle all bowl parts very gently. Always put them on a ***clean*** and ***soft*** base. By way of example, the contact surface (A) of a lock ring provided with external thread should never rest on a dirty base. Scratches and dirt particles on contact and guiding surfaces as well as on threads must be avoided.



Use the lock ring lifting tools, if any. Even when the ring can be lifted by hand it may be difficult to put it gently on the bowl body. Denting may be the result if the ring thuds against the bowl body.

Align the hoisting device very exactly when assembling and disassembling. ***Never*** use a hoist that works jerkily. Use a lifting hook with catch.

CORROSION



- Corrosive attacks on bowl parts and particularly bowl body bowl hood and lock ring should be watched with the utmost care.

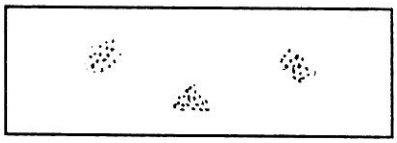
Parts of non-stainless steel and cast-iron

Corrosion (rusting) occurs as a rule on unprotected components of non-stainless steel and cast-iron forming part of the bowl, bowl spindle and frame and exposed to the process liquid or aggressive atmosphere.

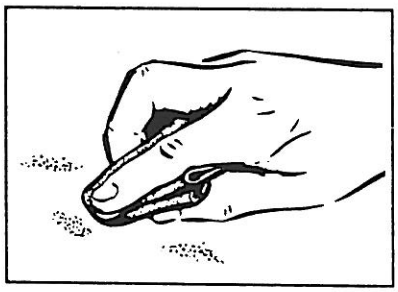
Replace the parts when corrosion is evidently jeopardizing their strength, relative location and play, or general function.

Parts of stainless steel etc.

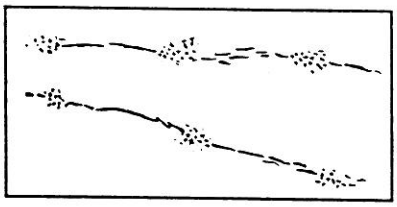
In certain circumstances corrosion can occur even on stainless bowl parts. The risk of attack will increase when the surface is isolated from the surroundings by a layer of solids.
Solids deposits must therefore be removed immediately after every shut-down.



Corrosion attacks on stainless steel are not easily detected. This applies for instance to attacks made by chlorides. Such attacks may begin merely as small dark spots.



- **Polish** such dark spots with a fine-grain abrasive cloth. In some cases this will prevent further attacks.



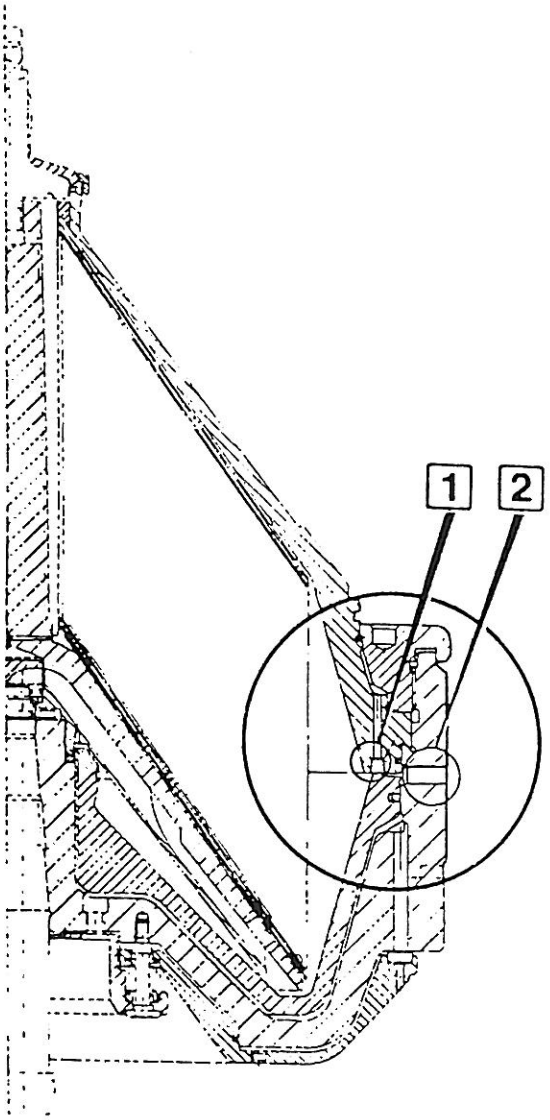
- Under special conditions corrosion on stainless steel can result in deeper attacks, so-called pits, to which special attention should be given.

  Pits lying closely together or forming a regular pattern such as a straight or curved line may indicate that cracking has begun beneath the surface of the material. Such pits should be examined by an expert on materials and checked by means of crack-indicating agents – consult our representative.

- Always watch carefully any corrosion attacks found on stainless steel. Record the observations.

- In unfavourable circumstances even components of copper alloy and light metal etc. may become susceptible to corrosion and should, therefore, be kept under observation.

EROSION



Erosion can occur for instance when particles suspended in the process liquid slide along a surface or strike against a surface while passing through the bowl.

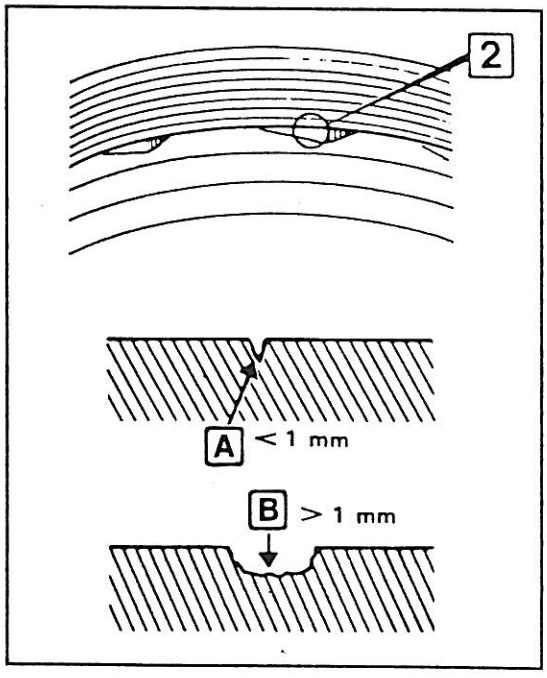
Erosion is characterized, in the former case by burnished traces in the material, and in the latter case by dents and pits with a granular and shiny surface.

Erosion is intensified in some places by locally high flow rates.

Always observe carefully any signs of erosion damage. It may deepen rapidly and weaken the bowl parts by reducing metal thickness.

Surfaces subjected to erosion are, by way of example,

1. the sealing edge of the sliding bowl bottom, and the seal ring in the bowl hood.
2. the bowl wall portions ("pillars") between the sludge ports in the bowl body.

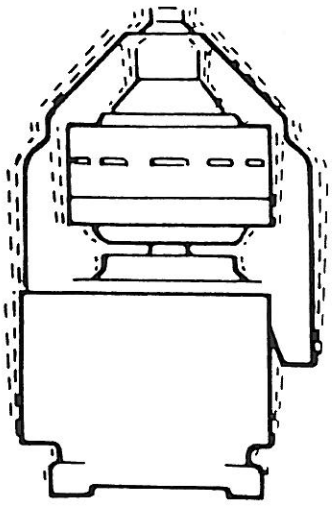


If one or more of the following observations are made on the said bowl wall portions (2), consult your Alfa-Laval representative:

- that the bottom radius of the erosion trace is less than 1 mm in the narrowest place, or that coarse scratches are present (A),
- that the largest depth of the trace exceeds 1 mm (B),
- that defects presumably caused by corrosion are present.

Valuable information on the nature of the damage can be given by photos, plaster impressions, and hammered-in lead.

VIBRATION



Abnormal vibration or noises are clues that something is wrong. **Stop the machine and look for the cause.**

If vibration analyzing equipment is available, use this equipment to periodically check and record the magnitude of vibration.

If no such equipment is available at the customer it is recommended to consult Alfa Laval for periodical checking and recording of the vibration.

Caution:

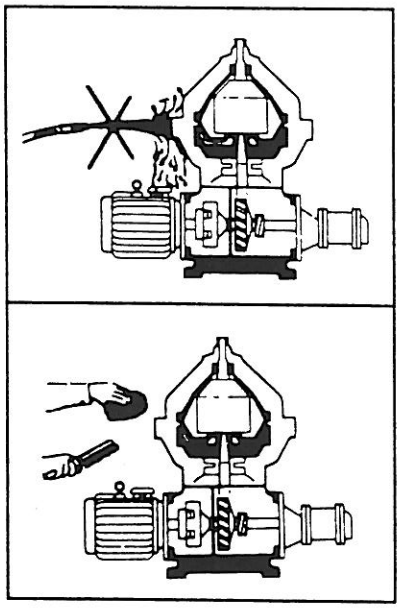
Vibration may occur, for shorter periods, during the starting cycle. This is normal and may pass without any danger.

If the vibration becomes heavy or if it continues at full speed, stop the separator immediately.

Cause of the vibration must be found and corrected before the separator is restarted.

CLEANING

- **When using chemical cleaning agents observe general rules and supplier's recommendations as to ventilation, personal protection etc.**

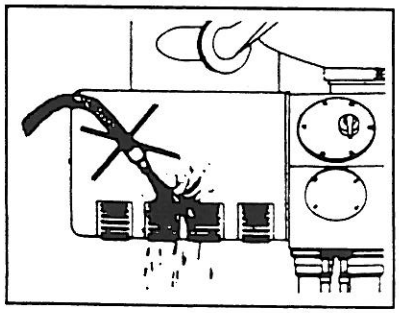


Frame/Motor

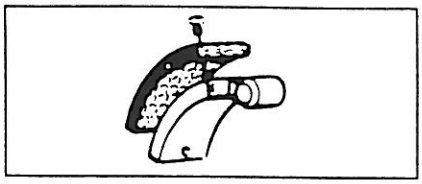
Never wash down a separator with a direct water stream. **Totally enclosed** motors can be damaged by direct hosing to the same extent as **open** motors and even more than those, because:

1. many operators believe that these motors are sealed, and normally they are not.
2. 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.
3. water directed on a hot motor may cause condensation, and subsequently produce grounding and internal corrosion.

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



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

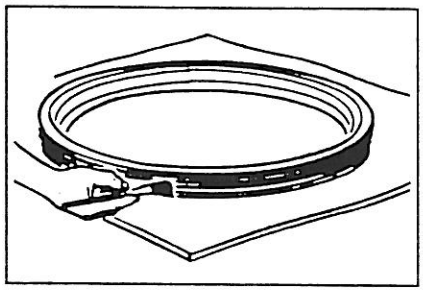


Coupling Pads (if any) and Brake Lining

To degrease pads or lining and the corresponding friction surfaces use a suitable degreasing agent.

Other Parts

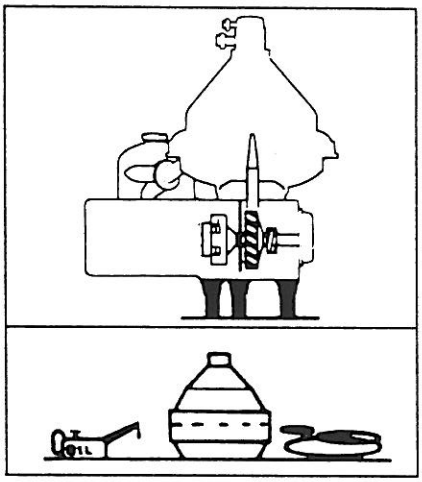
Use white spirit, cleaning kerosene or any other solvent with equivalent properties.



LUBRICATION

Wipe and oil all parts after cleaning. Protect the parts against dust and dirt when not to be mounted at once.

Follow strictly the lubrication instructions given for the bowl lock ring joint.



SHUT-DOWNS

If the machine is shut down for some time, the bowl should not be left on the spindle, and its O-rings should be removed.

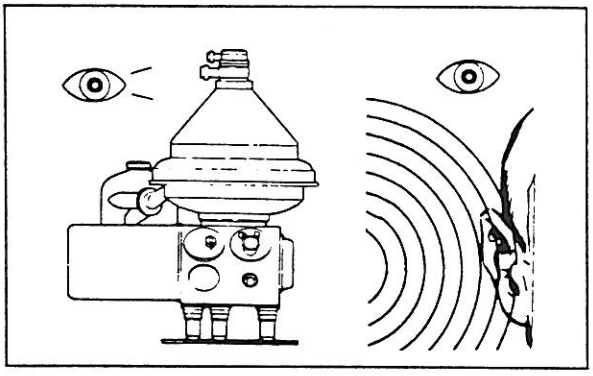
When the machine is to be set in operation again:

After some weeks

- Lubricate top bearing with some drops of oil
- Check electric insulation in motor. If necessary dry up the motor to obtain correct insulation value.
- Flush the pipings clean.

After some moths

- Fit and lubricate new O-rings in the bowl.
- Check the rubber discs between motor shaft and worm wheel shaft with respect to cracks. Replace if necessary.



BEFORE STARTING THE OVERHAUL

Try to form a conception of the machine action. The observations may be very useful when you have to decide whether a part should be replaced.

- Note visible leakage.
- Initiate some ejections and check the ejecting function.
- Note symptoms which you regard as differing from normal machine running.

The trouble tracing schedules included in Operator's Manual "OM" may be of some help.

However, the working experience gained from similar estimations will be the best aid.

TIGHTENING OF SCREWS

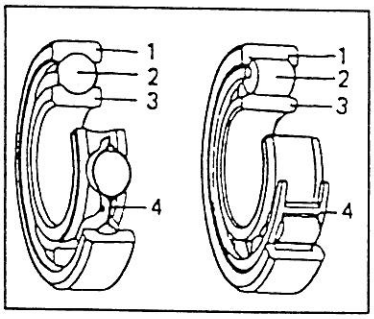
Tightening all screws with the correct torque is important.

These figures apply unless otherwise stated:

METRIC THREAD			
Thread	Quality Class A4 - 70 Torque		
	kpm	Nm	lb.ft
M6	0.75	7	5
M8	1.8	18	13
M10	3.6	35	26
M12	6.5	64	47
M16	16.0	157	116
M20	31.0	304	224
M24	51.0	500	369

The figures apply to oiled screws tightened with a torque key.

BALL AND ROLLER BEARINGS



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

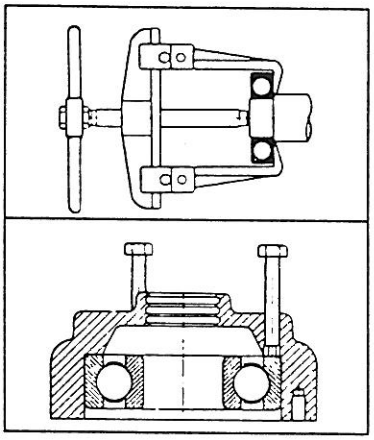
Use the greatest cleanliness when handling rolling bearings. Avoid unnecessary dismounting of bearings. ***Do not re-fit a used bearing. Always replace it with a new one.***

Important: Special design bearings for the bowl spindle

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

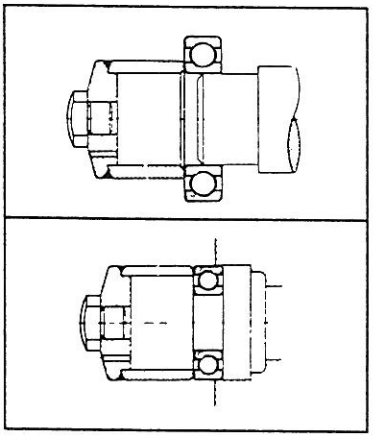
Do not use other bearings than those stated in the Spare Parts Catalogue.

A bearing that in appearance looks equivalent to the correct bearing may be considerably different from the latter in various respects: inside clearances, design and tolerances of the cage and ball (roller) races as well as material and heat treatment. ***Any deviation from the correct bearing may cause a serious breakdown.***



Dismounting

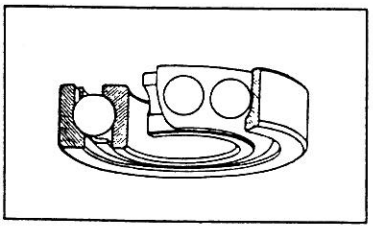
Detach the bearing from its seat by pressing against the race having the tightest fit. Use a puller or a special tool. Thus, apply the pressure to the inner race when the bearing sits tightly on the shaft, and to the outer race when the bearing is tightly fitted in the housing respectively.
Arrange dismounted bearings and other parts in assembling order to avoid confusion.
Check the shaft end and the bearing seat in the housing for damage indicating that the bearing has rotated on the shaft, and in the housing respectively. Replace the damaged part, if the faults cannot be remedied by polishing or in some other way.



Fitting

Leave new bearings in original wrapping until ready to fit. The anti-rust agent protecting a new bearing need not to be removed. Fit a bearing on a shaft by pressure applied to the inner race and in a housing by pressure applied to the outer race. Use a suitable piece of pipe or a metal drift and a hammer. Never strike the bearing directly.

Bearings sitting with tight fit on a shaft should be heated in oil before assembly. The oil temperature should not exeed 100 °C. Never leave the bearing in the oil bath longer than required for thorough heating.



Angular contact ball bearings

Always fit single-row angular contact ball bearings with the WIDE shoulder of the INNER race facing UPWARDS.

DIRECTIONS FOR MAINTENANCE / MAINTENANCE LOG

The following directions for maintenance specify what is to be checked and replaced at recommended intervals for **preventive maintenance**.

The directions serve as a check list for different sub-actions when used for **corrective maintenance**.

The directions also state what is to be checked from a safety point of view and are in this respect applicable to preventive as well as to corrective maintenance.

The directions for maintenance can be used as a maintenance log and a work sheet for performing the actions recommended by Alfa Laval.

Alfa Laval

DIRECTIONS FOR MAINTENANCE
MAINTENANCE LOG

Machine type:

Place of operation:

Manufacturing No:

Time of operation (hours):

Process:

Previous service done at (hours or date):

.....

Type of service:

Intermediate (**IS**) ☐ 2 000 hours */

Major (**MS**) ☐ 8 000 hour

Others ☐

Data before service:

Vibration: 1. .....mm/s. 2. .....mm/s. 3. .....mm/s.

4. .....mm/s. 5. .....mm/s. 6. .....mm/s.

Next service to be done at (hours or date):

.....

Data after service:

Vibration: 1. .....mm/s. 2. .....mm/s. 3. .....mm/s.

4. .....mm/s. 5. .....mm/s. 6. .....mm/s.

Type of service:

Intermediate (**IS**) ☐ 2 000 hours

Major (**MS**) ☐ 8 000 hours

Others ☐

Futher observations and remarks:

.....

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Jobs done by (date and signature):

*/ Or less, depending on working conditions.

INTERMEDIATE SERVICE

To be carried out by customer or **Alfa Laval**
The IS-kit spares are to be used

MAIN PARTS AND OPERATIONS	Remarks	Done
INLET / OUTLET		
Renew rubber rings / packings included in the IS-kit		
Check parts for wear / erosion / corrosion / damage. Rectify any surface damage		
Check height adjustments		
Check wobble and eccentricity (hermetic separators)		
SEPARATOR BOWL		
Renew rubber rings / packings included in the IS-kit		
Renew valve plugs for operating slide and bowl hood seal ring		
Clean and inspect all bowl parts for erosion / corrosion / damage. Rectify any surface damage		
Clean and inspect nave of bowl body		
Clean and treat lock ring threads. See "Lubrication"		
Check disc stack pressure		
Check bowl spindle taper for run-out. Rectify any surface damage		
PARING DISC DEVICE / OPERATING WATER		
Renew rubber rings / packings included in the IS-kit		
Clean channels		
Check water flow		
Check height adjustment		
FRAME		
Renew brake lining and friction clutch linings (if any)		
Renew oil in worm gear housing, if necessary. See "Lubrication"		
Renew oil drain plug packing		
Check play in speed transmitter (if any)		

MAJOR SERVICE *)

To be carried out by **Alfa Laval** or customer
The MS-kit spares are to be used

MAIN PARTS AND OPERATIONS	Remarks	Done
VERTICAL DRIVING DEVICE		
Renew rubber rings / packings included in the MS-kit		
Renew ball bearings included in the MS-kit		
Renew buffers (rubber buffers or buffers with springs)		
Check worm gear for abnormal wear		
Check bottom bearing housing for any signs of rotating outer ring		
HORIZONTAL DRIVING DEVICE		
Renew rubber rings / packings included in the MS-kit		
Renew ball bearings included in the MS-kit		
Renew elastic plates of coupling		
Check worm wheel shaft for wobbling and eccentricities		
Check bearing seats for any signs of damage		
FRAME		
Renew rubber dampers (at least every second year)		
Check foundation		
Check vibrations		
MOTOR		
Check vibrations		
Lubricate according to manufacturer´s recommendations		
Check insulation (meg. test). See check points, Motor		

RECONDITIONING SERVICE

To be carried out by **Alfa Laval**

OPERATIONS	Remarks	Done
Inspect and if necessary **renew** bowl spindle and worm wheel shaft		
Inspect and if necessary **renew** bottom bearing housing (bottom bushing)		
Inspect and if necessary **renew** worm gear		

*) includes "Intermediate service"

Separator

Type .....

Manufacturing No .....

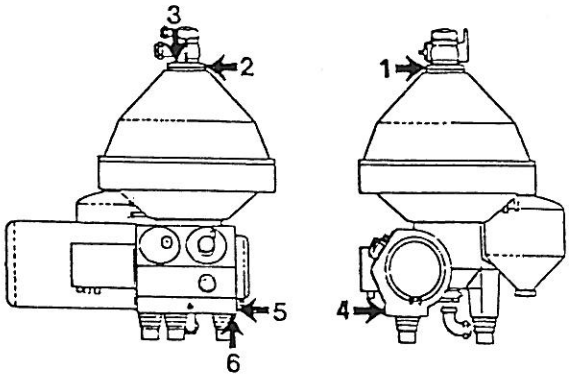
Vibration measurement procedure and instrumentation according to SS-ISO 2372 and SS-ISO 2954 standards

Instrument

Type .....

Manufacturing No.....

Transducer positions



Vibration velocity RMS, mm/s
(RMS stands for Root-Mean-Square Value)

Running conditions	*Transducer position*						Vibration severity: (max value from 1-6*)	Date: Signature:
	1	2	3	4	5	6		
1								
2								
3								
4								
5								
6								
7								

*Vibration limit: max 11.2 mm/s. If higher, contact Alfa Laval.

Separator

Type .....

Manufacturing No .....

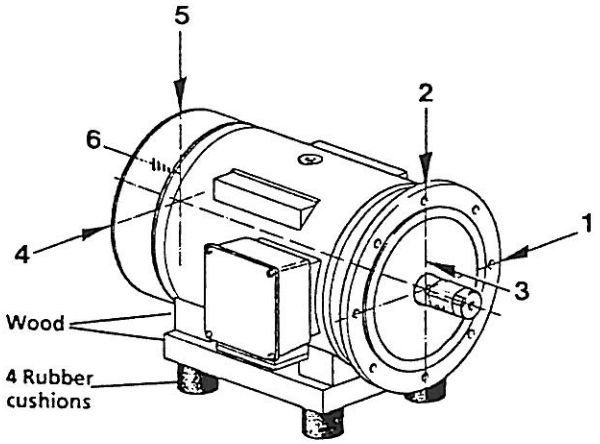
Vibration measurement procedure and instrumentation according to SS-ISO 2373,quality grade N and SS-ISO 2954 standards.

Instrument

Type .....

Manufacturing No.....

Transducer positions



The key of the motor shaft must be placed in its groove and be locked with a strong self-adhesive tape.

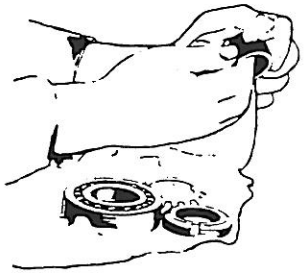
Vibration velocity RMS, mm/s
(RMS stands for Root-Mean-Square Value)

Running conditions	*Transducer position*						Vibration severity: (max value from 1-6*)	Date: Signature:
	1	2	3	4	5	6		
1								
2								
3								
4								
5								
6								
7								

*Vibration limit: max 2,8 mm/s. If higher, contact Alfa Laval.

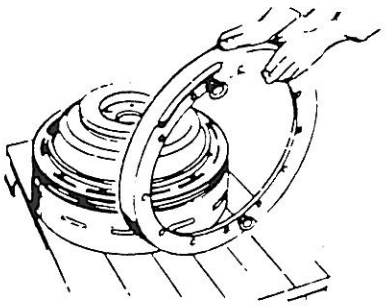
In the following chapters it is described how to disassemble and assemble the separator in the correct order by means of the proper tools. The symbol appears here and there in the text and illustrations. It refers to the heading CHECKPOINTS in the chapter in question (or in another chapter stated) where description of the checking method / recommendation is to be found.

In the Spare Parts Catalogue (SPC) the article number for each part is stated.

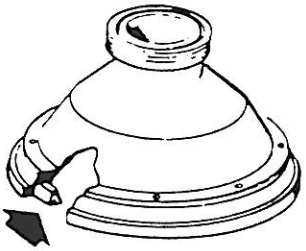


REMEMBER:

- Handle the parts with care. Protect them against damage, dust and dirt. Make sure that the parts are clean and free from burrs when mounting.



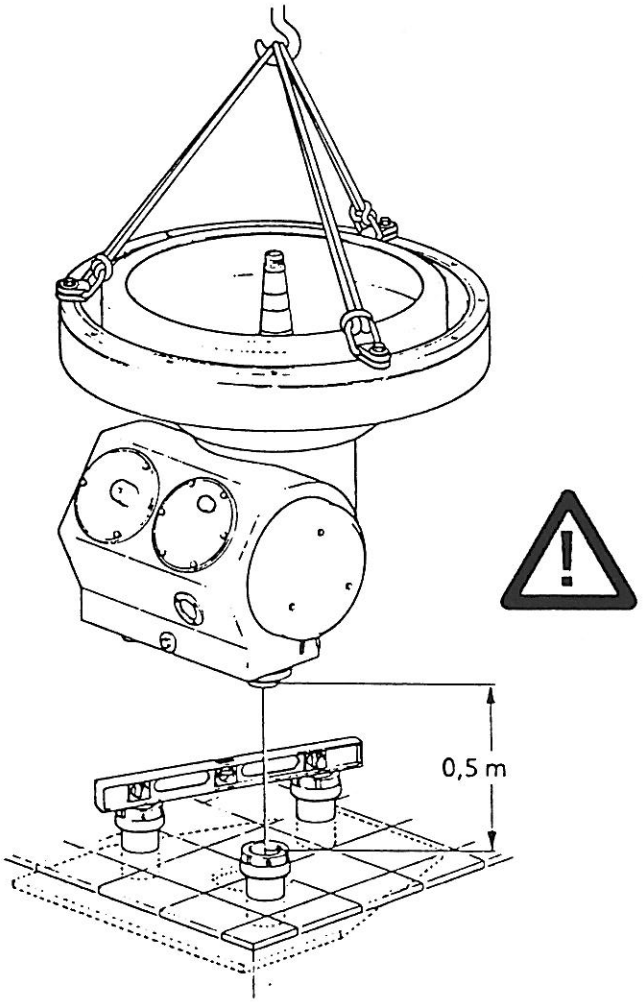
- Never place parts directly on the floor. Use a clean rubber mat, fibreboard or a suitable pallet as base.



- Be particularly careful of the bowl hood seal ring. It may easily get scratched if the hood is put down carelessly and on a dirty base.

- Position the hoisting device very exactly when assembling and disassembling. **Never** use a hoisting device that works jerkily. Use a lifting hook with catch.

  An electrically operated hoist should have two speeds: 1.5 metres / minute and 6 metres / minute, approx.
  The lower speed is used when lifting parts out of and into the machine.



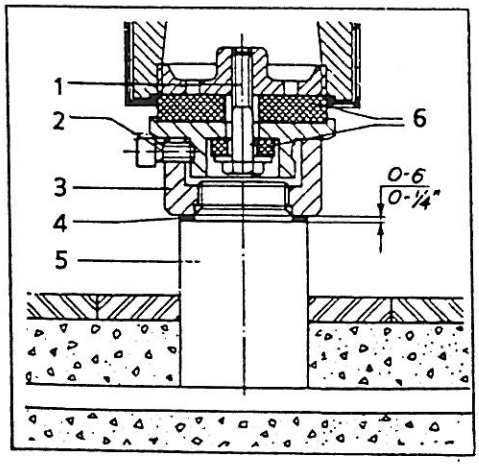
LIFTING THE SEPARATOR

Remove in order stated

- o Inlet / Outlet
- o Frame hood
- o Cyclone
- o Motor
- o Bowl

Loosen the set screws (2). Screw the three lifting eyes on the frame – see figure – and lift the separator. For checking the tightening of screws (1) or for checking and replacing vibration dampers (6) the separator must be lifted approx. 0.5 m.

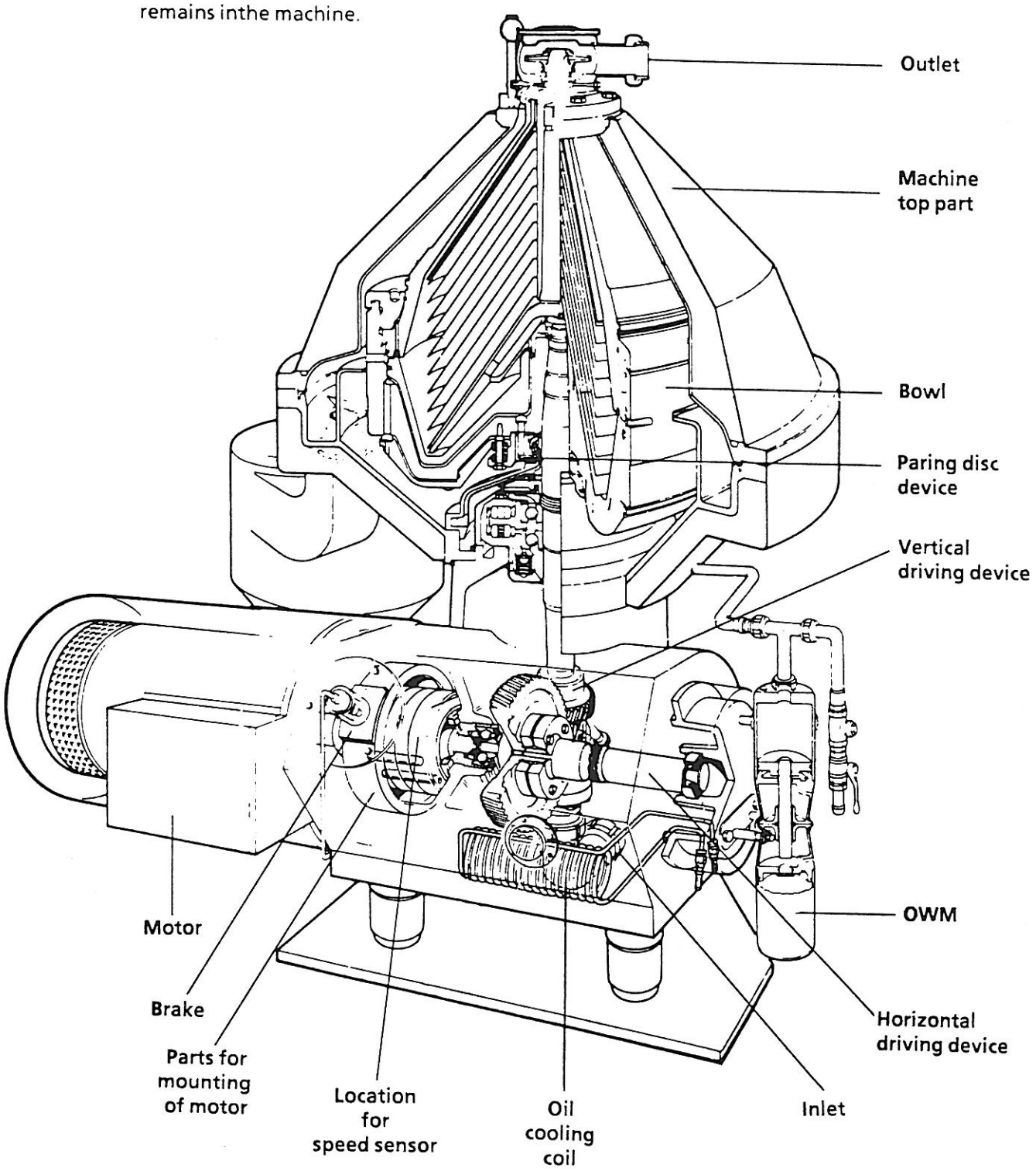
Note! Never lift the separator in any other way.



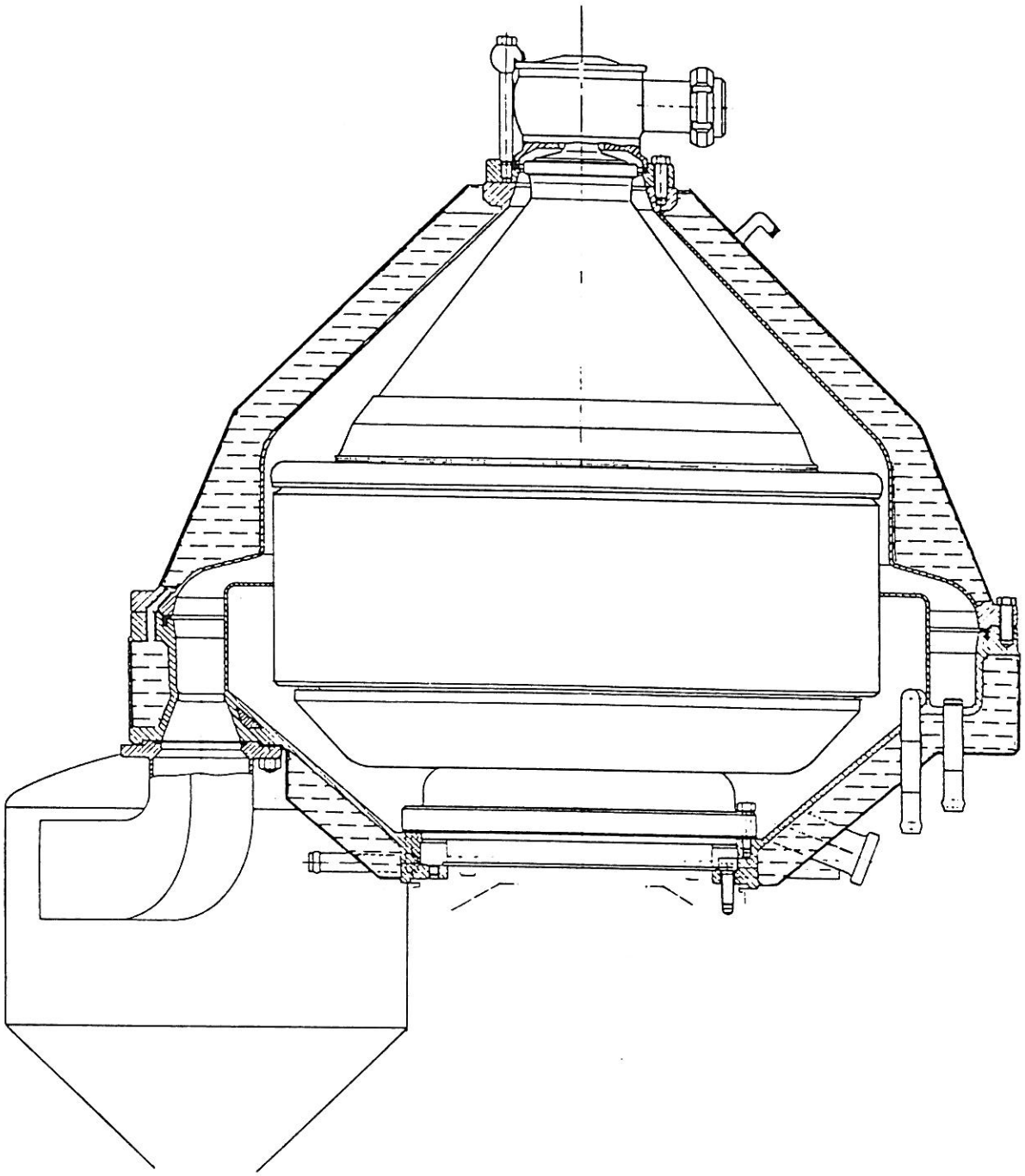
1. Screw and washer
2. Set screw
3. Holder
4. Adjusting washer
5. Foundation foot
6. Vibration damper

MAIN PARTS

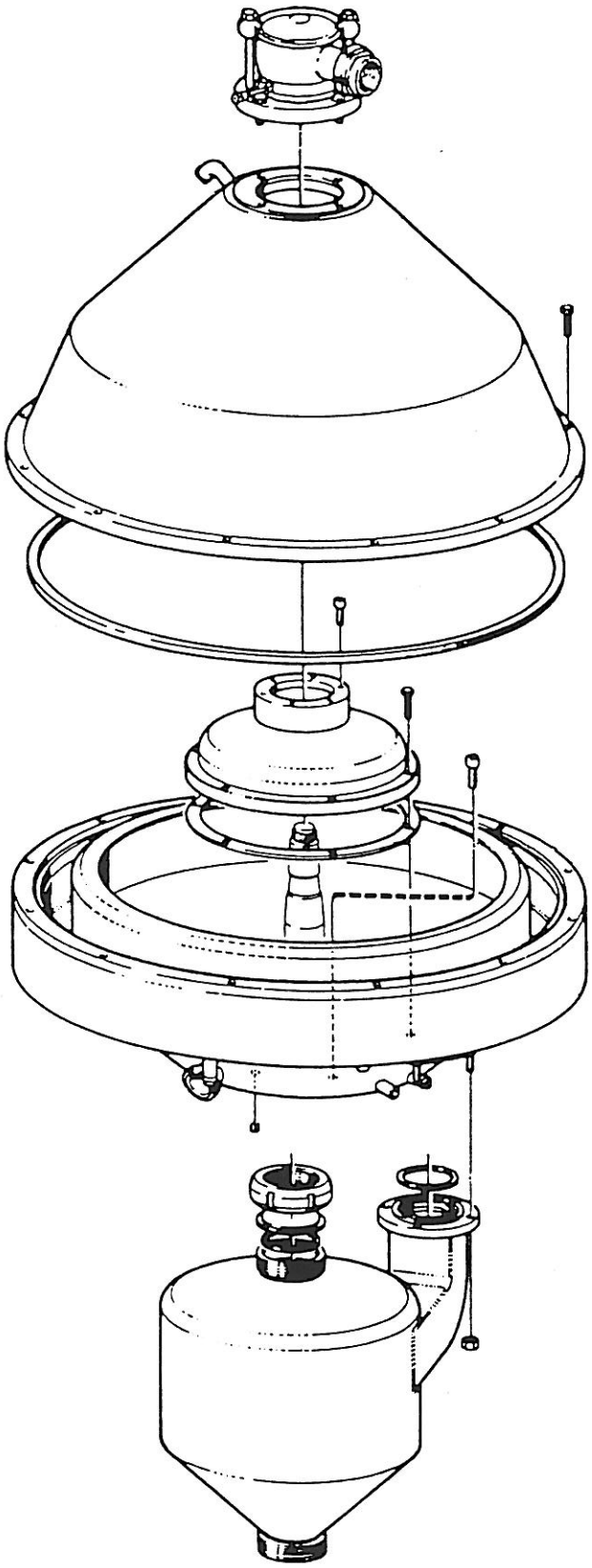
Note! If ***Inlet*** or ***Worm wheel*** is going to be disassembled it is recommended to do this while the bowl still remains inthe machine.



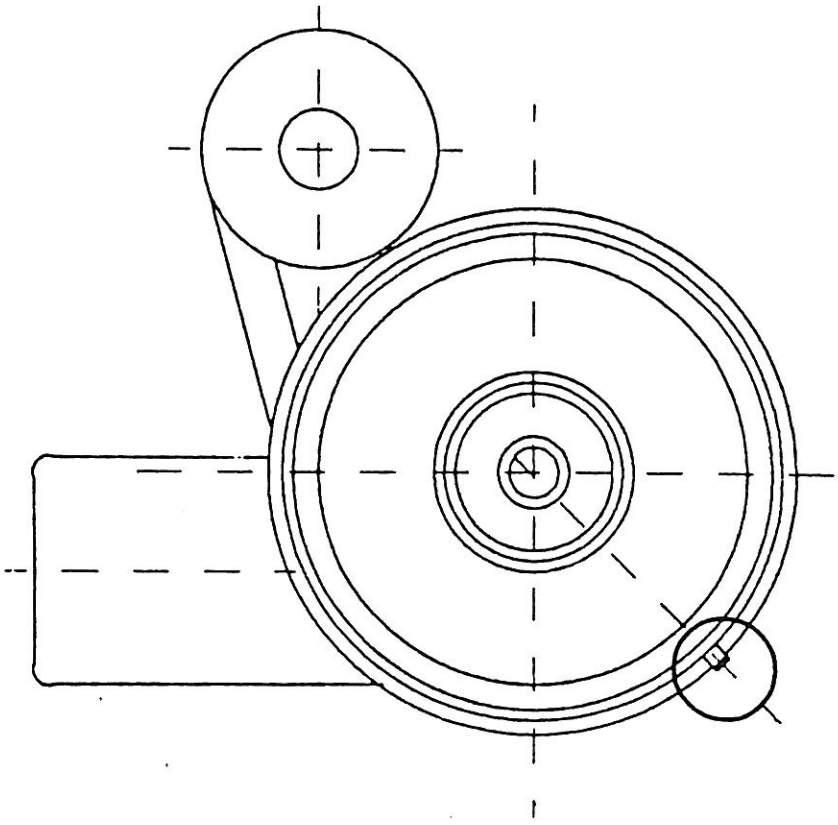
MACHINE TOP PART		

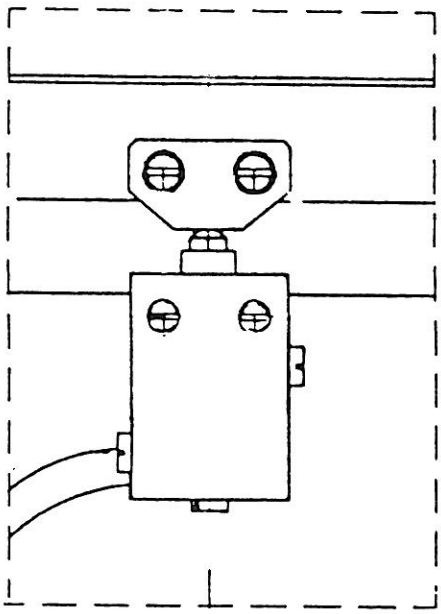


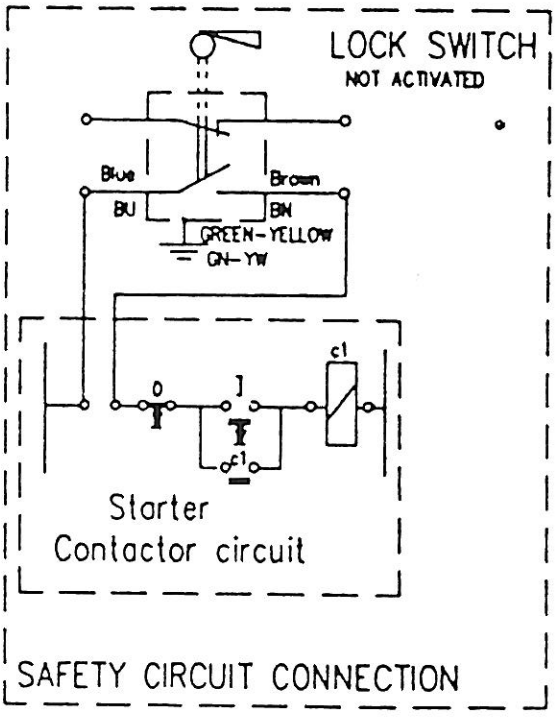
MACHINE TOP PART		



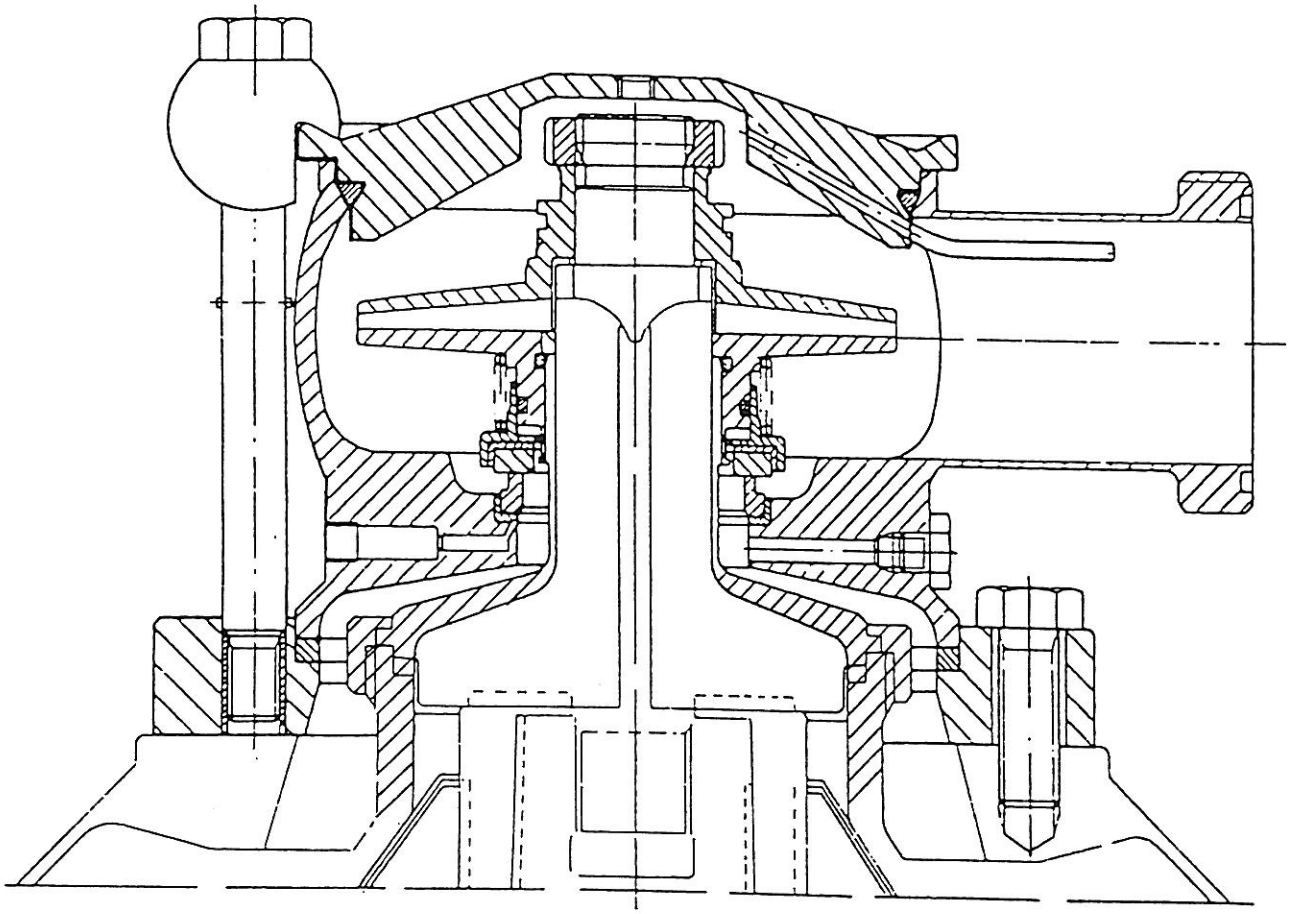
MACHINE TOP PART	LOCK SWITCH (Optional)	





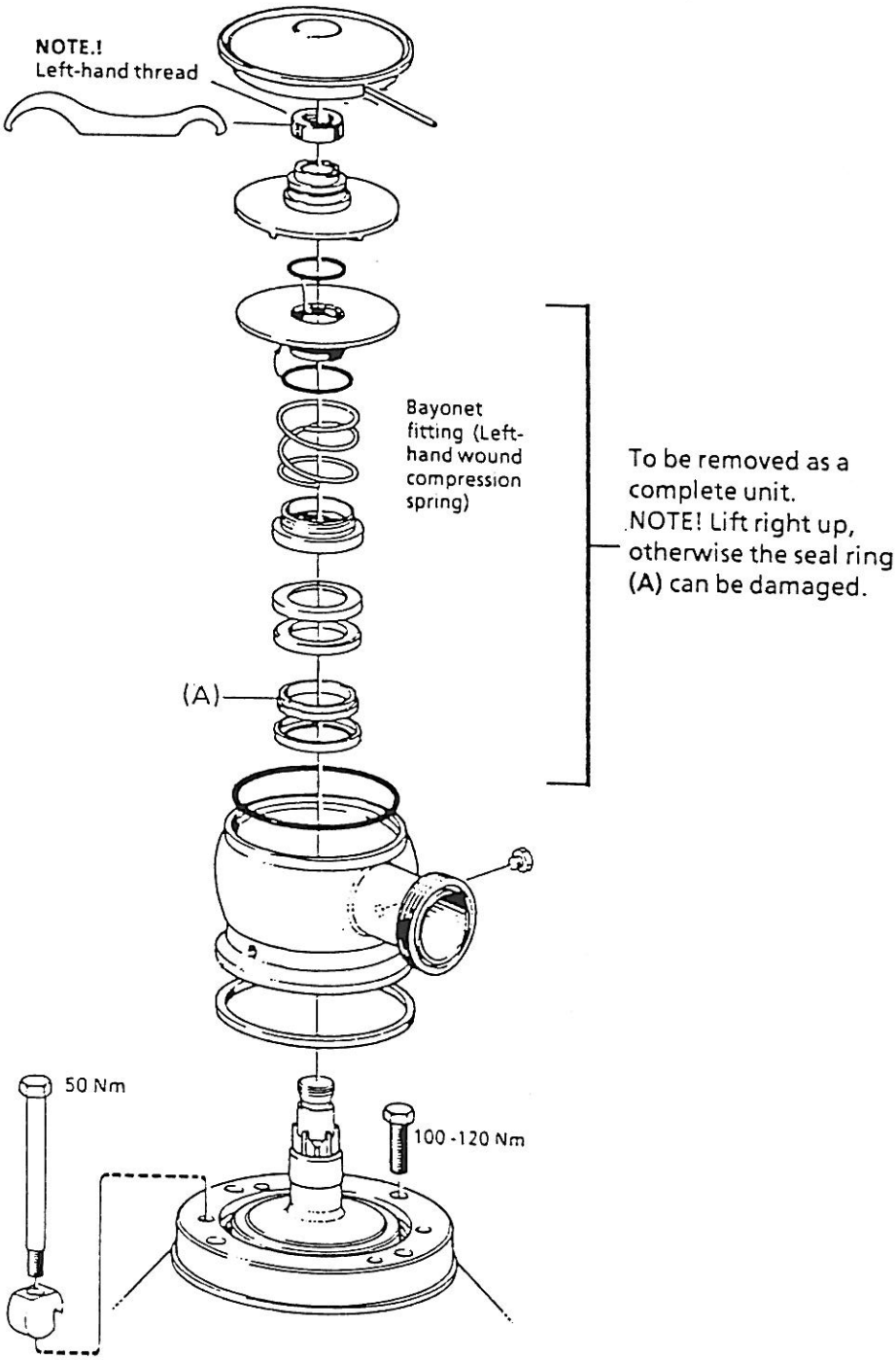


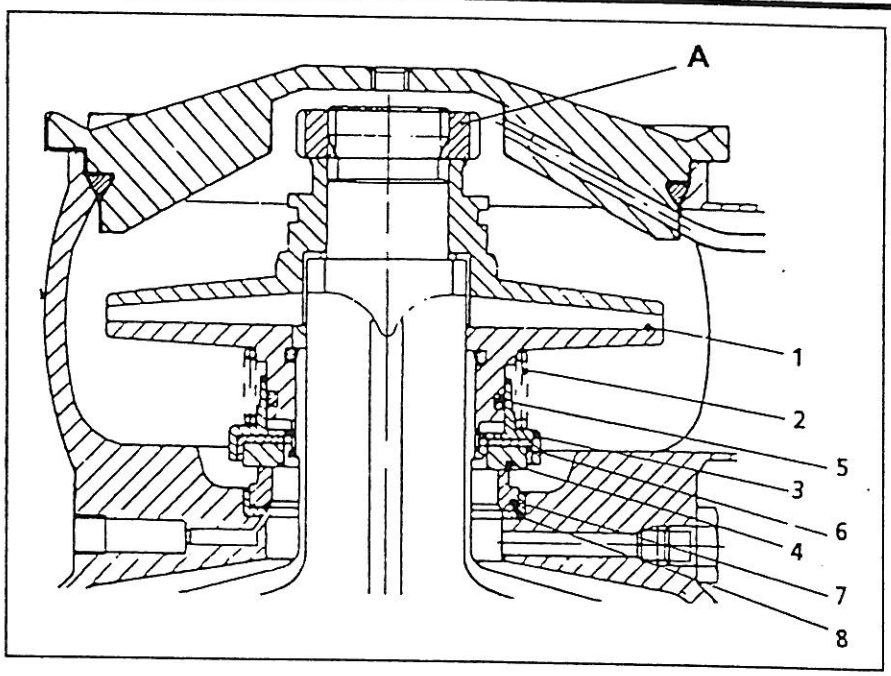
OUTLET		



SAFETY PRECAUTIONS

NEVER loosen any part of the separator until the bowl has come to a COMPLETE STANDSTILL.





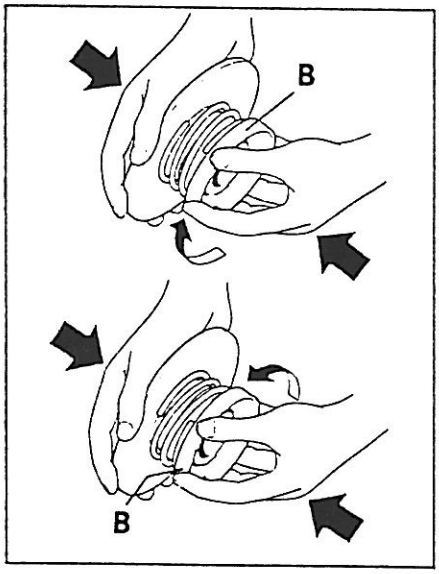
The axial seal consists of:

A	Nut
1	Pump impeller upper / lower part
2	Compression spring
3	Support
4	Wear ring
5	O-ring
6, 8	Rubber packing
7	Seal ring

DISASSEMBLY

Remove the pipings for process liquid and cooling water.

When dismantling, note that the nut (A) which secures the impeller has left-hand thread.



Dismantling a bayonet fitting:

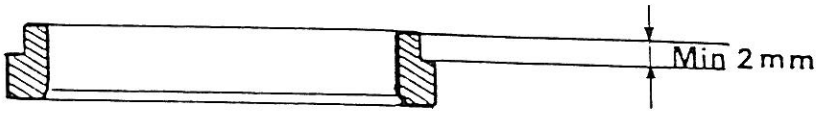
Press the parcel and turn at the same time the support (B) ***against*** the bent end of the spring (it cannot be turned in the other direction). Be careful that the parts do not fly out when the fitting is disengaged.

(Assembly takes place by reversing the sequence of operations for disassembly).

- Defective axial seals will cause a leakage of process liquid from the machine.

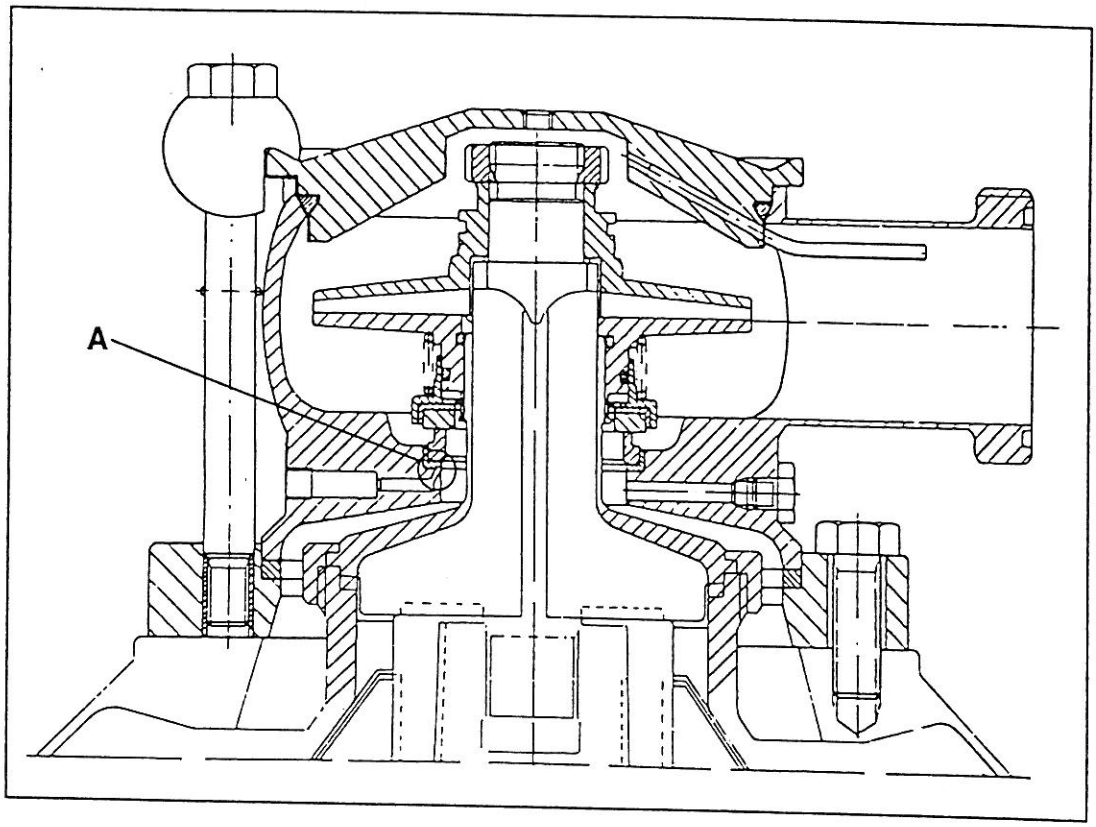
The sealing surfaces of wear ring and seal ring must be free of deposits and defects which can give rise to leakage and exceptionally rapid wear. In certain cases damaged sealing surface of the ***seal rings*** can be remedied – see below. However, for practical reasons it is best to have new or reconditioned seal rings available when inspecting the seals, so that defective seal rings can be replaced at once when required. The old seal rings may then be repaired when convenient and put to use again at a later inspection.
The ***wear rings*** can not be remedied.

Repairing the sealing surface of a seal ring.



OUTLET	CHECK POINTS	

Cooling water nozzle



- Cooling water must be fed to the seals during the starting and stopping periods as well as during operation. CIP-liquid must be fed during cleaning. See Operator's Manual (OM). It is important, therefore, that the cooling water nozzle (A) is not obstructed. Hole diameter of the nozzle: 1.2 mm.

Clean the nozzle with an iron wire or the like.

Axial seals

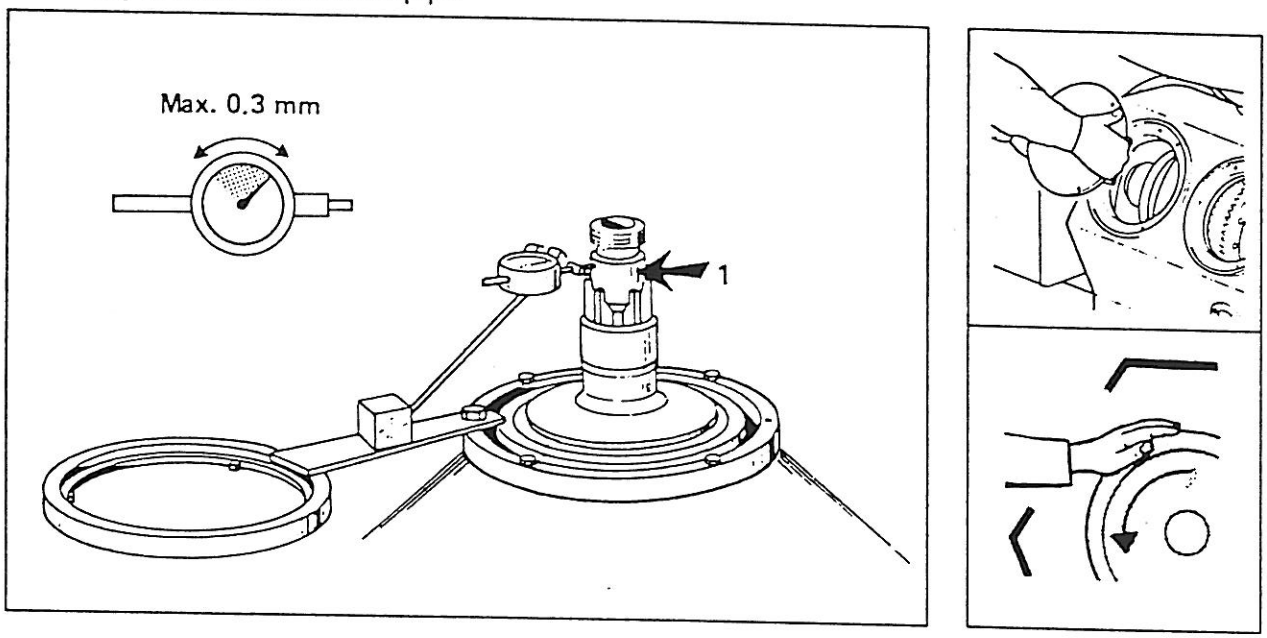
- Defective axial seals will cause a leakage of process liquid from the machine.

The sealing surfaces of wear ring and seal ring must be free of deposits and defects which can give rise to leakage and exceptionally rapid wear. Worn or leaky rings must be replaced.

Assembly

Assembly takes place by reversing the sequence of operations for disassembly. Observe the following:

Checking the wobble of outlet pipe



Excessive radial wobble of the outlet pipe will cause wear on the seals.

Tighten the spanner for the small lock ring in the ring situated on the top of the frame hood with one of the hexagon screws – see figure. Place the support of the dial indicator on the handle of the spanner and measure the wobble at 1. Remove the brake cover and revolve the outlet pipe by turning the coupling drum by hand.

Max. permissible wobble is 0.3 mm.

If the wobble is excessive, turn the pipe in the distributor, check that it is not riding on distributor or bowl hood, thus being forced into an incorrect position.

Outlet pipe, guide sleeve and distributor are marked with punch marks. They must be assembled with these marks exactly opposite each other. If the max. permissible wobble is exceeded, try in a new position. If a position is found where the wobble is acceptable, make new punch marks in the new position.

If an unacceptable wobble cannot be remedied in this way, the bowl spindle cone must be checked with respect to defects, even the bowl body nave may be defective. See "Separator bowl: Bowl body nave / Bowl spindle cone".

Height adjustment

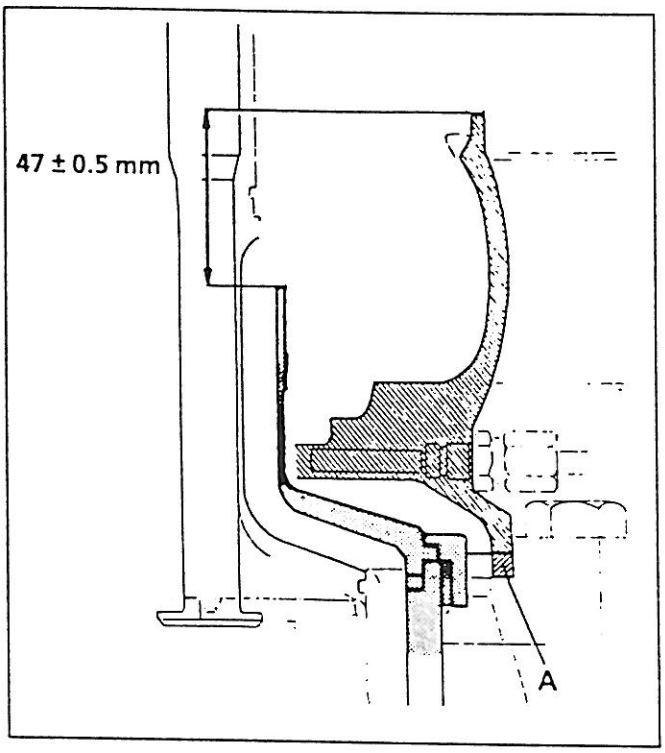
Check the height position after each assembly.

Use two steel rules or a depth gauge.

If the height measure does not correspond with the measure stated in the figure: Replace the inserted height adjusting ring A by a ring with more suitable thickness.

Check the height position by removing the brake cover and rotating the coupling drum by hand. The bowl should then move freely and easily.

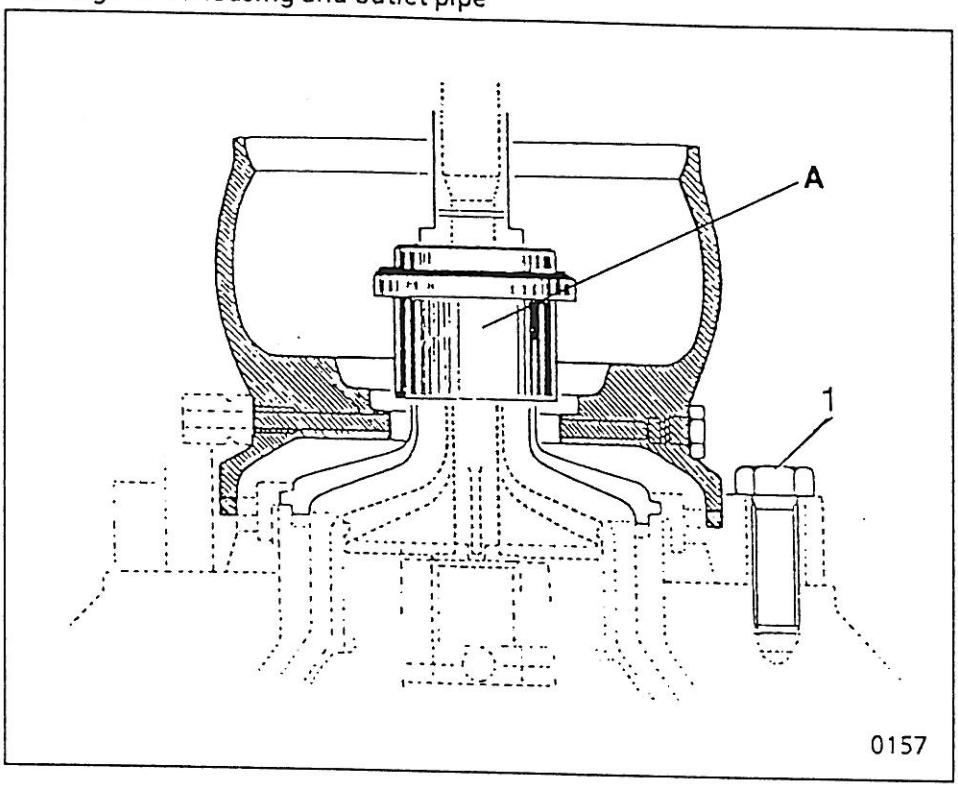
If the outlet pipe touches the outlet housing, it must be checked that the bowl is correctly assembled.



Checking eccentricity of outlet pipe / outlet housing

Excessive eccentricity between the outlet housing and the outlet pipe will cause increased wear on the axial seals. The eccentricity must always be checked when mounting the outlet device.

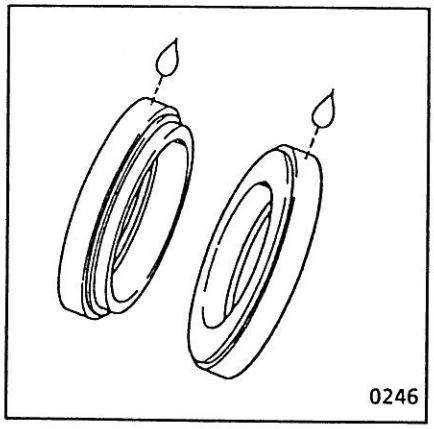
Setting outlet housing and outlet pipe



- Undo the four screws (1) of the centering ring (if not already done).
- Fit the outlet housing (its height position should already have been checked). The seal ring and rubber packing must not be fitted when mounting the outlet housing.
- Pass the gauge (A) for checking centering over the outlet pipe and press down the gauge in the bottom hole of the outlet housing.
- Tighten the four screws (1) with a torque of 100 - 120 Nm (10 - 12 kpm).
- Lift out the gauge. Notice that it should be easy to lift out.
- Remove the outlet housing and fit seal ring and rubber packing of the axial seal.
- Fit the outlet housing on the frame hood.

  The checking could also be done with the seal ring and rubber packing fitted. The gauge (A) should then be turned upside down relative the figure above.

  Be careful not to cause any damage.

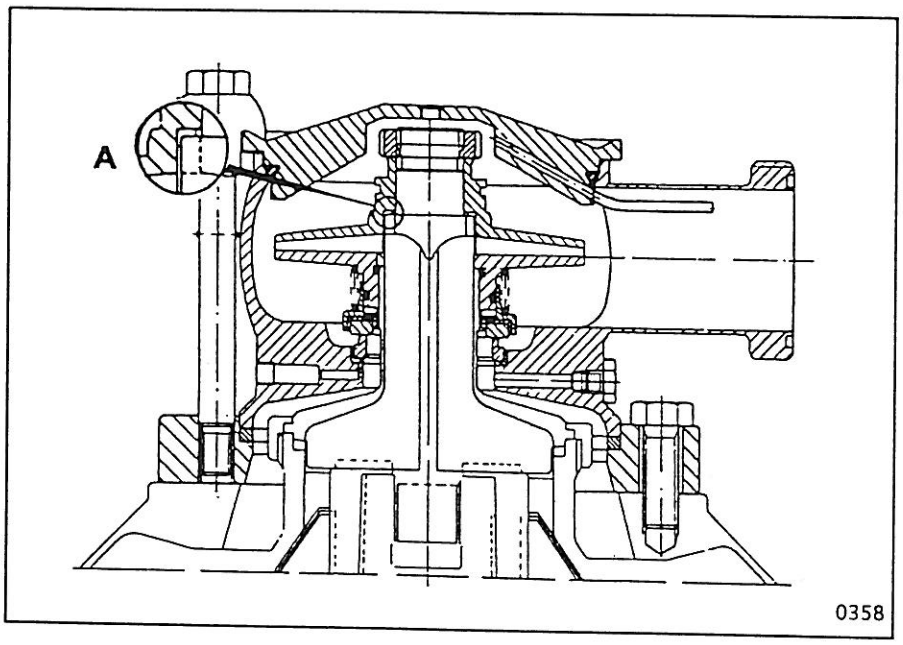


Axial seals

Clean the parts and ascertain that they are undamaged. Press down the seal rings and the wear rings in their rubber packings. Lubricate the packings on their external surface with soapy water (not oil) and press them down (with rings) in the parts to which they belong, i.e. in the support and the outlet housing respectively. * See "OUTLET, DISASSEMBLY".

Lubricate the O-rings of the impeller with silicone grease **. Assemble the parts to be locked by bayonet fitting.

Press the parcel and turn at the same time the support **against** the bent end of the spring until the parts are engaged. Finally check that the support slides easily on the O-ring.

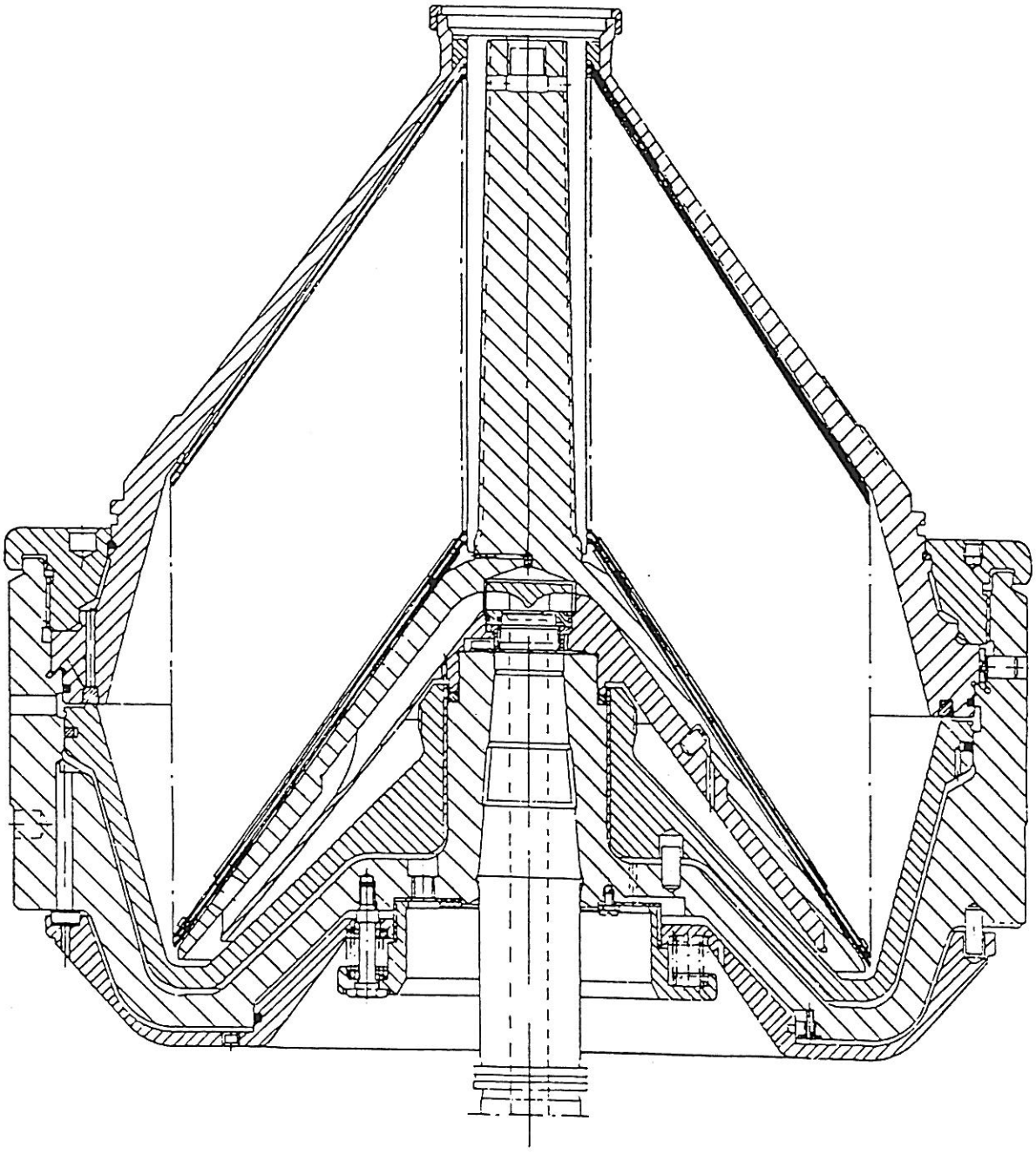


Ascertain that the grooves of the top part of the impeller fit over the ribs of the outlet pipe (A).

* The wear ring and the seal ring are made of carbon and must be handled with care. When the parts are to be pressed down in their seats together with the rubber packings, the power must be uniformly distributed around the periphery. It is likewise important not to damage the sealing surface on which power is applied. ***Preferably use a plastic tube with a smooth end surface.***

** Quality requirements – see ***LUBRICATION*** at the end of the book.

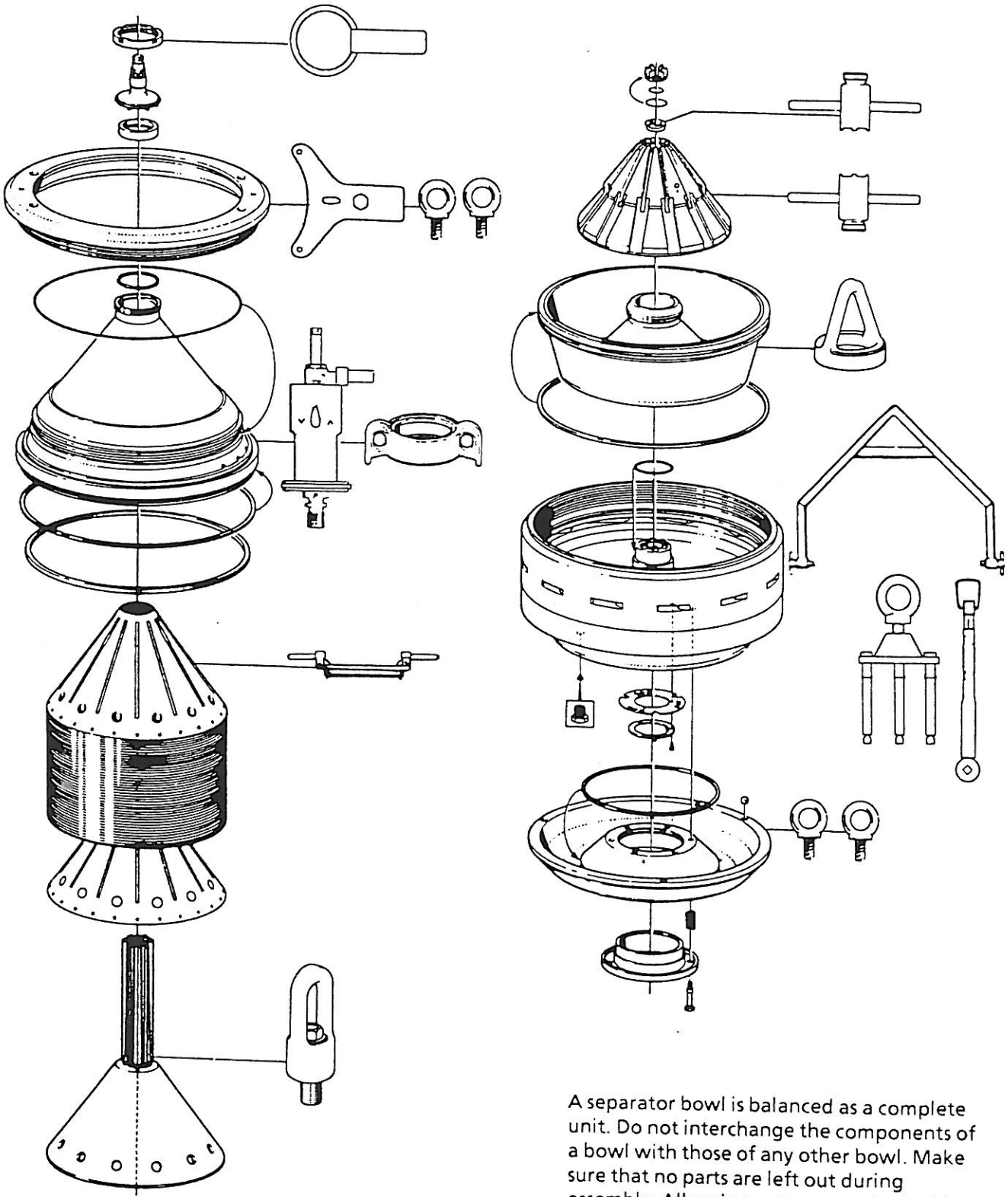
SEPARATOR BOWL		



SEPARATOR BOWL		

SAFETY PRECAUTIONS

NEVER loosen any part of the separator until the bowl has come to a COMPLETE STANDSTILL.

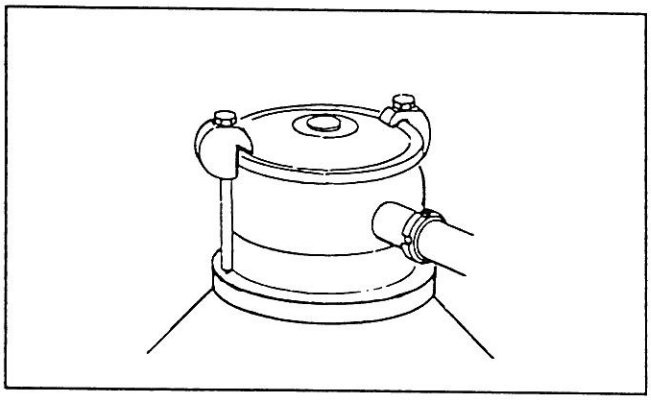


A separator bowl is balanced as a complete unit. Do not interchange the components of a bowl with those of any other bowl. Make sure that no parts are left out during assembly. All major parts are marked with the full serial number or the last three digits for identification purposes.

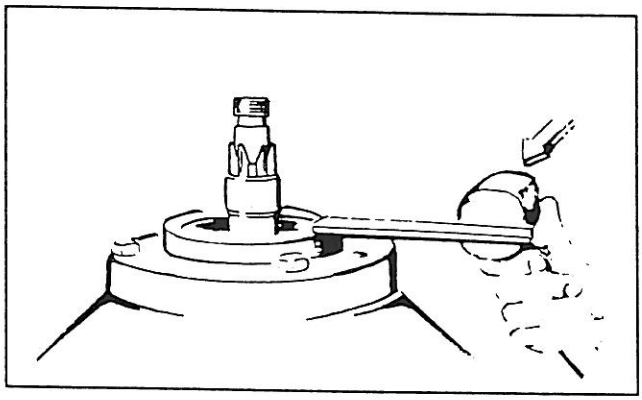
Uncovering the bowl

SAFETY PRECAUTIONS

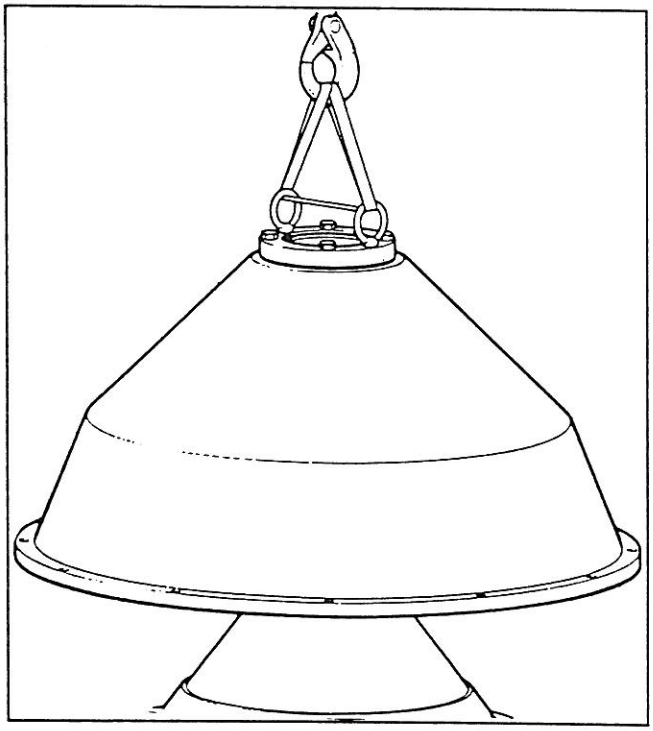
NEVER loosen any part of the separator until the bowl has come to a COMPLETE STANDSTILL.



Disassemble outlet parts as advised in Chapter "OUTLET, Disassembly".



Unscrew small lock ring clockwise (left-hand thread).
Remove outlet pipe.

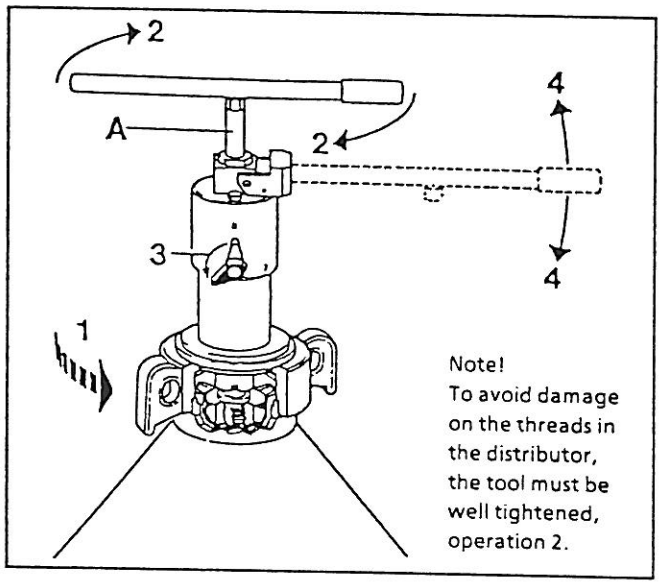


Remove the screws for the frame hood.
Drain off the cooling jacket before lifting.
Screw the lifting eyes into the threaded holes for the hook screws in the centering ring. Lift off the frame hood with the aid of the eyes.

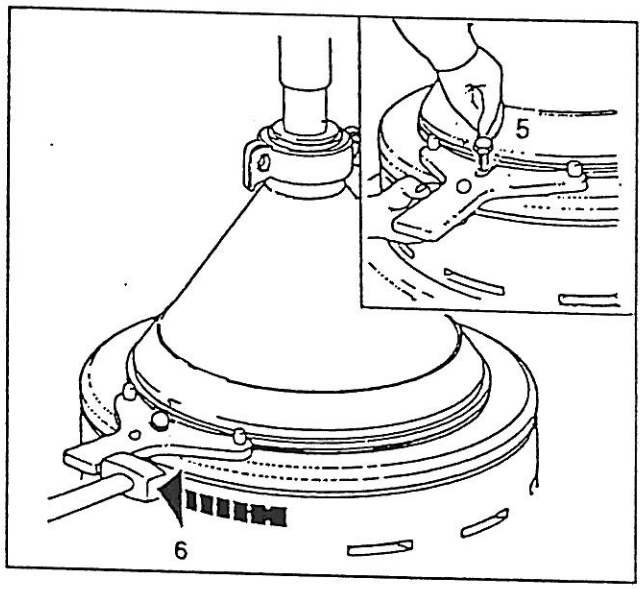
SEPARATOR BOWL	DISASSEMBLY	

Large lock ring

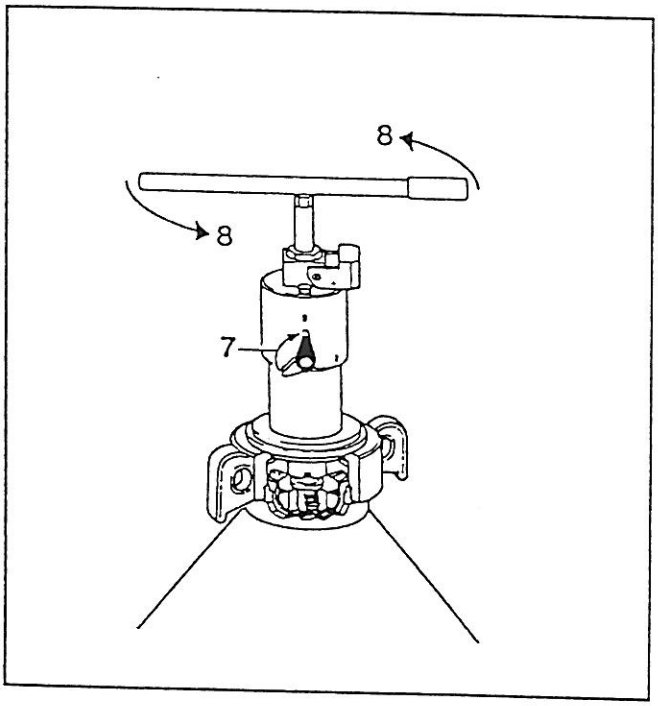
Before loosening the large lock ring, the disc set pressure must be neutralized by means of a compressing tool. The latter is used together with a lifting ring, which is to be screwed on to the bowl hood. (See also directions in the instruction book for the compressing tool.)



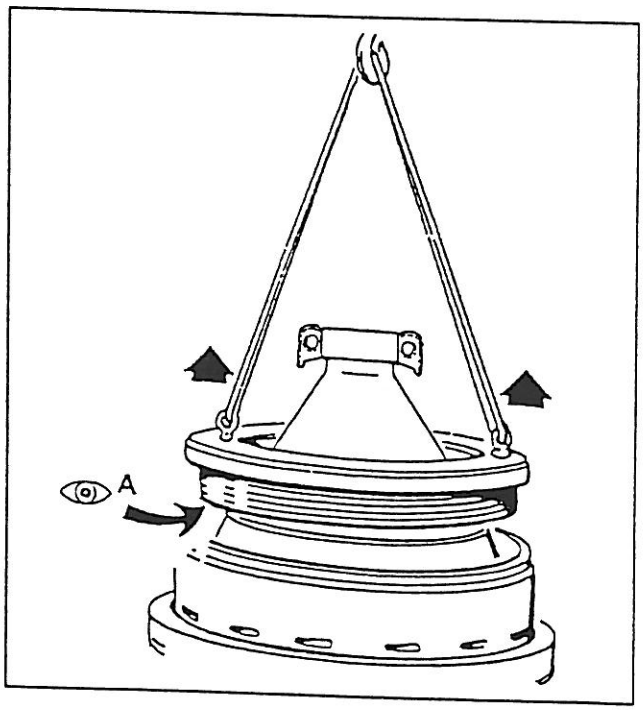
Carry out operations (1 - 3). **Note:** Pump (4) until ***full pressure*** is obtained (automatic release at correct disc compression).Centre rod moves upwards.



Fit large lock ring spanner (5).
Unscrew large lock ring ***clockwise*** (left-hand thread) (6).



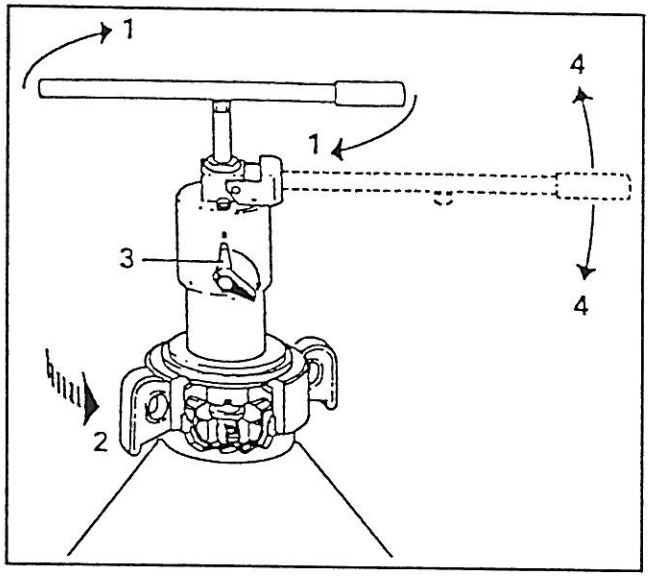
Undo and remove the compressing tool.
Operations (7 - 8).



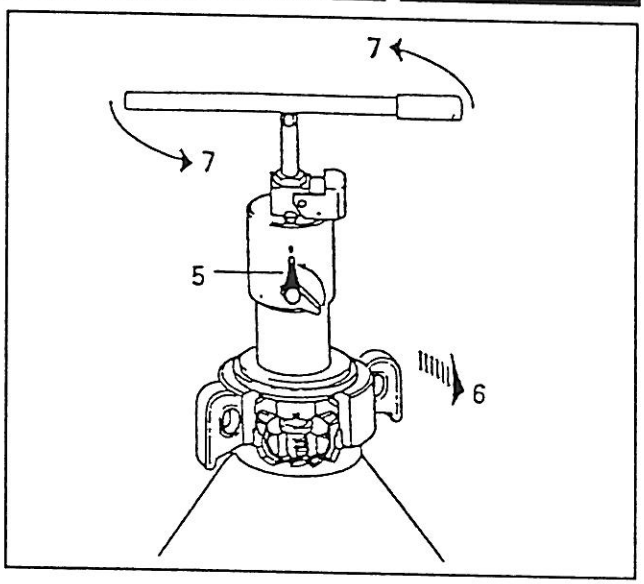
Check that the lock ring is entirely screwed off before lifting it. Take care not to damage the contact surface (A).

CHECK POINTS

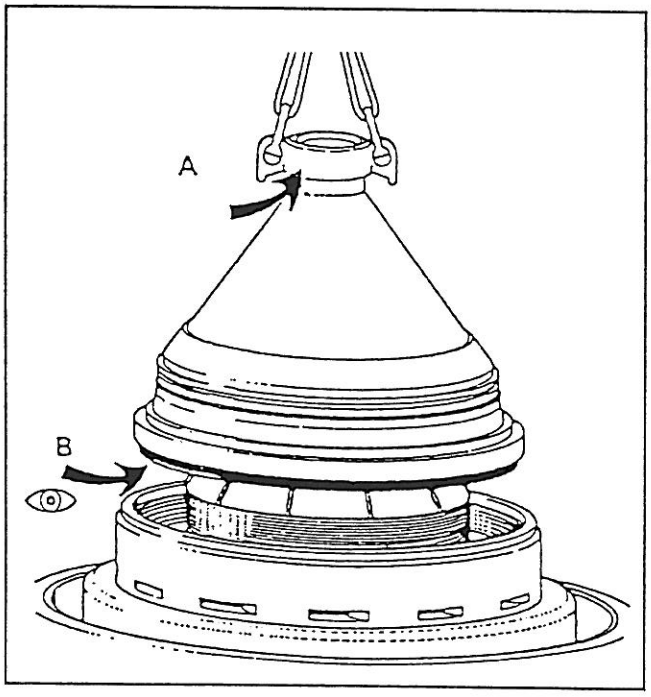
SEPARATOR BOWL	DISASSEMBLY	



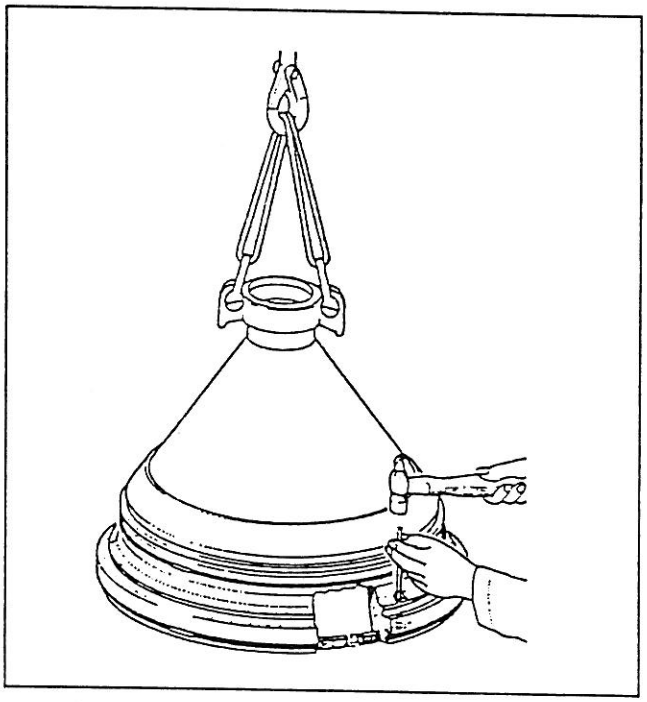
If the bowl hood sticks in the bowl body, use the compressing tool to ease off the hood.
Carry out operations (1 - 3). **Note:** Fit the compressing tool before fitting lifting ring. Pump. Centre rod moves downwards (4).



Undo and remove the tools. Operations (5 - 7).



Lift the bowl hood by means of lifting ring (A). ***Never*** with compressing tool fitted. Take care not to damage the seal ring (B).

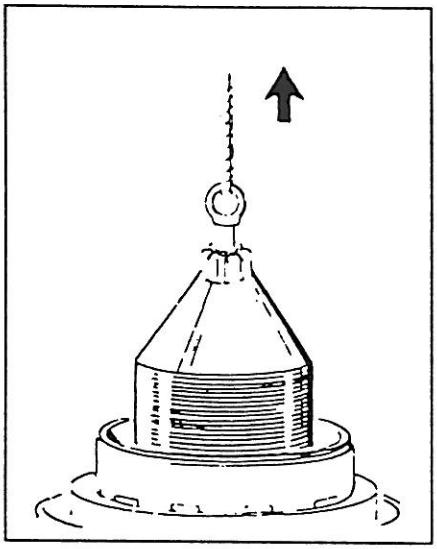


When seal ring in lower edge of bowl hood needs replacement, force out the ring by means of a **drift**, inserting it alternately in the holes intended for this purpose. When the seal ring has been forced out of that part of the groove which is situated under the holes, pull it off by hand.

CHECK POINTS

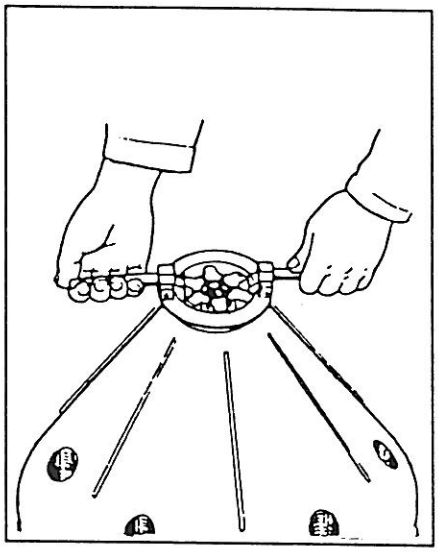
SEPARATOR BOWL	DISASSEMBLY	

DISTRIBUTOR WITH DISC STACK, WING CROWN, CAP NUT AND DISTRIBUTING CONE.

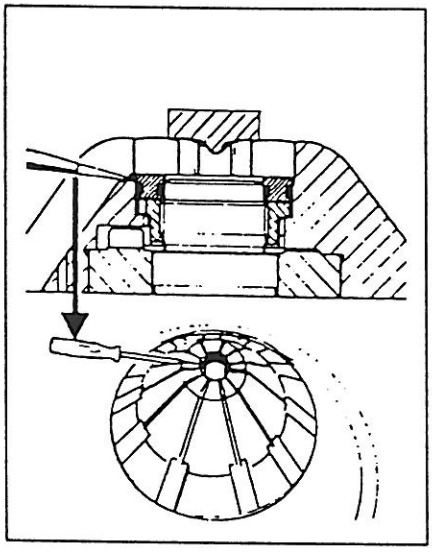


Lift out the distributor with disc stack.

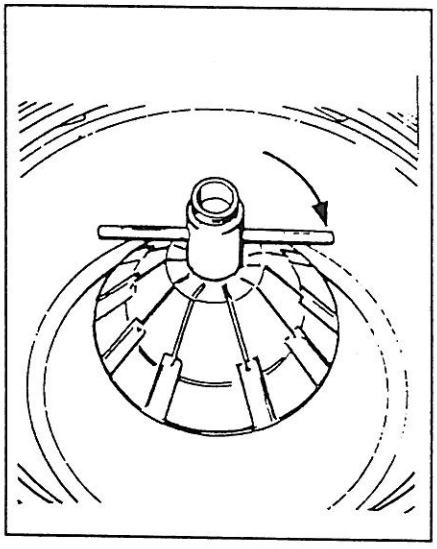
Check washing efficiency – see Operator's Manual 'OM'.



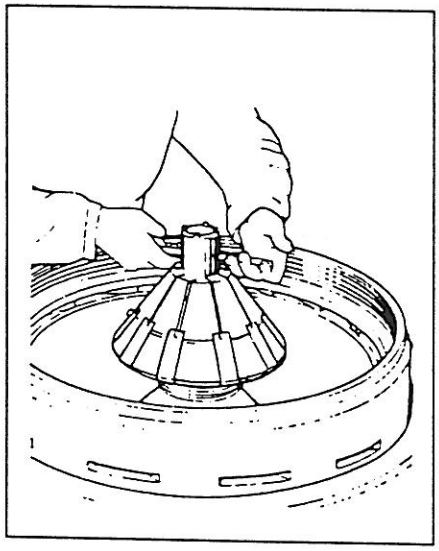
If the discs are to be removed, use the special tool.



Carefully remove the wing crown by means of a screw driver. Note, that there is one internal and one external O-ring in the wing crown.



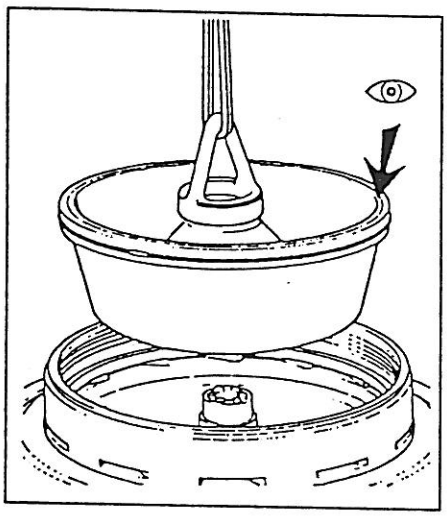
Unscrew the cap nut ***clock-wise*** (left-hand thread).



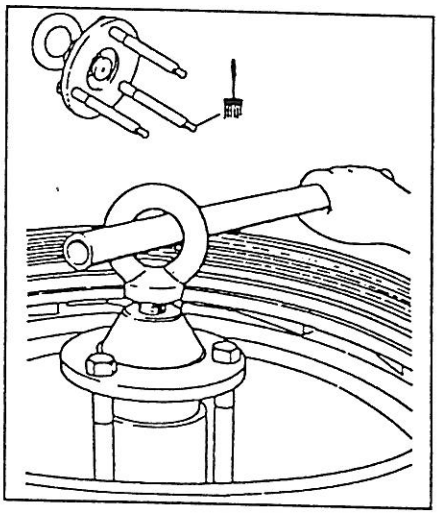
Lift out the distributing cone.

SEPARATOR BOWL	DISASSEMBLY	

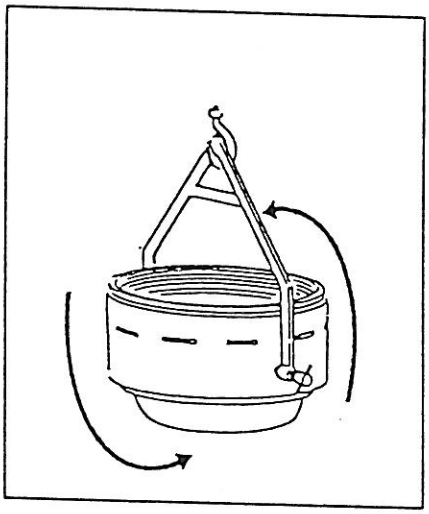
SLIDING BOWL BOTTOM. BOWL BODY. EJECTION MECHANISM



The sliding bowl bottom edge sealing against the bowl hood – CHECK POINTS. Look out for erosion!



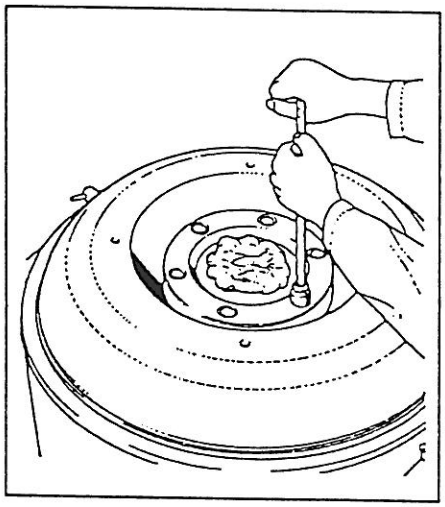
Remove the screws for the bowl body. Mount lifting tool.
Important: To ensure that the three screws beeing properly screwed down into the bowl body, the lifting eye must be screwed back first. Ease off bowl body from spindle top by tightening the central screw of the lifting tool.



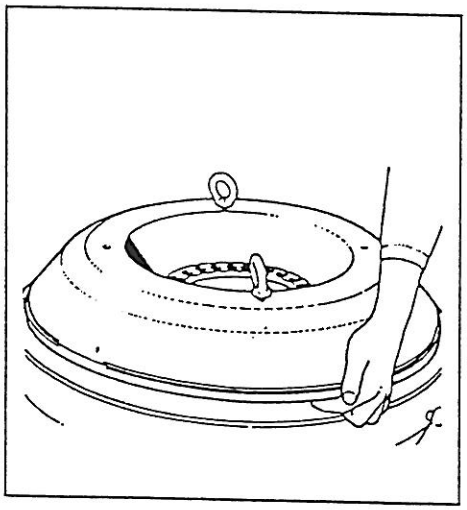
Warning!

Ascertain that the screws of the turning tool are properly tightened, before turning the bowl upside down.

Be aware of the risk for jamming injuries.

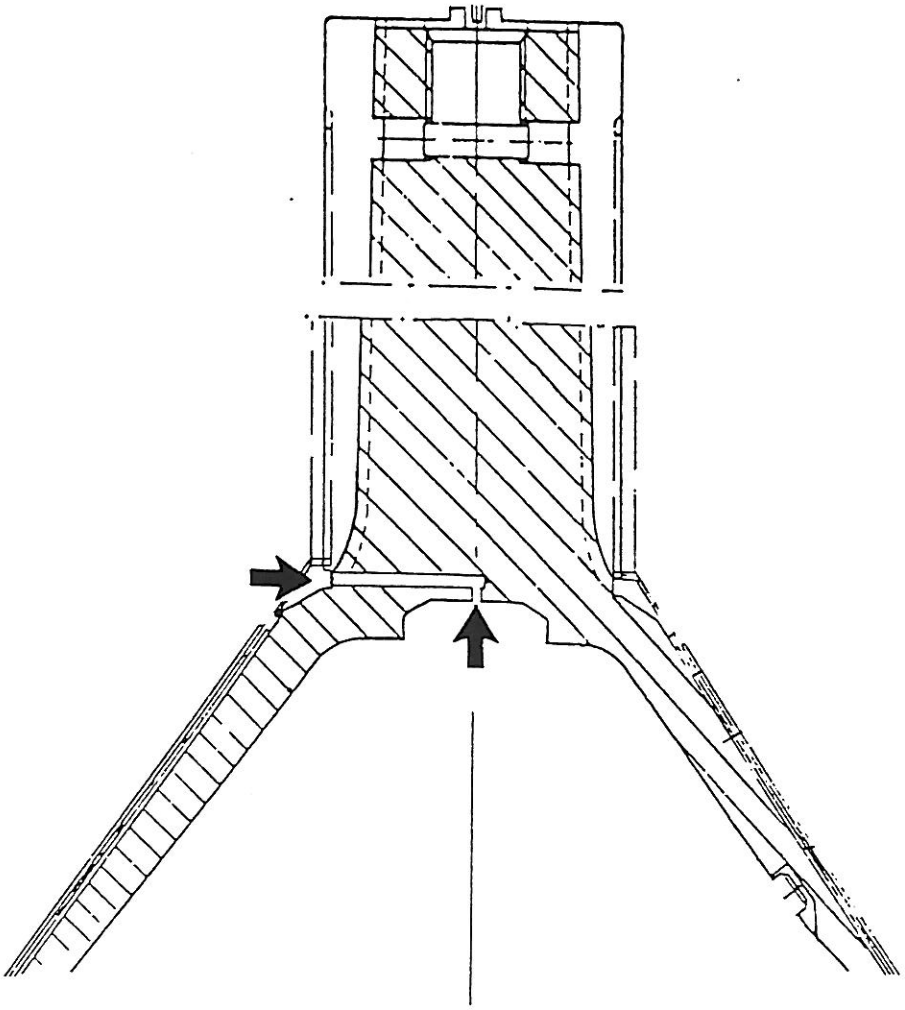


Protect the nave bore in bowl body with a rag.
Loosen the screws of the spring support alternately and a little at a time.



Ease off the operating slide with the aid of two lifting eyes. These are also used for lifting the operating slide.

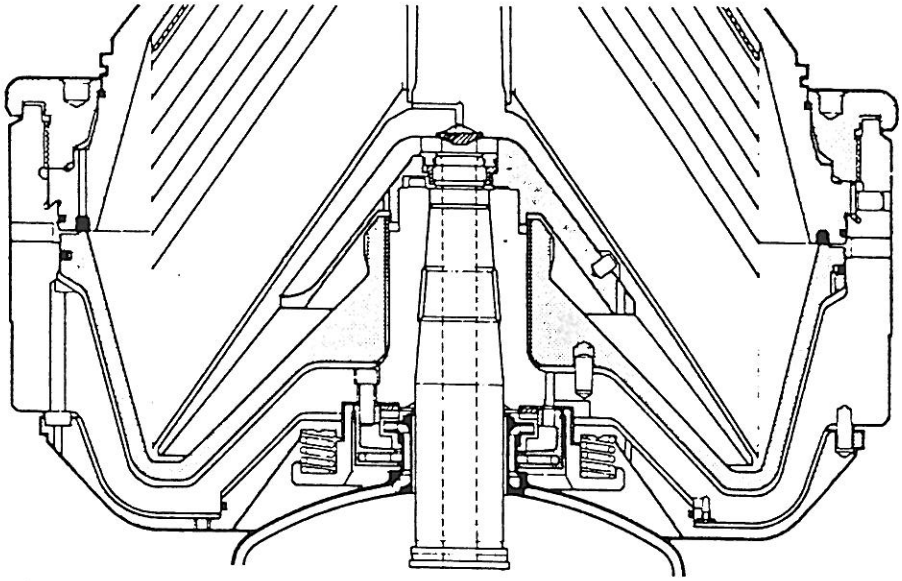
SEPARATOR BOWL	CHECK POINTS DUCT IN DISTRIBUTOR	



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

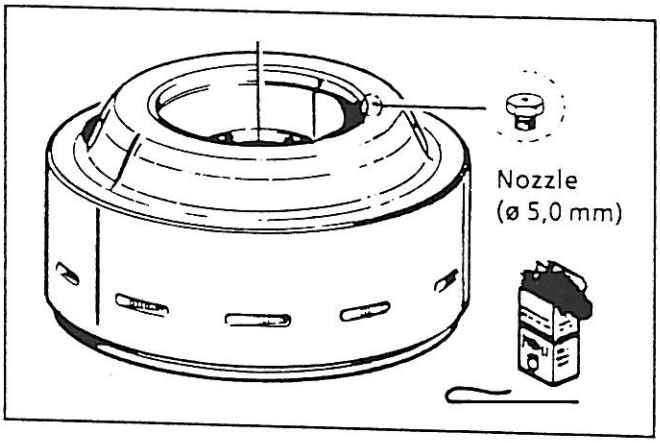
It is therefore important to clean this duct when tendency towards rising inlet pressure is observed.

SEPARATOR BOWL	CHECKPOINTS EJECTION MECHANISM	



Parts of ejection mechanism on bowl

- Dirt and lime deposits in the ejection mechanism may cause bad ejecting function or none at all.

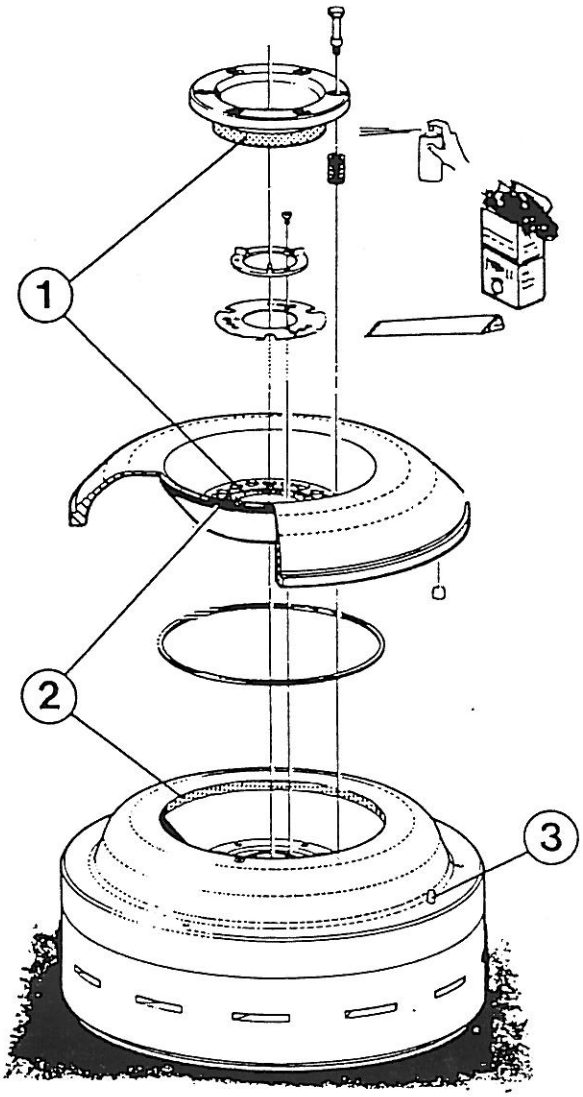


Nozzle, ducts

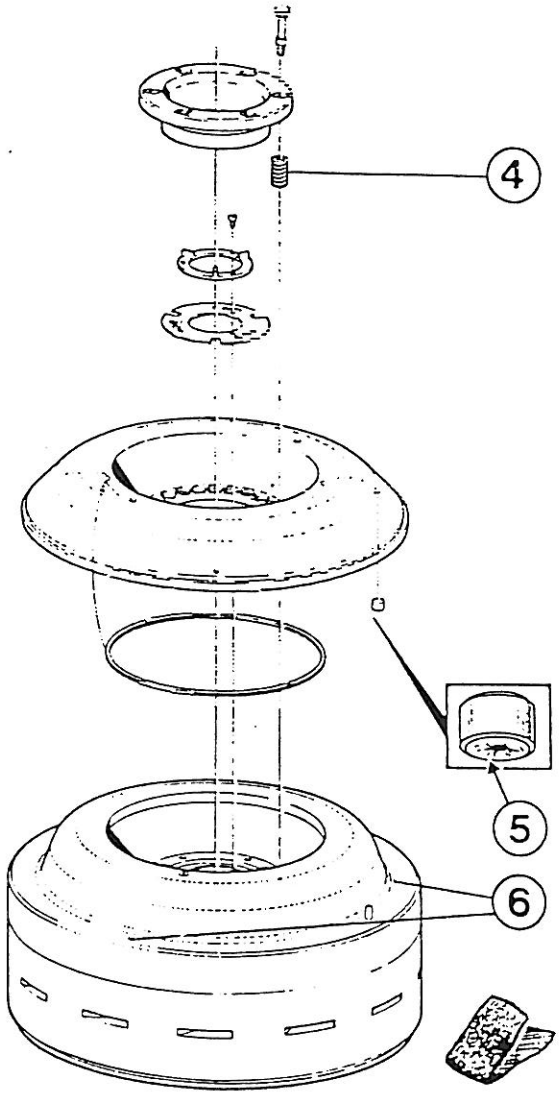
Clean the nozzle and the ducts with a soft iron wire or the like. If necessary unscrew the nozzle.

Remove deposits on other surfaces with steel wool.

Guiding surfaces etc.



Springs, valve plugs



Examine the guiding surfaces (1) of spring support and operating slide. Clean the surfaces, remove any marks and lubricate the surfaces. Proceed in the same way as for repair of seizure damage in lock ring joint, see later in this chapter.

Polish sealing surfaces (2) of operating slide and bowl body with steel wool.

Inspect guide pin (3) for the operating slide. If worn (eroded) so much as to jeopardize the polar location of the slide, replace it.

NOTE! There must be clearance between operating slide and guide pin.

- Defective or broken springs, as well as poor sealing between the valve plugs of operating slide and the bowl body, may prevent complete closing of the bowl.

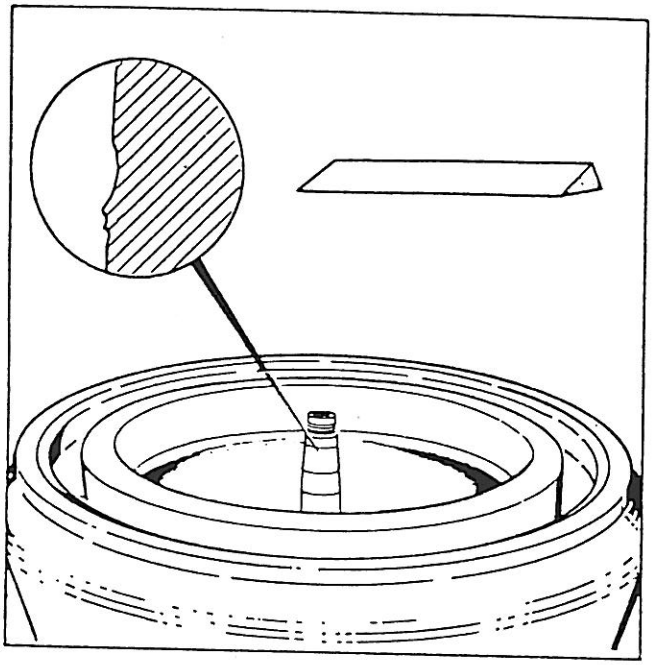
If one or more springs (4) differ appreciably from the other ones in regard to length or which seem to be defective in other respects, replace all springs.

Check the sealing surface (5) of the three valve plugs. Preferably replace all plugs even if only one of them is defective (scratches, pores).

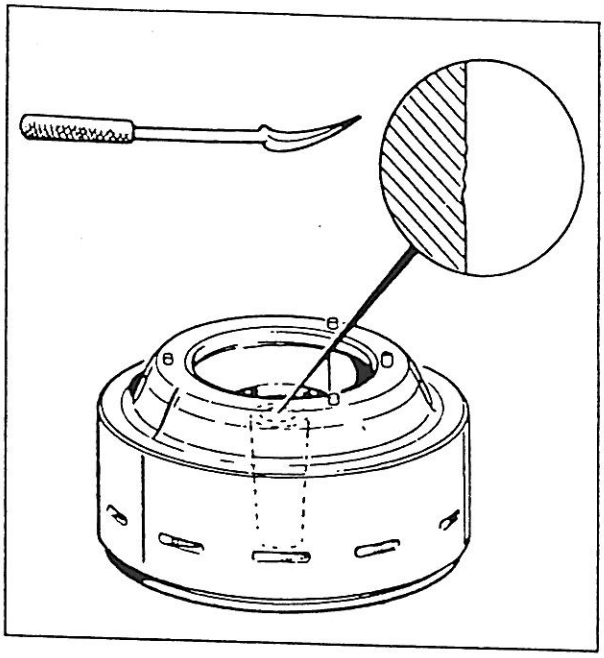
Examine the three sealing surfaces (6) of the bowl body in contact with the valve plugs. Remove any marks and lime deposits with a very fine-grain emery cloth.

SEPARATOR BOWL	BOWL BODY NAVE BOWL SPINDLE CONE	

Impact marks and similar on the spindle cone and / or in the nave may cause bad bowl run.

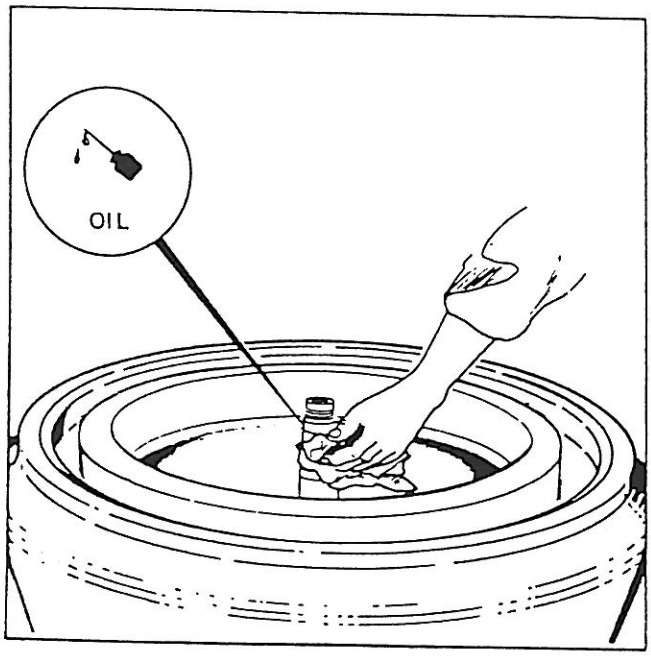


Clean spindle cone with a suitable defatting agent. Remove any impact marks on cone with an oil-stone.



Clean bowl body nave with a suitable defatting agent. Remove any impact marks on nave with a scraper.

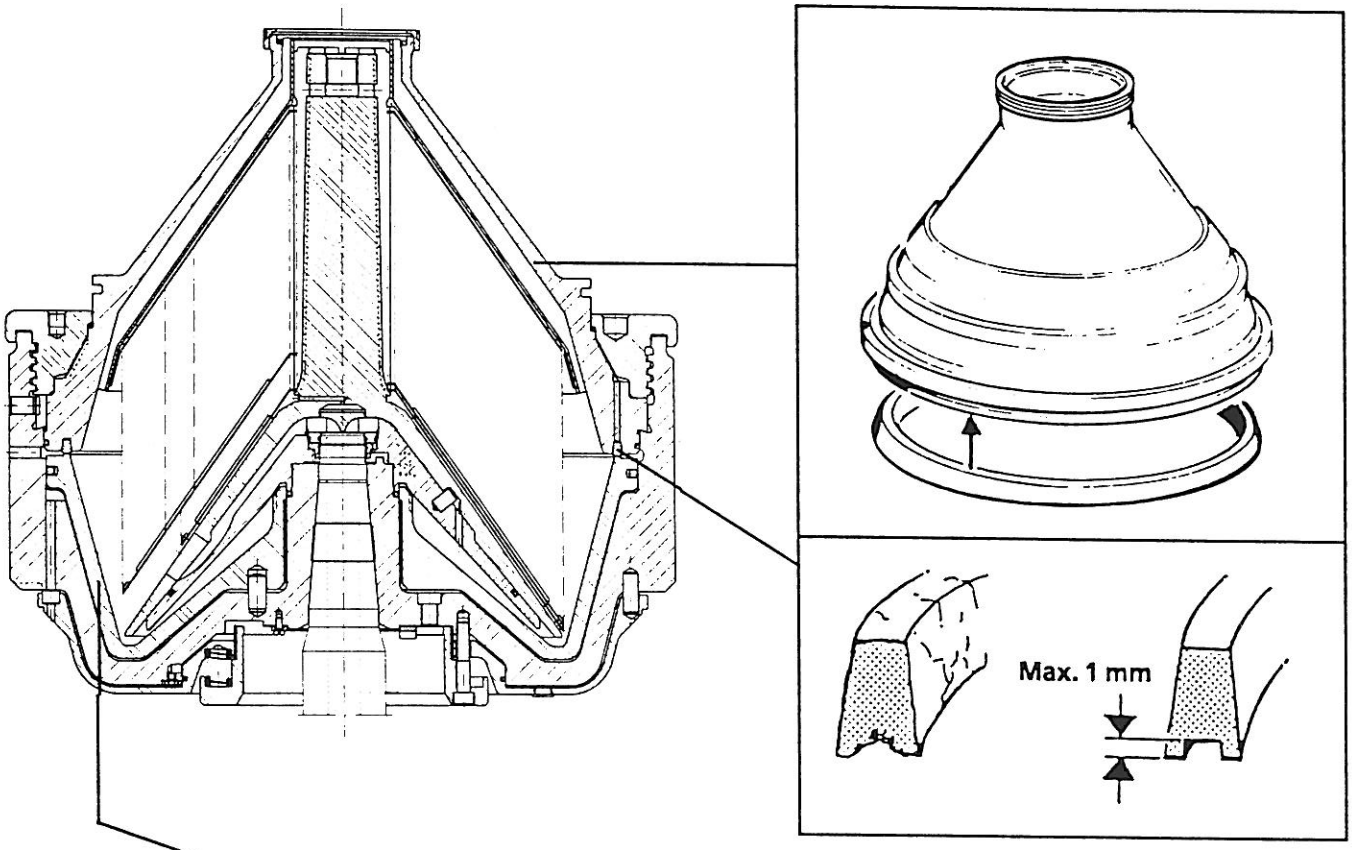
NOTE! Always use the scraper with great care. The conicity must not be marred.

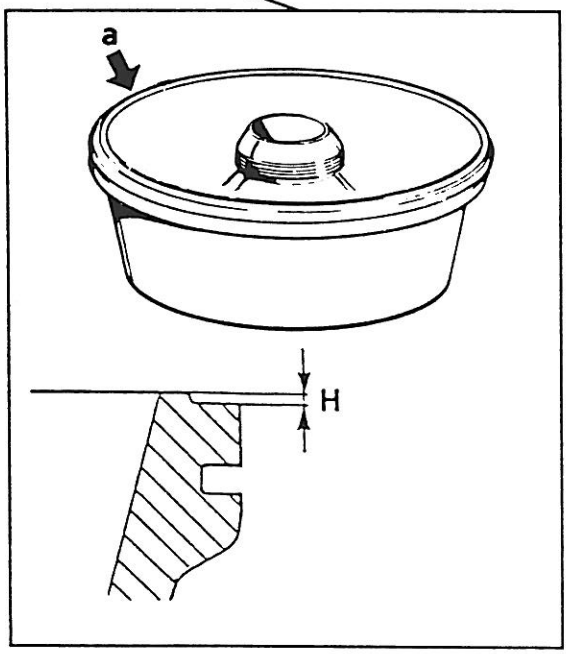


Whenever fitting the bowl body on the spindle first apply a few drops of oil to the spindle cone for corrosion protection reasons and then wipe it with a clean cloth.

SEPARATOR BOWL	CHECK POINTS BOWL HOOD / 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, which can damage the bowl hood and sliding bowl bottom (erosion).





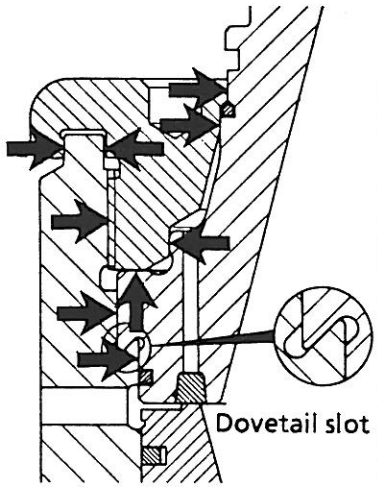
Replace the bowl hood seal ring if it has fissures or pores, deep scratches or indentations made by course solid particles.

The ring should be replaced also when its sealing surface is depressed by more than 1 mm, even though acceptable in other respects.

Also check the sealing edge (a) of the sliding bowl bottom. If damaged through corrosion or erosion or in other ways it can be rectified by turning in a lathe, provided that suitable equipment is available.

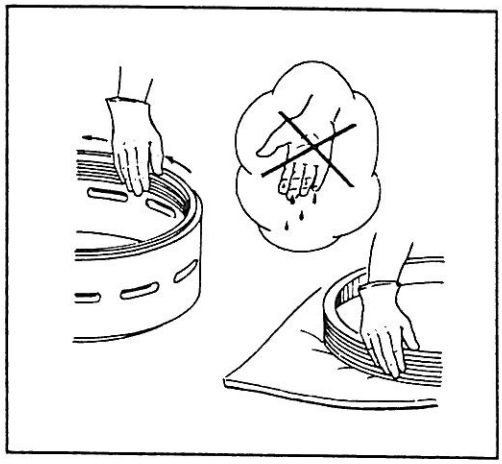
Profile height (H) at least 1.5 mm.

SEPARATOR BOWL	CHECK POINTS LOCK RING JOINT. Seizure damage	



Impact marks and similar scores on lock ring, bowl hood or body can cause seizure damage.

Check threads as well as contact- and guiding surfaces – see arrows.



Check the parts for seizure damages by letting your fingers lightly slide over the area to be inspected. Note, however, that these damages are very sharp and easily cut your fingers. Therefore, always use a piece of cloth or gloves when making this inspection.

An obvious sign of seizure damage is when the lock ring does not fit with the main guide.

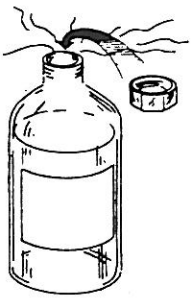
NOTE! Never force any parts together. It can be very time-consuming and expensive to repair these defects. Careful handling is therefore of utmost importance.

If damage has occurred due to seizure or other reasons, the following agents are recommended:

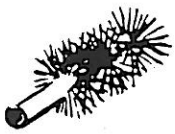
Emery cloth
(grain size: 240)

Hand drilling machine

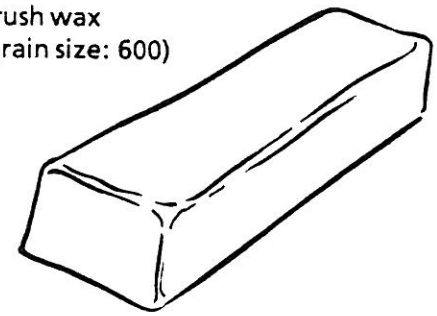
Defatting agent



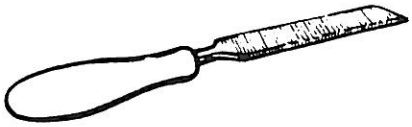
Fibre brush
Ø 25 mm (1")



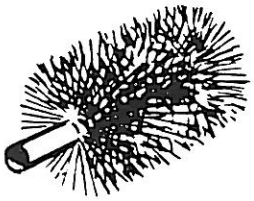
Brush wax
(grain size: 600)



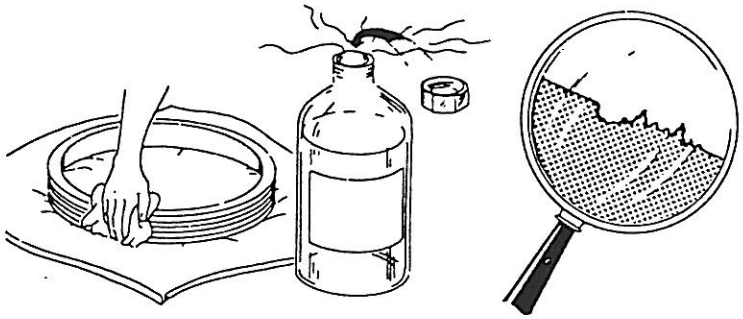
Very fine-cut file
(single-cut)



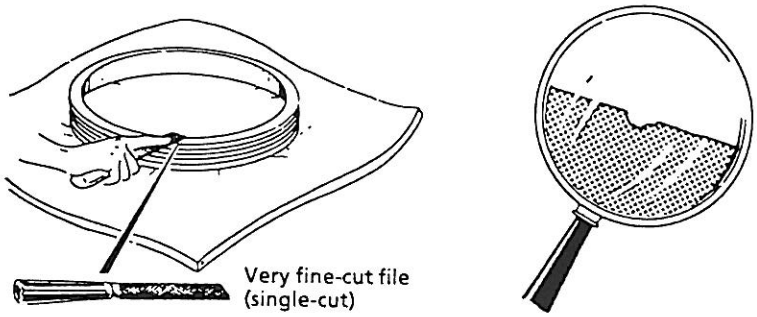
Fibre brush
Ø 50 mm (2")



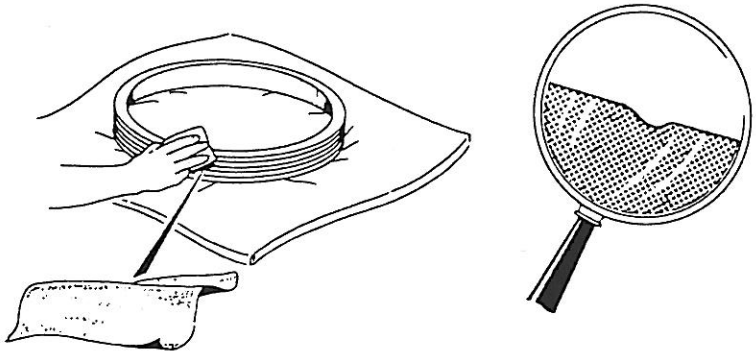
SEPARATOR BOWL	CHECKPOINTS LOCK RING JOINT Procedure for seizure damage	



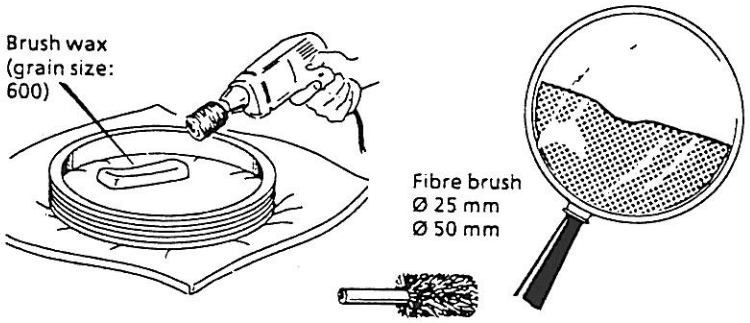
Clean threads, contact and guiding surfaces with a defatting agent, HNO_3 (1/2 % solution) or NaOH (1–2 %) to absolute clean material. This is important as the following programme otherwise is of minor value.



If the seizure damage is large, first use a fine and single-cut file, but moderately. Otherwise the damage may get worse. Remove the seizure damage material on top of the surface. Don't use rotating files etc. Just take away the damage, not the undamaged material.

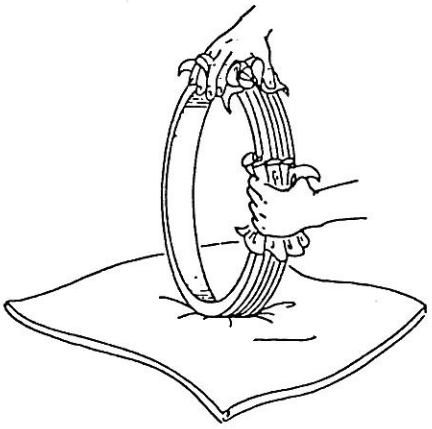


A fine-grain emery cloth, i.e. 240 should be used to smoothen off the edges and to remove the burnt impurities.

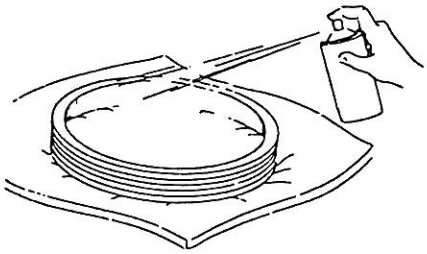


Accomplish the remedy by polishing the damaged spot with the fibre brushes and brush wax. It is recommended to polish the whole area where seizure damage may occur. The polishing will smoothen out the complete damage, even in the deepest parts.

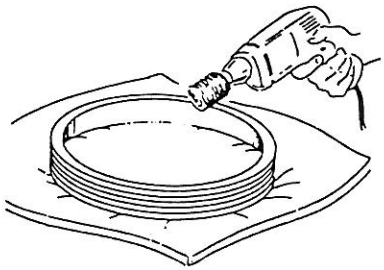
SEPARATOR BOWL	LOCK RING JOINT Repair of seizure damage	



The lock ring shall now be thoroughly cleaned, preferably with a detergent and afterwards with hot water (70-90°C).
The water temperature will warm the lock ring so that it will dry quickly. It is essential that the lock ring is perfectly polished and dry before applying any Molykote.

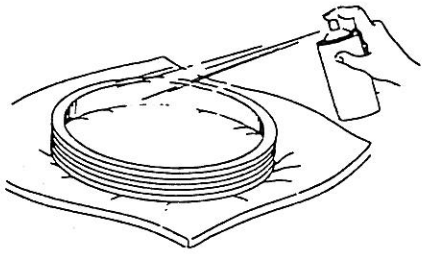


Spray the clean and dry surface with **Molykote 321R** and let it dry for 10 min.

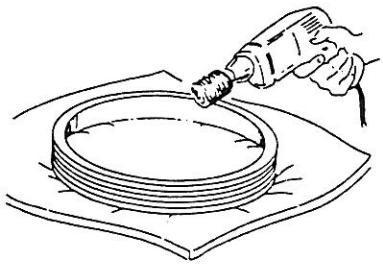


Use a fibre brush to polish the Molykote into the surface. The black spray will look like black shoe cream well polished when right performed.

Note! Never use the same brush as in previous operation.

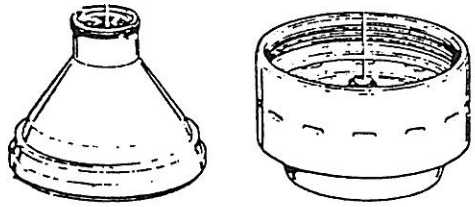


Spray the lock ring a second time and let it dry for 10 min.

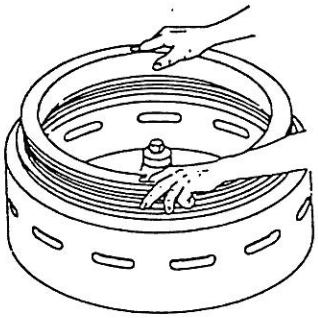


Polish the Molykote to a black shining surface which now can last about one year. Smaller dam - ages can be repaired locally.

SEPARATOR BOWL	CHECK POINTS LOCK RING JOINT. Seizure damage	

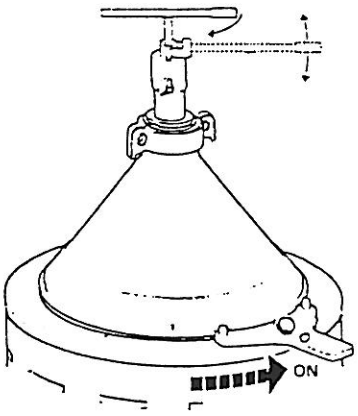


Proceed in the same way with the bowl hood and bowl body guides.



Before final mounting of the bowl check as a precaution that the lock ring turns easily on the bowl body threads. To this end the ring should be screwed on by hand without using the spanner. If it turns heavily, adjust according to recommendation in this instruction.

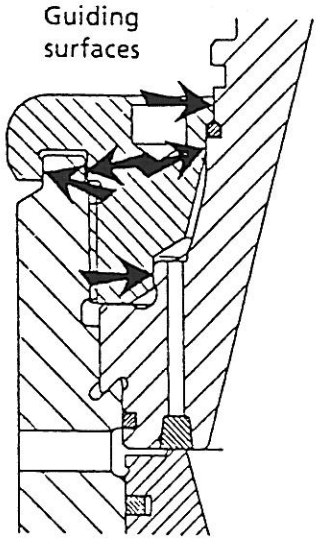
Check the roundness of the lock ring, if it is still turning heavily at different positions (oval).



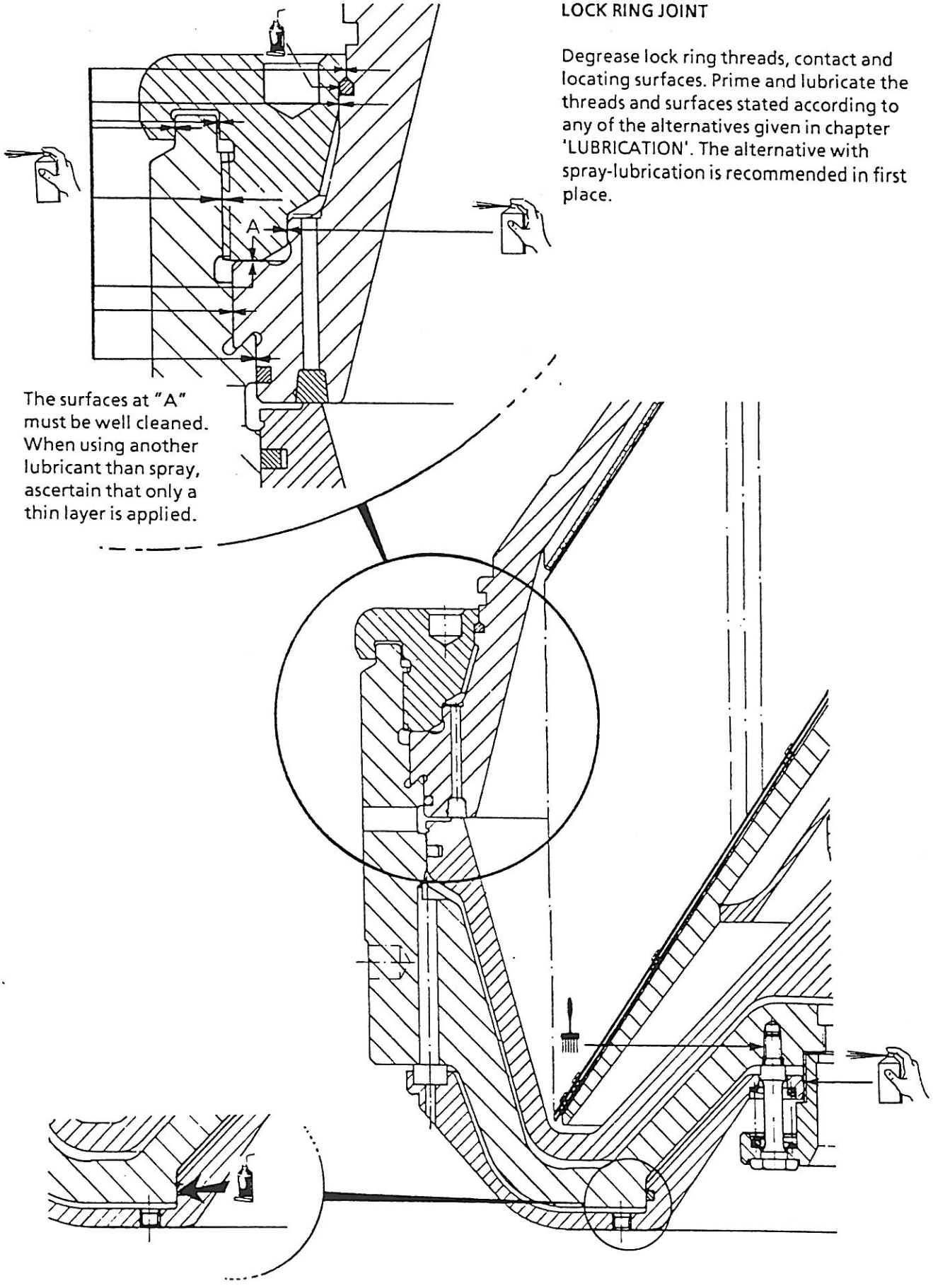
Final mounting of the lock ring.

Assemble
- distributor with disc stack
- top disc
- bowl hood

Assemble the lock ring according to directions in this chapter. The following must, however, be taken into consideration:
- When the lock ring is screwed on by hand, before pumping the compressing tool, do this slowly and gently. When the guiding surfaces bowl body/bowl hood are approaching each other, be extra careful. Shift the hands from the spanner handle to either side of the lock ring in order to feel, while gently continuing the screwing, that the guiding surfaces of the lock ring easily enter the corresponding surfaces of the bowl hood and bowl body.



SEPARATOR BOWL	LUBRICATION POINTS	



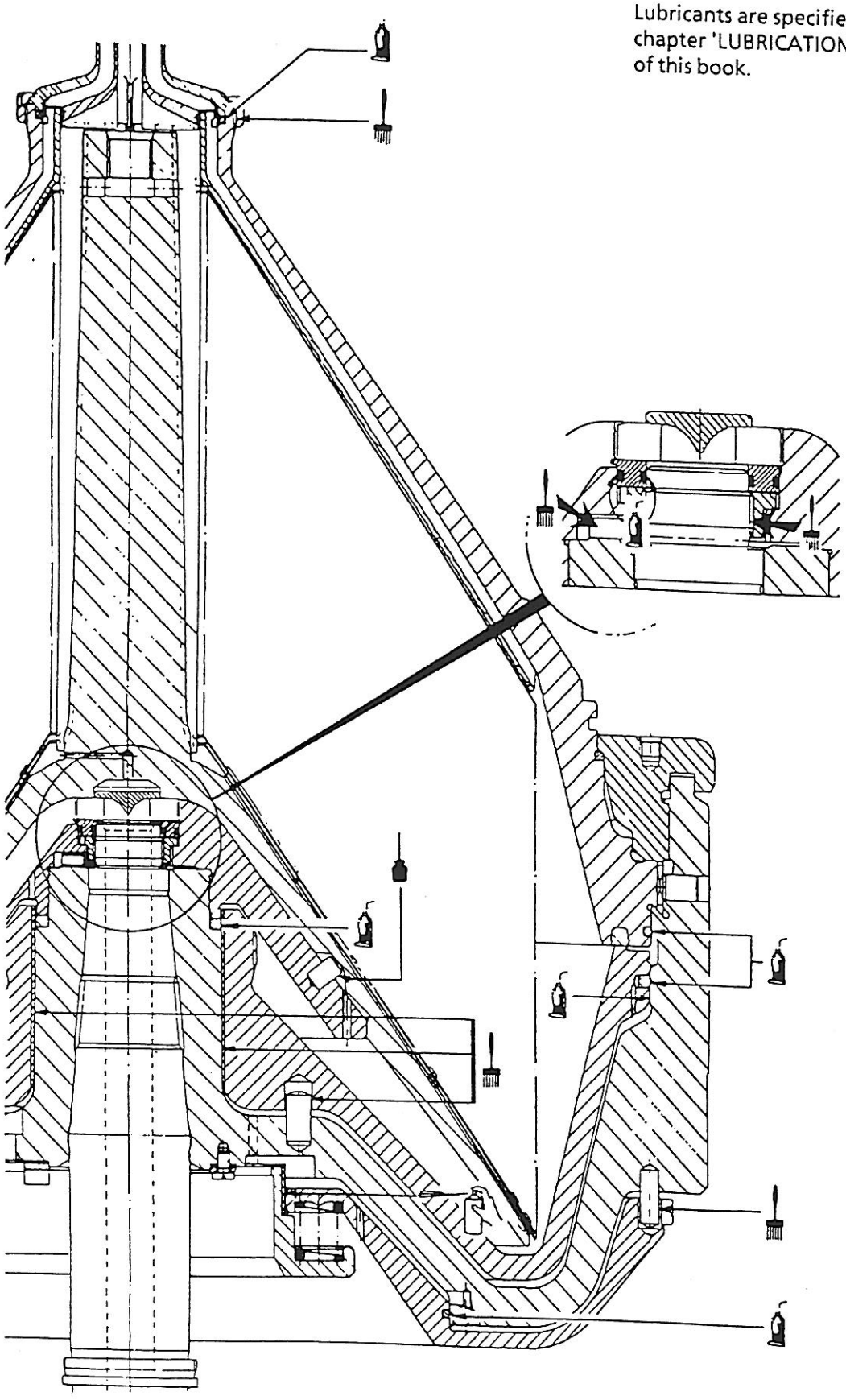
LOCK RING JOINT

Degrease lock ring threads, contact and locating surfaces. Prime and lubricate the threads and surfaces stated according to any of the alternatives given in chapter 'LUBRICATION'. The alternative with spray-lubrication is recommended in first place.

The surfaces at "A" must be well cleaned. When using another lubricant than spray, ascertain that only a thin layer is applied.

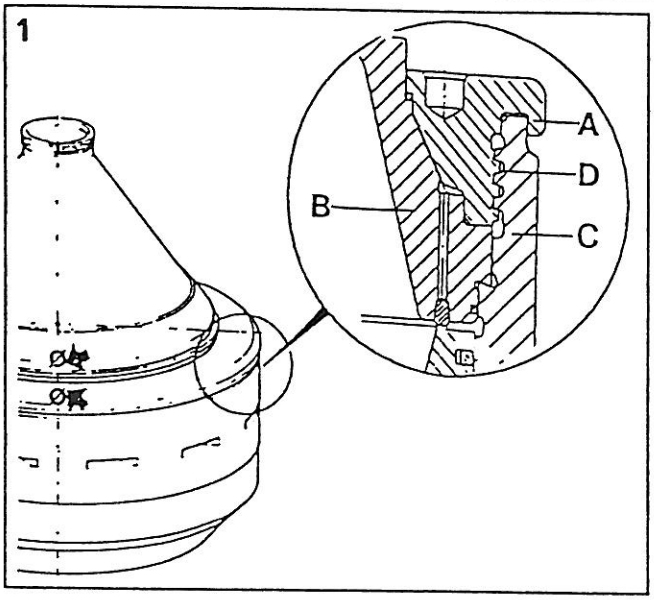
SEPARATOR BOWL	LUBRICATION POINTS	

Lubricants are specified in the chapter 'LUBRICATION' at the end of this book.



SEPARATOR BOWL	CHECK POINTS THREADS OF LARGE LOCK RING AND BOWL BODY	

1

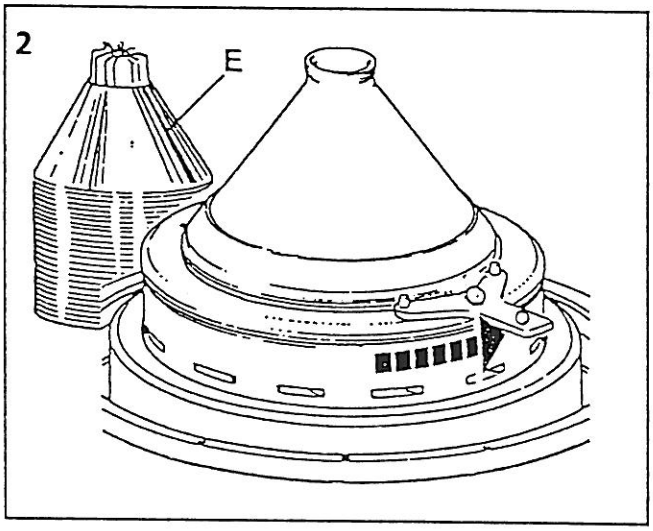


- The purpose of the lock rings (A) is to keep the bowl hood (B) securely in position against the bowl body (C) during operation. No play is permissible here. The threads (D) on the lock ring joint must not be worn to such an extent that the security of the lock ring joint is jeopardized.
  Excessive wear of these threads may involve risk of personal injury or damage of the equipment.

  Note! By using the hydraulic disc compression tool, thread wear is reduced to a minimum.

1. When the bowl is new the Ø-marks (see arrow) on bowl hood and lock ring are positioned exactly opposite each other. After some time, due to thread wear, these marks will pass each other when the lock ring is properly tightened.

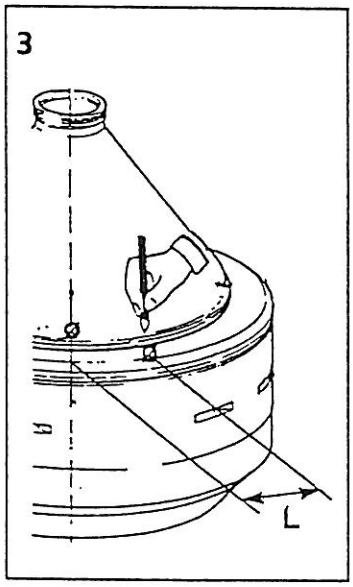
2



2. To check the thread wear, the threads of lock ring and bowl body must be properly cleaned and lubricated first. Remove the disc stack (E) and tighten the lock ring with a few blows of a lead hammer until it is fully tightened. The position of the lock ring relative to the bowl body and hood has now been established.

   If the Ø-marks are exactly opposite each other, proceed to the chapter "Check point – Disc stack pressure".

3



3. If the Ø-mark on the large lock ring has passed the Ø-mark on the bowl hood, mark the position of the lock ring mark with a felt-tipped marker pen on the bowl hood. This mark indicates the actual position of the lock ring by which the bowl hood is attached to the bowl body. This mark is needed for the following disc stack pressure check.

   Measure the distance "L" between the Ø-marks.
   – If the distance "L" is less than 150 mm proceed to the chapter "Check point – Disc stack pressure".

   – If the distance "L" exceeds 150 mm, the bowl must NOT be used! Get in touch with an Alfa Laval representative.

WARNING!

Risk of PERSONAL INJURY if operation is continued!

SEPARATOR BOWL	CHECK POINTS DISC STACK PRESSURE	

This check will ensure that the number of discs in the bowl is correct, so that two conditions have been fulfilled:

- The disc stack pressure is sufficient.
- Bowl hood and bowl body are securely attached to each other.

WARNING:

Incorrect disc stack pressure will cause vibration when running and can involve a risk of injury to personnel.

Assumptions:

- The wear on the lock ring joint has been checked. (See "Check points – Threads of large lock ring and bowl body").
- The position of the Ø-mark on the lock ring has been marked with a marker pen (only applies if the Ø-marks are NOT exactly opposite each other).
- All parts of the bowl have been cleaned.
- The sliding bowl bottom and distributing cone are in place.

Procedure:
Insert the complete disc stack in the bowl. The distributor fits into the guide pin and locked so that it cannot be turned in relation to the bowl body.

Remove the lifting eye from the distributor.
Place the bowl hood in position. Make sure that the groove in the hood fits into the guide pin in the bowl body. The bowl hood should drop down over the guide pin. Don't remove the bowl hood lifting tool.

Place the large lock ring on the bowl. Fit the lock ring tool on the lock ring and tighten the lock ring by hand.

Fit the hydraulic disc compression tool. The valve on the tool should point upwards – "Unloaded position". Use the handle to tighten the piston rod in the distributor.

Set the valve on the tool into the left position. Pump until no resistance can be felt in the handle. The disc stack has now been compressed by the hydraulic tool against the bowl hood and the axial force of the disc stack against the lock ring joint is thus unloaded.

Tighten the large lock ring by hand, then with a few blows of a lead hammer until it is tight. Pump again and tighten the ring finally with blows of the lead hammer until it is fully tightened.

- If the Ø-mark positions are as in "Check points - Threads of large lock ring and bowl body", proceed to instructions for "Pressure checking".

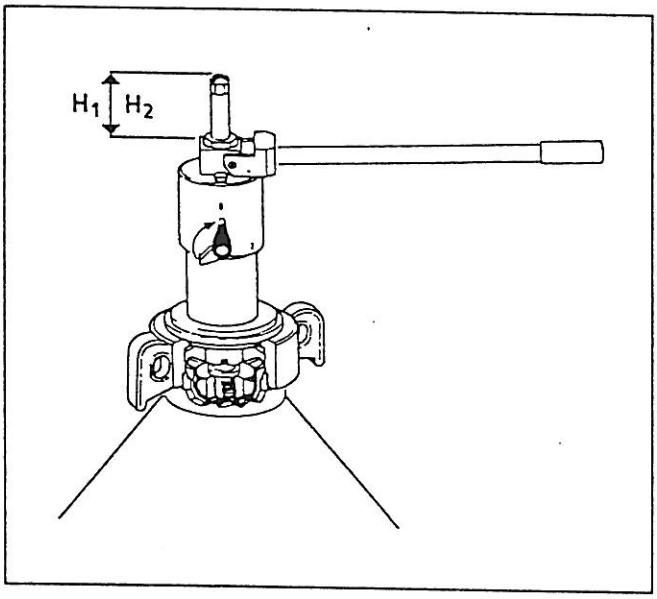
- If the Ø-mark positions are NOT as in "Check points – Threads of large lock ring and bowl body", the reason could be an incorrectly assembled bowl or too many discs in the disc stack. The bowl hood is not attached to the bowl body.

Disassemble the bowl and check that it is correctly assembled. If it is, then remove one or more discs and repeat the above described procedure. See also the instructions "Disc stack" below.

PRESSURE CHECKING

The position of the Ø-marks are now according to chapter "Check points – Threads of large lock ring and bowl body".

a/ The condition that the Ø-marks are exactly opposite each other has been fulfilled, or
b/ The condition that the Ø-mark is exactly opposite the felt-pen mark has been fulfilled.



Pump a few strokes until no resistance is felt in the handle.

Measure the height (H_1) of the piston rod (see fig.) with the depth gauge of a slide callipers. Make a note of the reading obtained.

Set the valve on the tool in the upwards position – "Unloaded position". The piston rod will now move down slightly when the disc set is released inside the bowl.

Measure once again the height (H_2) of the piston rod with the slide callipers and make a note of the reading obtained.

If the height difference H_1-H_2 is less than 2 mm, the disc stack pressure is correct.

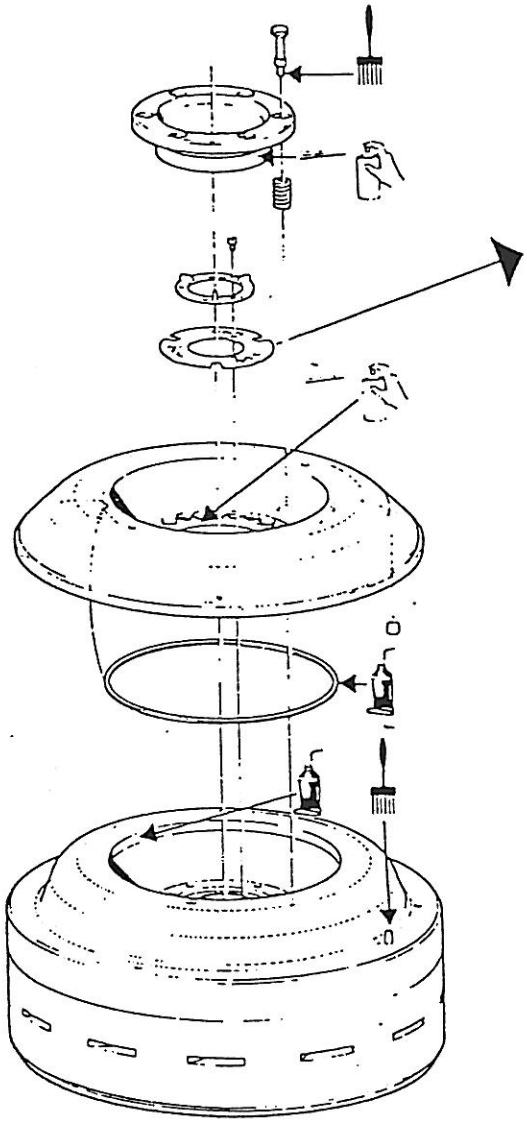
If the height difference exceeds 2 mm, the number of discs is not sufficient. Add one or more discs and repeat the above described check until correct disc stack pressure is obtained.

An insufficient number of discs permits the disc stack to wobble and cause unbalance in the bowl when running, resulting in vibration that cannot be eliminated by balancing.

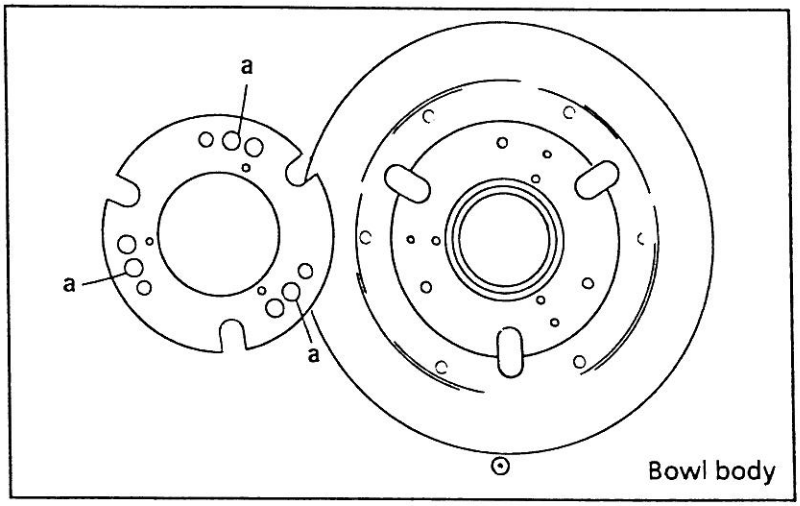
DISC STACK

The uppermost disc has thicker caulks than the other ones. The thick-caulked disc must always be located uppermost in the disc stack. If disc stack pressure is too low, add one or more bowl disc (not thick-caulked discs) to the top of the normal-caulked part of the stack. Replace the thick-caulked disc uppermost in the stack. Fit the bowl hood.

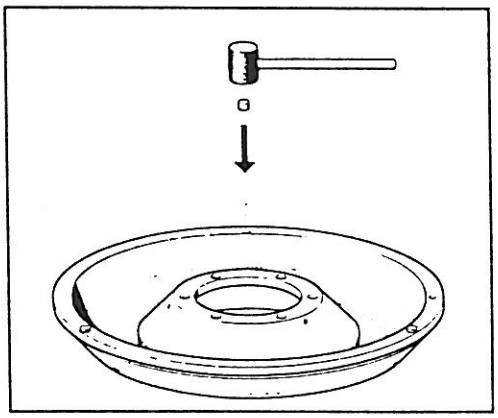
Ejection mechanism



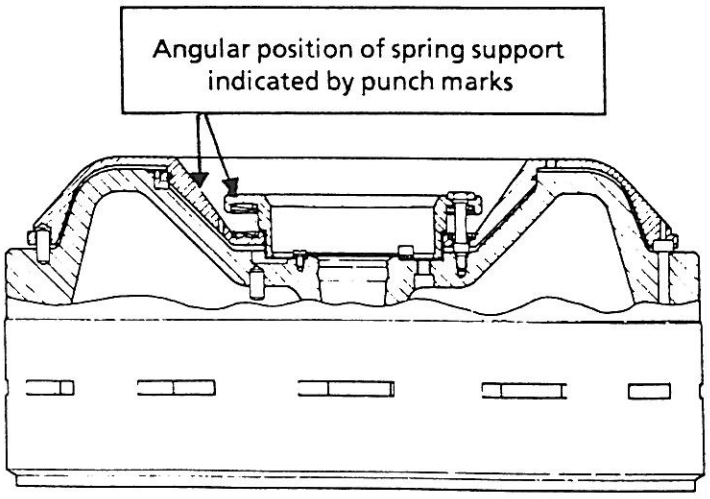
Lubrication of ejection mechanism. Specified directions are to be found on previous pages in this chapter.



Turn the gasket the right way. A gasket turned the wrong way could block the ducts for operating water. (This gasket is used for many separator types. For the types dealt with in this book the holes 'a' have no function.

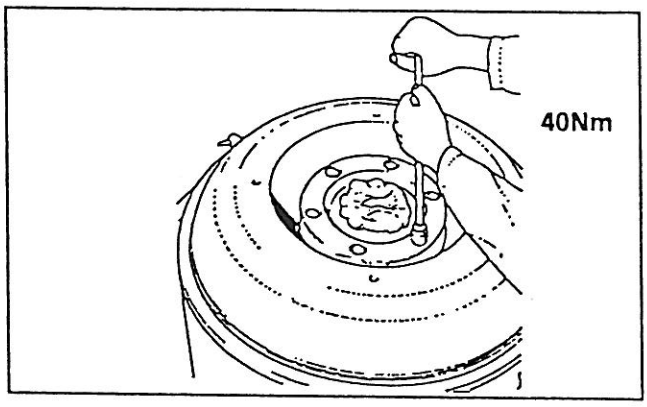


When inserting new plugs, use a rubber hammer or the like so as not to damage the sealing surface.

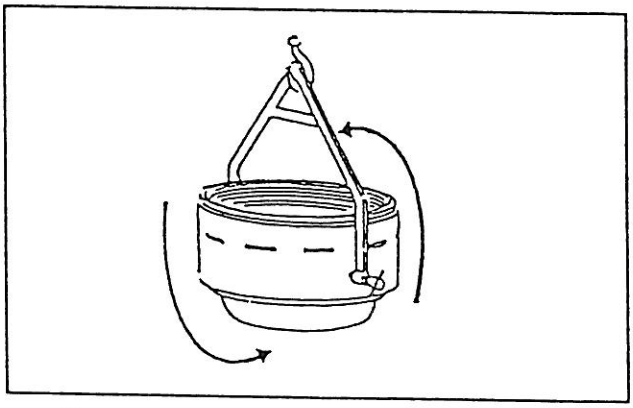


SEPARATOR BOWL	ASSEMBLY	

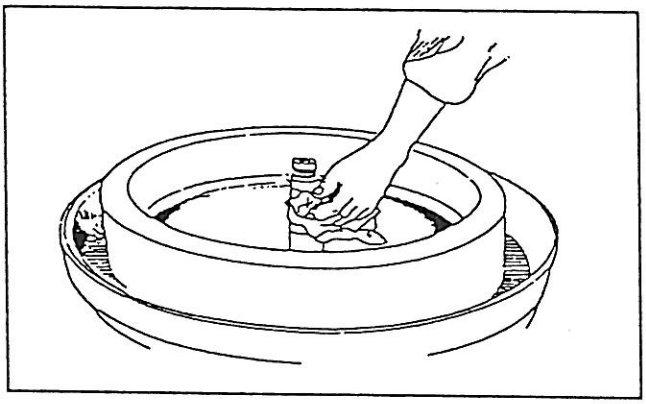
EJECTION MECHANISM. BOWL BODY



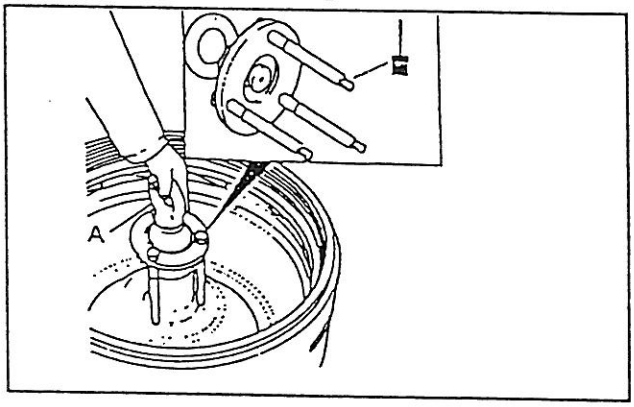
Protect the nave bore in bowl body with a rag.
Start with two diametrically opposite screws.
Then tighten screws successively a little at a time.
Final tightening torque **40 Nm.**



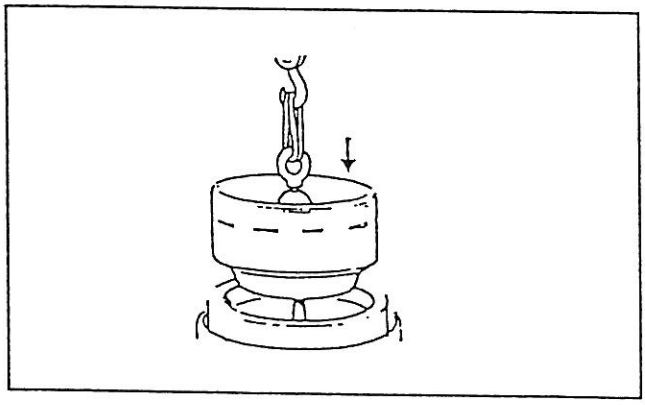
Warning
Ascertain that the screws of the turning tool are ***properly*** tightened, before turning the bowl upside down. Watch your fingers.



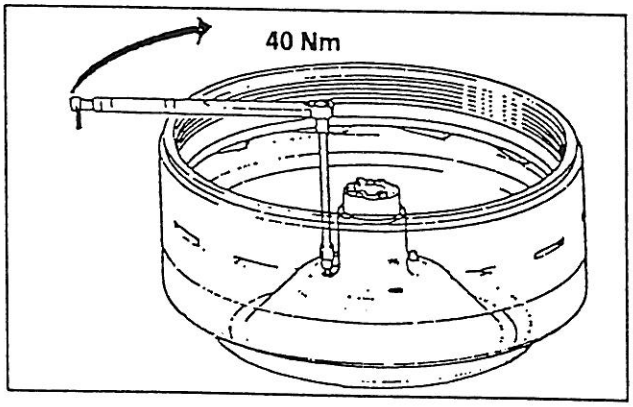
Clean spindle taper and nave bore in bowl body.



Apply the lifting tool of the bowl body. Important: Be sure that the three screws beeing properly screwed down into the bowl body. Screw down the centre screw (A) to the bottom position. Lift the bowl body onto the spindle.

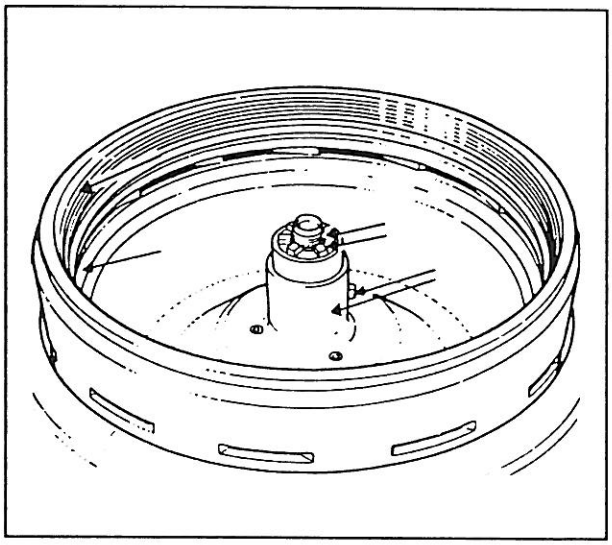


Lower bowl body until central screw rests on spindle top. Now unscrew the centre screw so that bowl body sinks down on the spindle taper.



Lubricate the screw threads with Molykote 1000 paste. Rotate the bowl body slowly and align it so that the screw holes in its bottom are exactly above the holes in the distributing ring. Lift up the distributing ring and tighten it against the bowl body by means of the three screws. Final tightening torque 40 Nm.

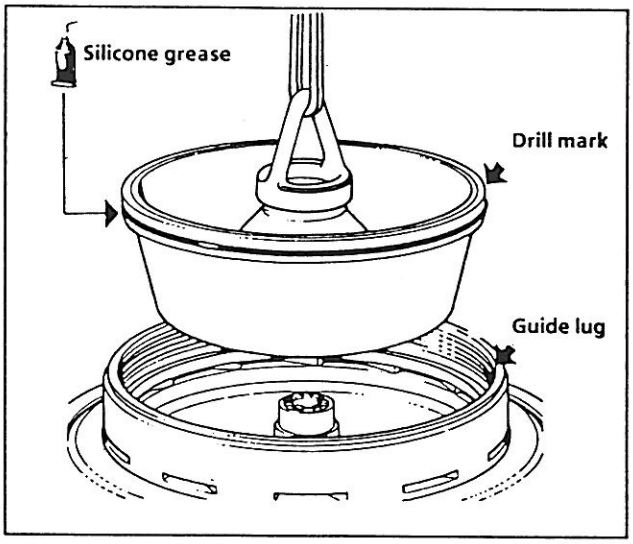
BOWL BODY. SLIDING BOWL BOTTOM. DISTRIBUTING CONE



Apply lubricant on

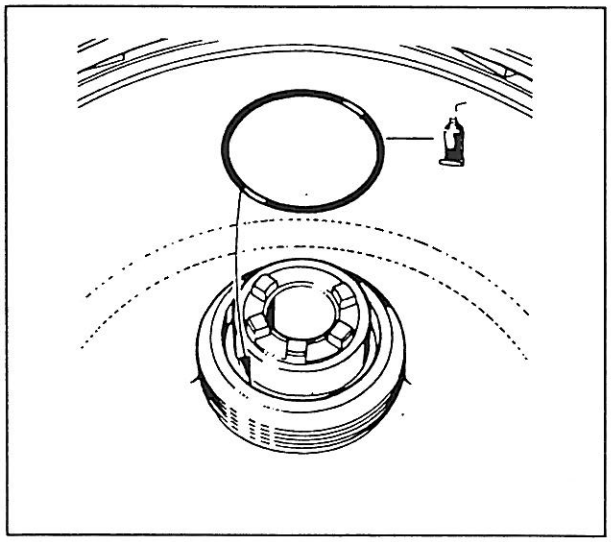
- threads of bowl body
- threads of bowl spindle
- bowl body nave on guiding surface and lugs
- guide pin in bowl bottom
- guiding surface for the sliding bowl bottom under the ejection openings in the bowl body.

See specified lubrication instructions in this chapter.

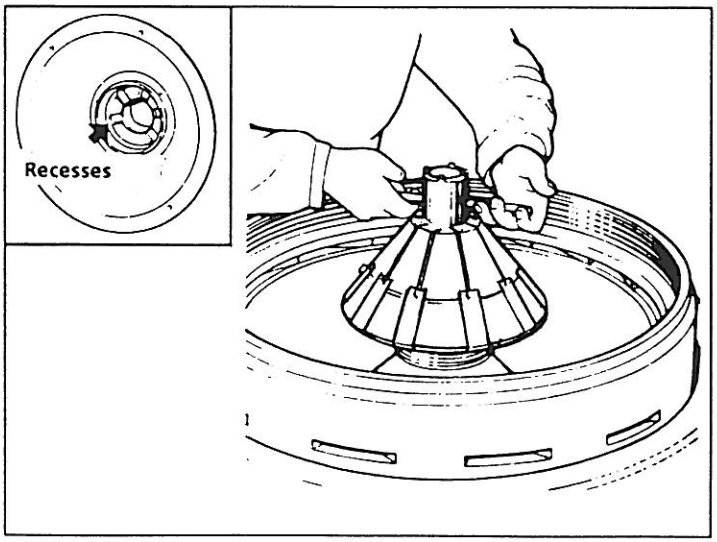


Take care to bring drill mark on sliding bowl bottom right in front of the guide lug in bowl body. This will ensure that sliding bowl bottom drops into correct position.

Note! Guide pin in the bottom.



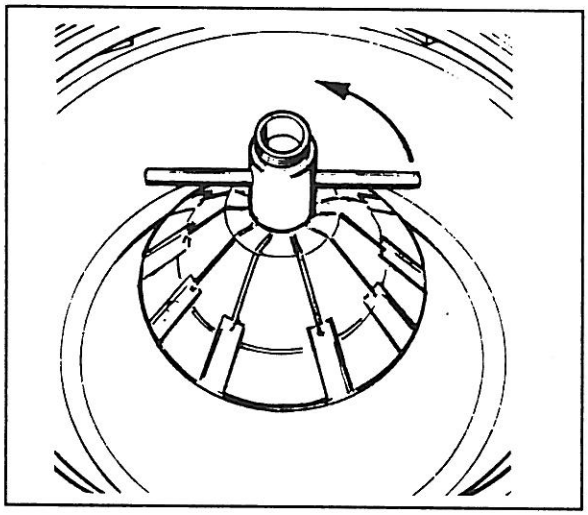
Avoid the risk of deforming the seal ring by fitting it after the sliding bowl bottom. As the bowl is completely full of process liquid under pressure, a defective seal ring can cause leakage of process liquid into the operating water system.



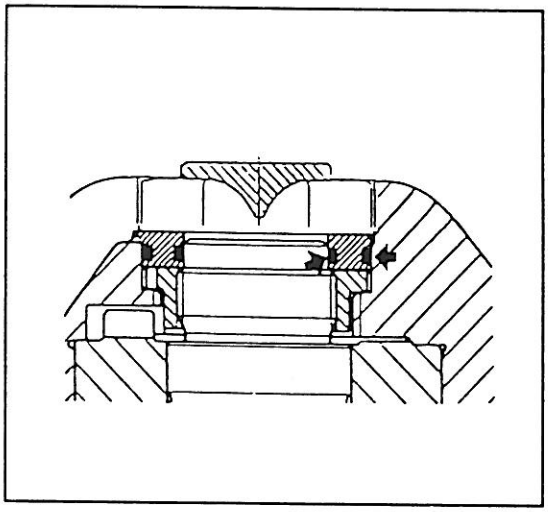
IMPORTANT

The recesses in the underside of the distributing cone must fit over the lugs on the bowl body nave. The mark on the distributing cone must be in line with the guide lug on the bowl body.

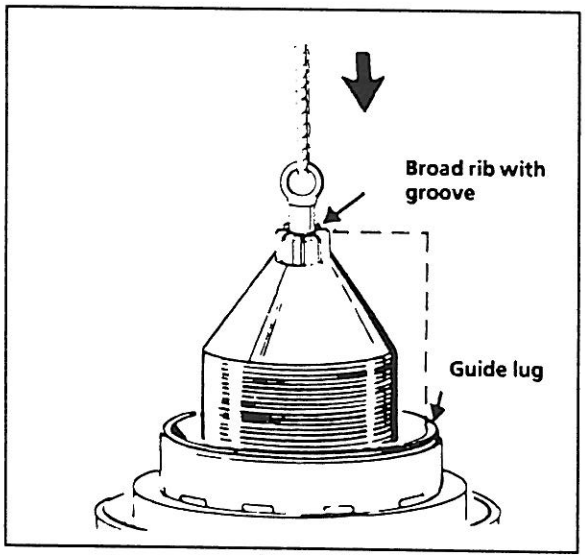
Cap nut. Wing crown. Disc stack. Distributor



Tighten the cap nut **counter-clockwise** on spindle (left-hand thread). Tighten firmly.



Apply **silicone grease** on the two O-rings for the **wing crown**. Put the O-rings in their grooves and press down the wing crown in the distributing cone. Knock cautiously with a soft hammer to get the wing crown into correct position.
Apply a light, non-toxic lubricant onto the guide pins of the distributing cone.

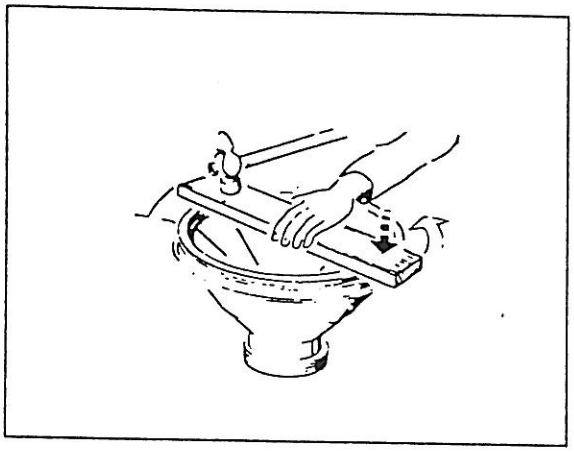


Disc stack pressure
– see ***CHECK POINTS*** in this chapter

IMPORTANT!

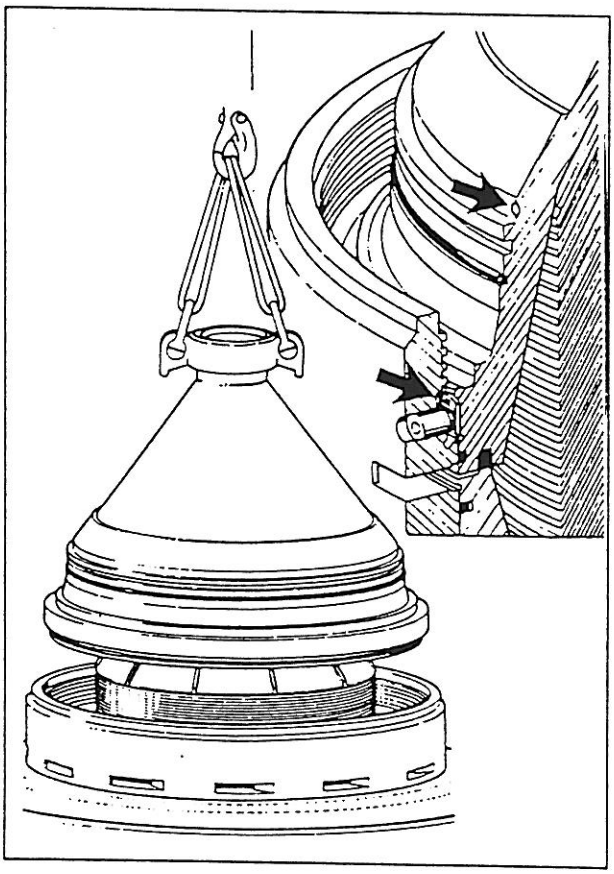
Make sure that the three guide pins of the distributor enter correctly into corresponding holes in the distributing cone. Do it like this: Place the distributor intentionally slightly offset in relation to the guide lug on the bowl body. Use a screwdriver or similar tool to turn the distributor carefully until it drops into place in the correct position.

BOWL HOOD. LARGE LOCK RING



When fitting a new seal ring in bowl hood:

If a new seal ring of nylon (amide resin) proves to be too wide when fitting, this is due to absorption of moisture. It will regain its correct dimensions after drying for about 24 hours at a temperature of 80°-90°C (175-195°F).
If the ring is too narrow – put it in hot water, 70°-80°C (160-175°F), for about 5 minutes.



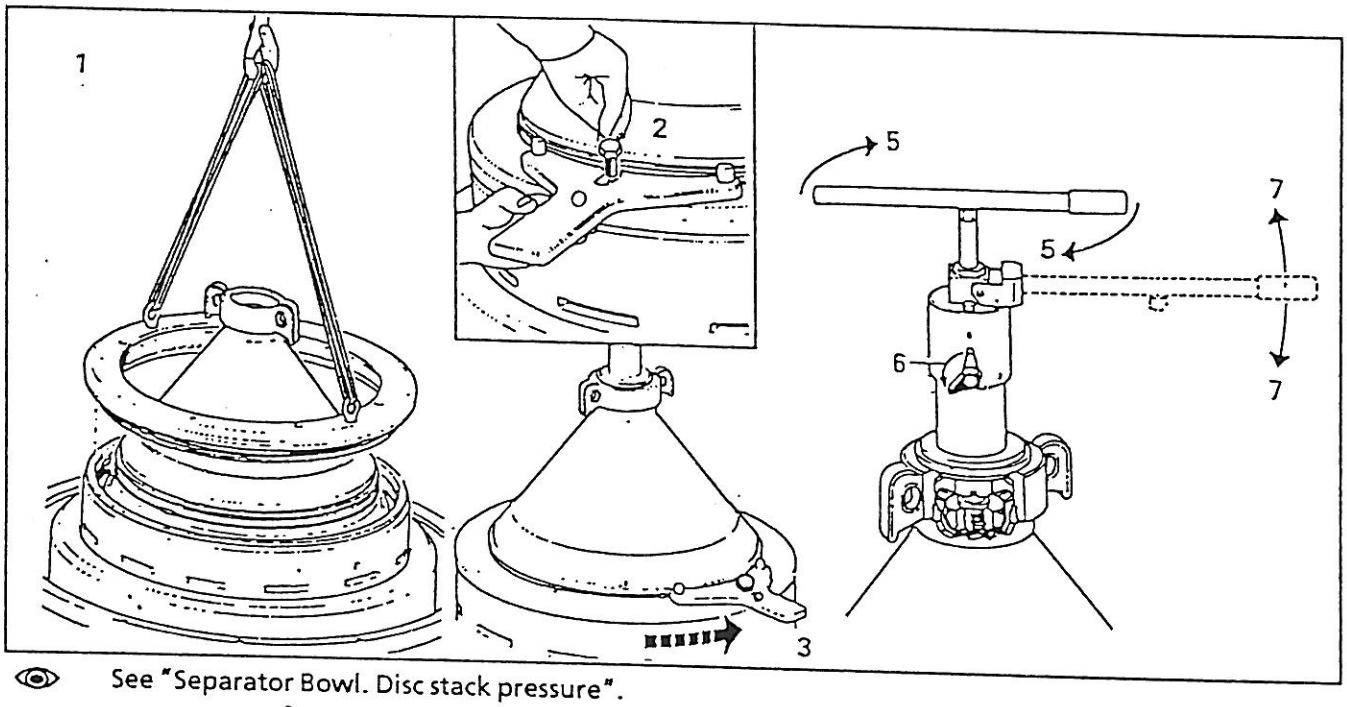
IMPORTANT!

Make sure that the groove in the bowl hood enters the guide lug in the bowl body.

See lubrication instructions in this chapter.

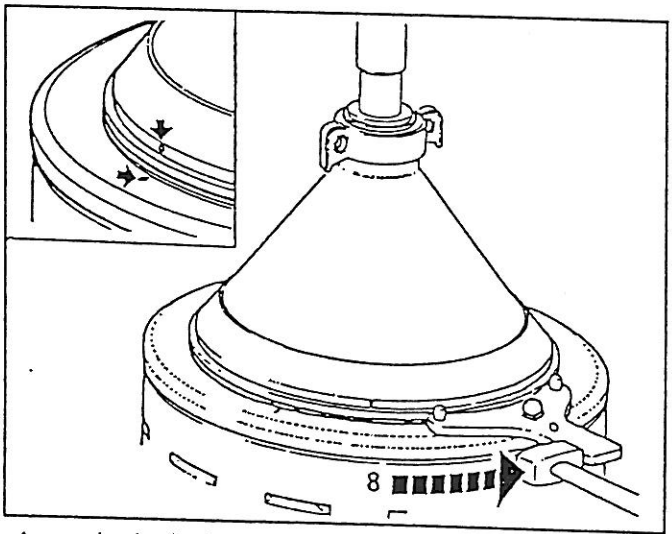
SEPARATOR BOWL	ASSEMBLY	

Large lock ring

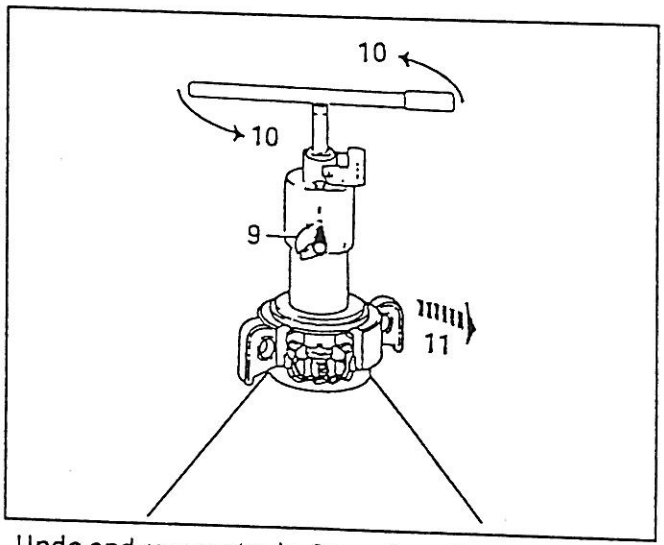


See "Separator Bowl. Disc stack pressure".

Lower the lock ring gently onto the bowl body (1). Fasten the lock ring spanner (2). Screw on the lock ring by hand as far as possible (3). Apply the compressing tool and carry out operations 5-6. Pump (7) and tighten the lock ring by hand (3) alternately a few times. Ascertain that full pressure is obtained in the compressing tool.



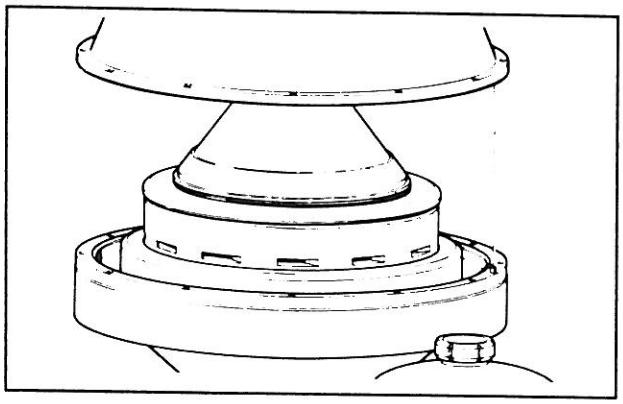
As a rule the lock ring can be tightened by hand until the distance between the Ø-mark on the lock ring and that of the bowl hood is 20-30 mm. The final tightening is carried out by hitting the spanner handle (8) until the spanner handle feels stiff, then check that the Ø-marks are at least opposite each other.



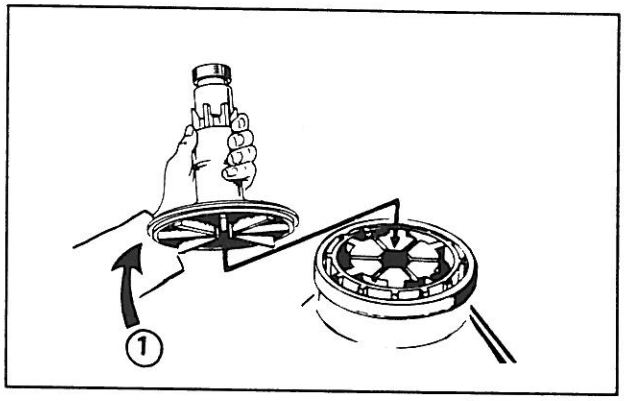
Undo and remove tools. Operations (9-11).

Note! If the paring disc device for operating water also has been assembled, check its height setting by rotating the bowl by hand and make sure the latter rotates freely.

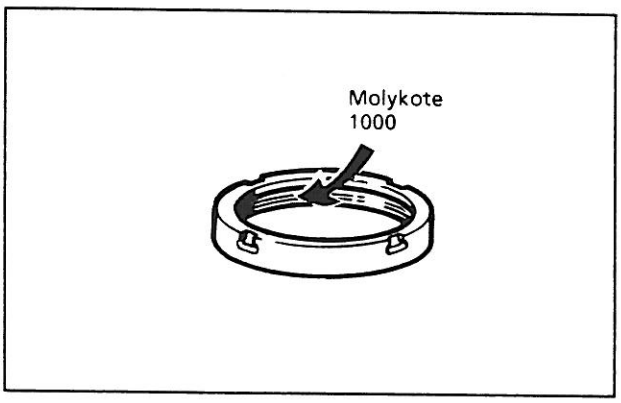
OUTLET PIPE. GUIDE SLEEVE. SMALL LOCK RING (Frame hood. Outlet)



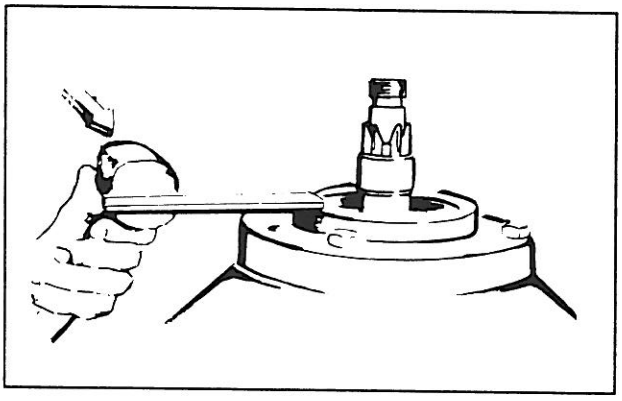
Note the angular positioning of the frame hood. Tighten the frame hood with the screws.



Note. Make sure that the seal ring (1) is undamaged.

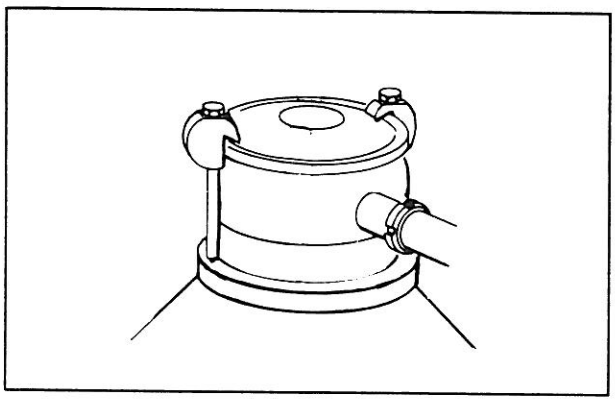


Apply Molykote 1000 on the inside of the lock ring.



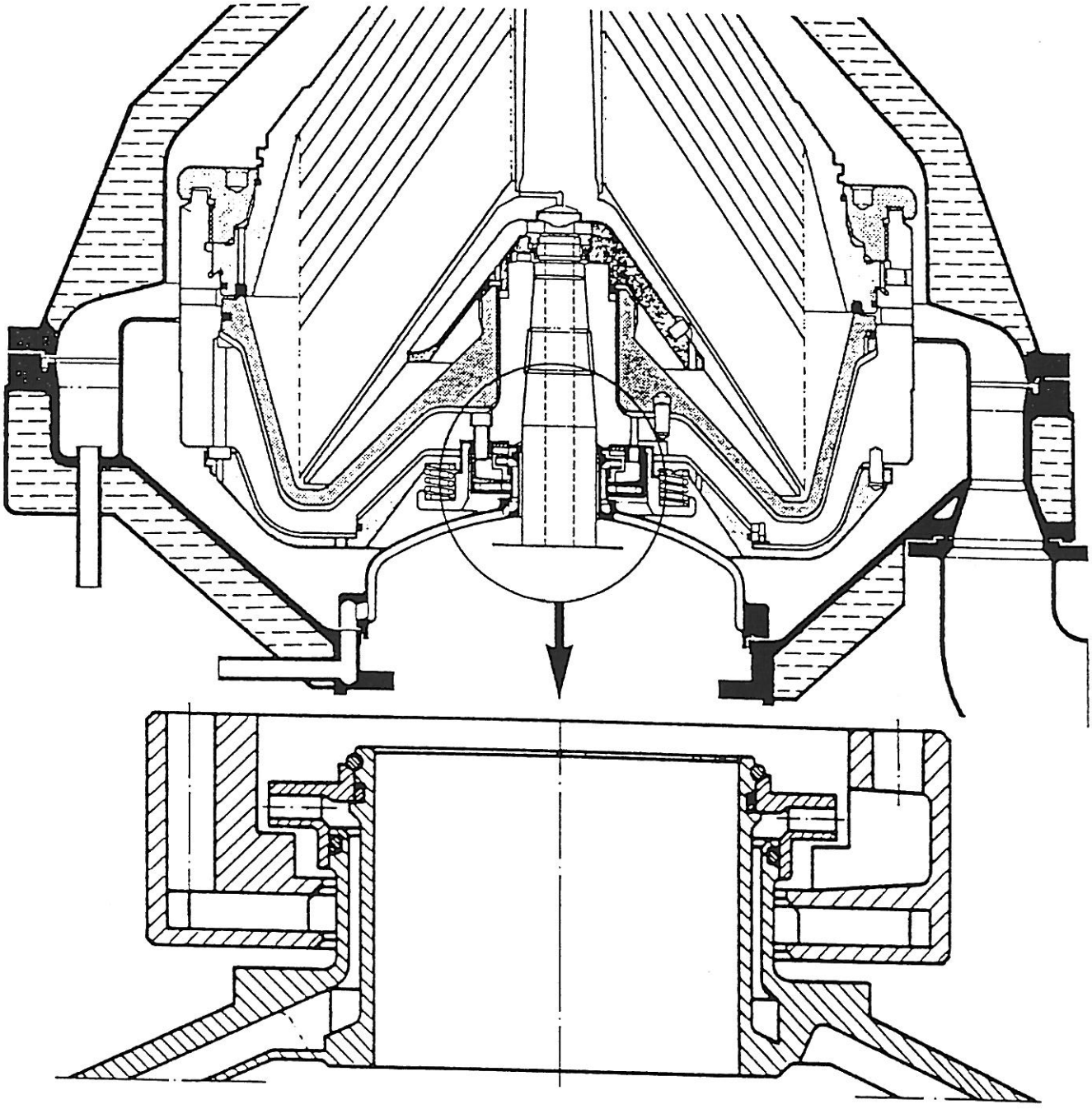
Radial wobble of outlet pipe.

When fitting, check eccentricity between outlet pipe and pump housing. See OUTLET. CHECK POINTS.



Assemble the outlet parts as instructed in Chapter OUTLET.
Note. The hook screws are tightened with a torque of 50 Nm (5 kpm).

PARING DISC DEVICE FOR OPERATING WATER		



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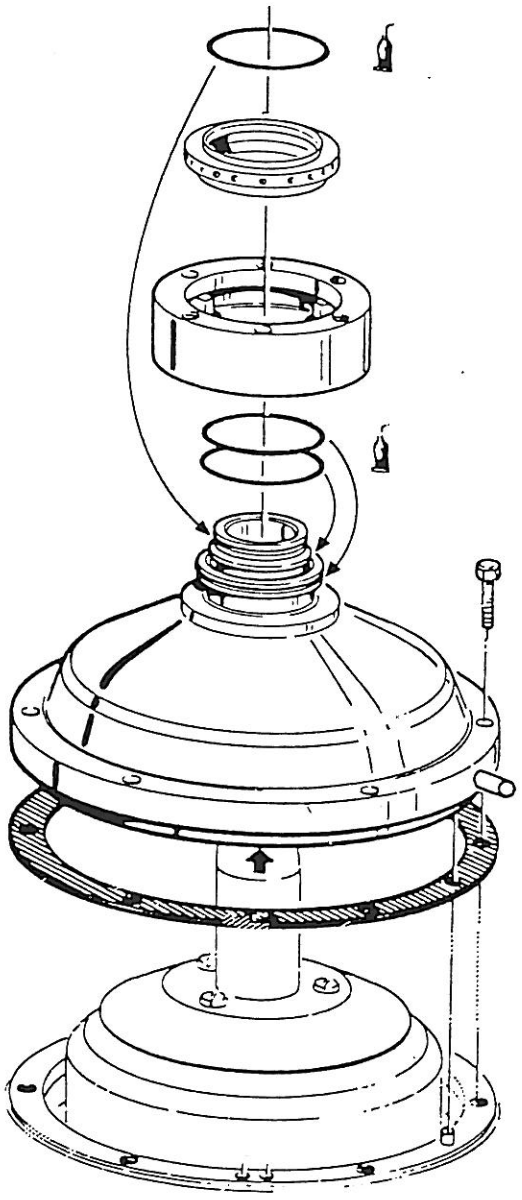
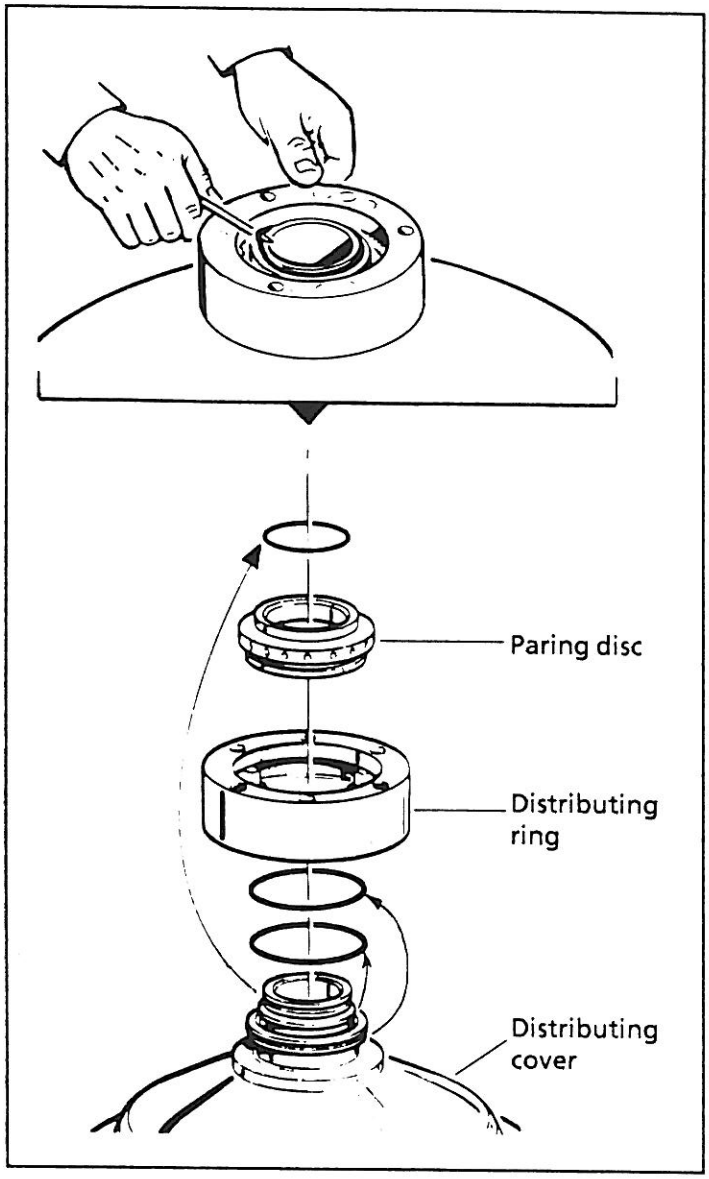
PARING DISC DEVICE FOR OPERATING WATER		

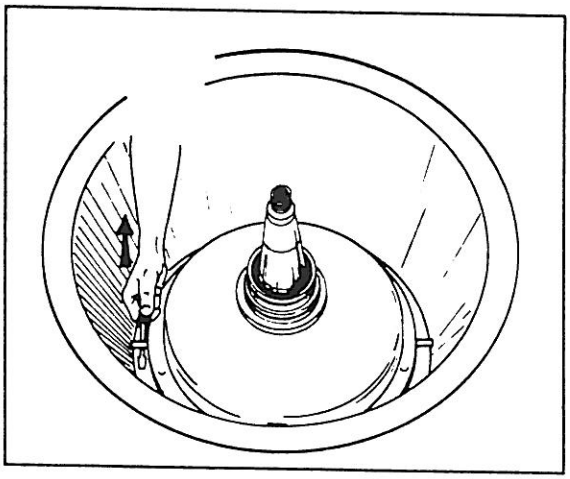


Apply lubricating grease of silicone type on to the O-rings.
See 'LUBRICATION' at the end of this book.

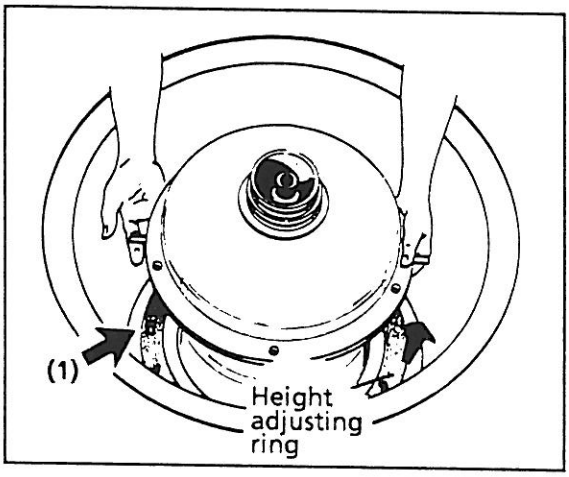
PARING DISC DEVICE FOR OPERATING WATER	DISASSEMBLY	



1 Tap the paring disc carefully with a soft drift, so that the upper O ring is unloaded. Remove the O ring with a small screwdriver or similar tool. Remove the paring disc by lifting up the distributing ring.



2 Remove the distributing cover as shown in the figure.



3 Notice the guide pin (1).

CHECK POINTS

Ducts

- Dirt and lime deposits in the ejection mechanism may cause bad ejecting function or none at all.

Clean all ducts with a soft iron wire or the like. Remove deposits on other surfaces with steel wool.

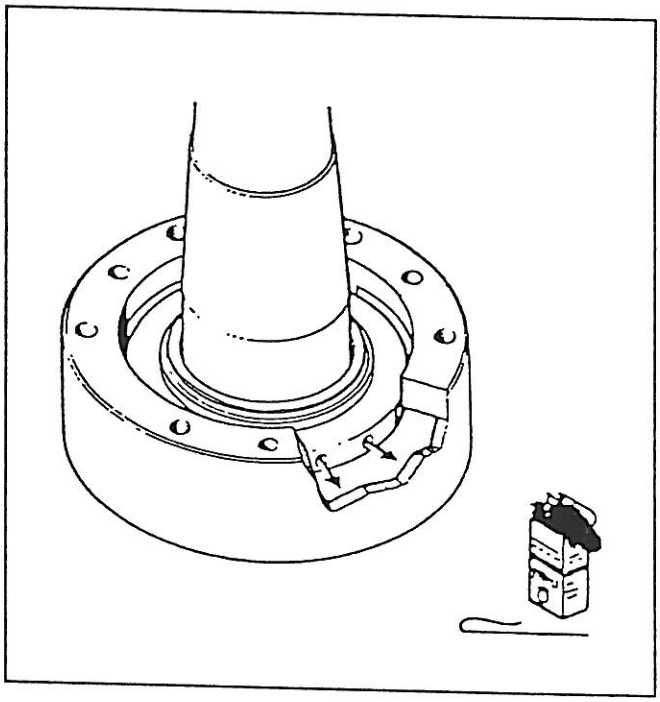
Rechecking water flow:

When the solenoid valve for make-up water is open, there should be weak water jets.

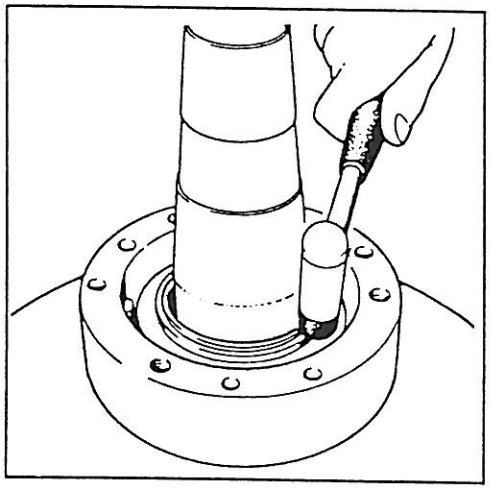
At operation the make-up water consumption is zero when the water pressure is less than 50 kPa (0.5 bar).

At discharge the water jets should be strong (1.5 – 3 litres / discharge).

Finally, when the machine is completely assembled, make a test run to make sure that the discharge function is in order.



ASSEMBLY



Assembly takes place by reversing the sequence of operations for disassembly. Observe the following:

The distributing cover is angularly positioned by a guide pin.

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

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

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

PARING DISC DEVICE FOR OPERATING WATER	ASSEMBLY	PX 614 PX 714	

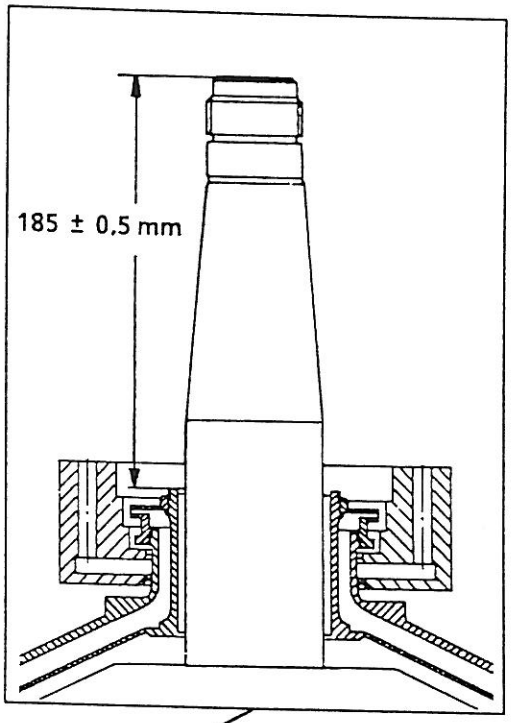
Height adjustment

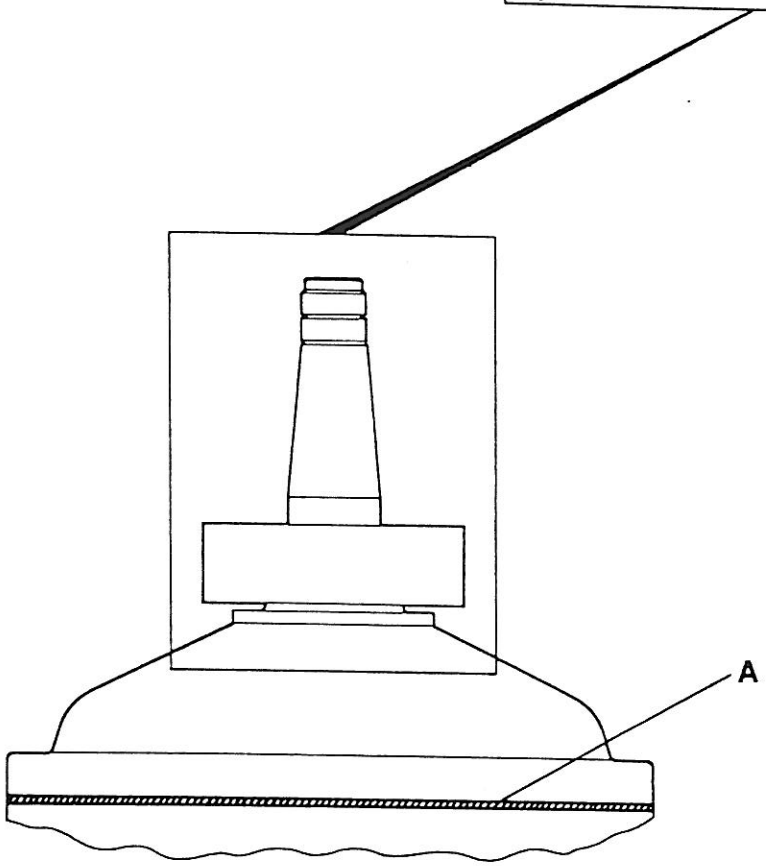
Check the height position after each assembly.

Use two steel rules or a depth gauge.

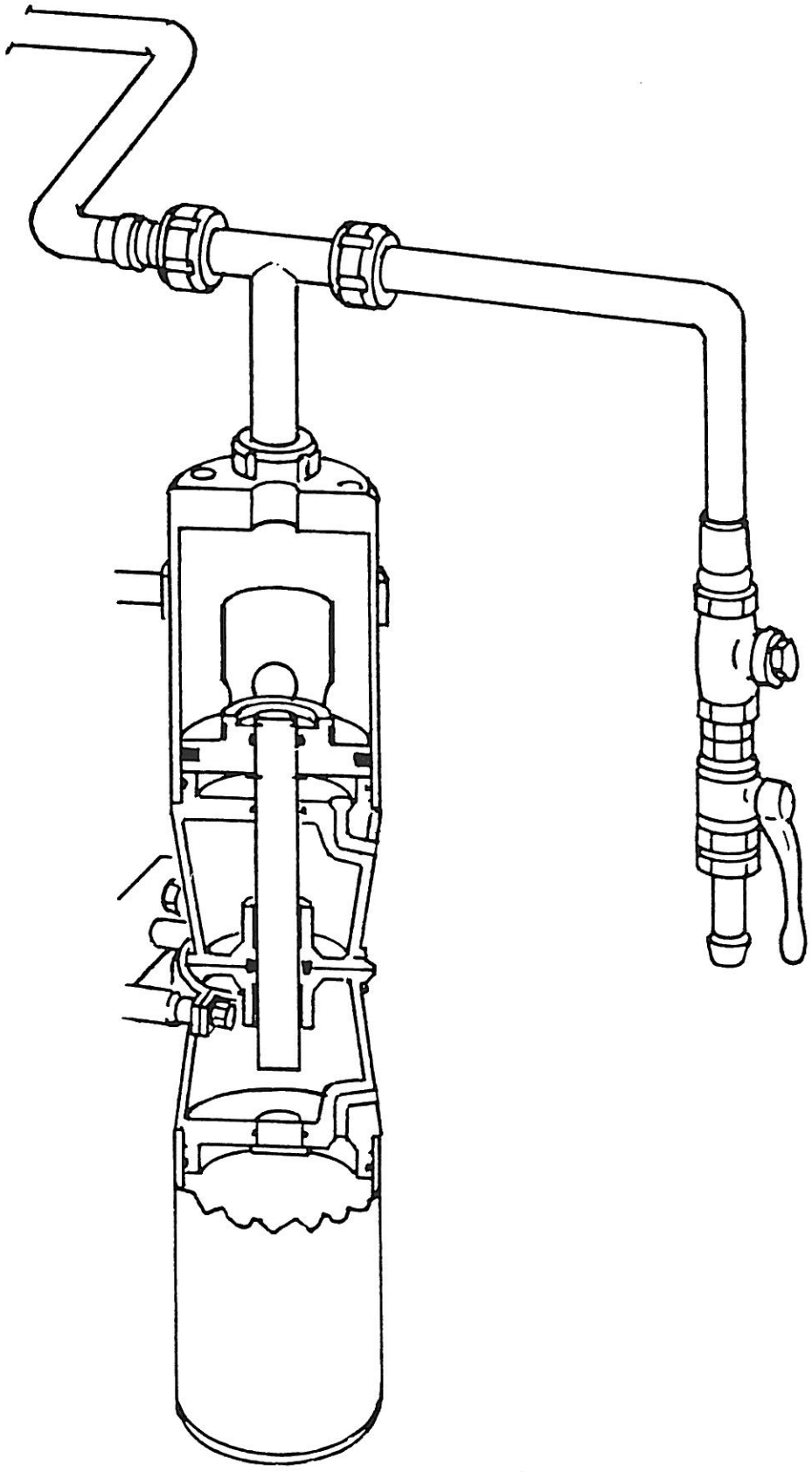
Any adjustment is made by means of one or more height adjusting rings A (1.0 mm thickness).

Note! Recheck the height position when the bowl has been mounted on the spindle by rotating the bowl by hand and make sure that it moves freely. A scraping noise may be an indication of incorrect positioning – readjust!

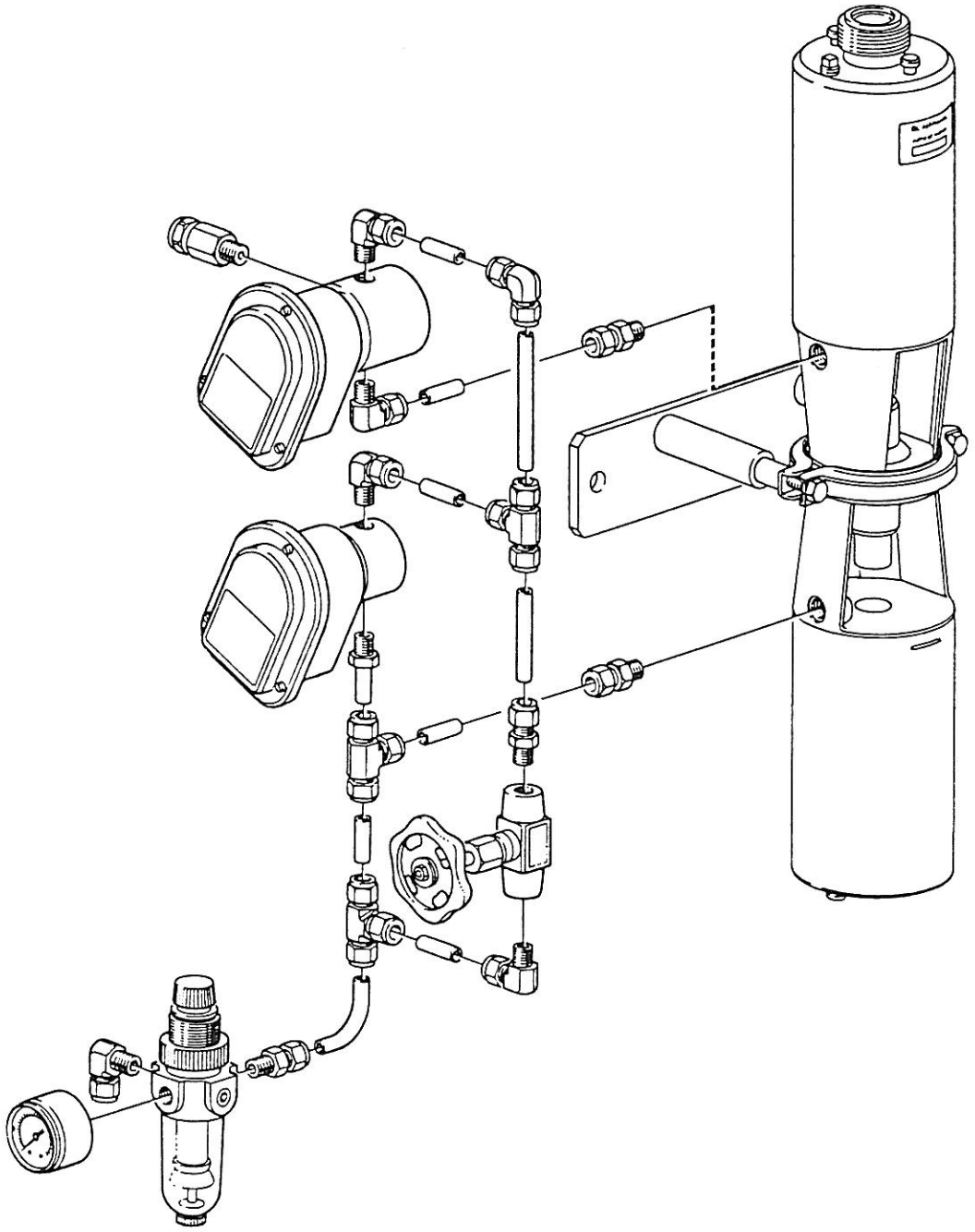




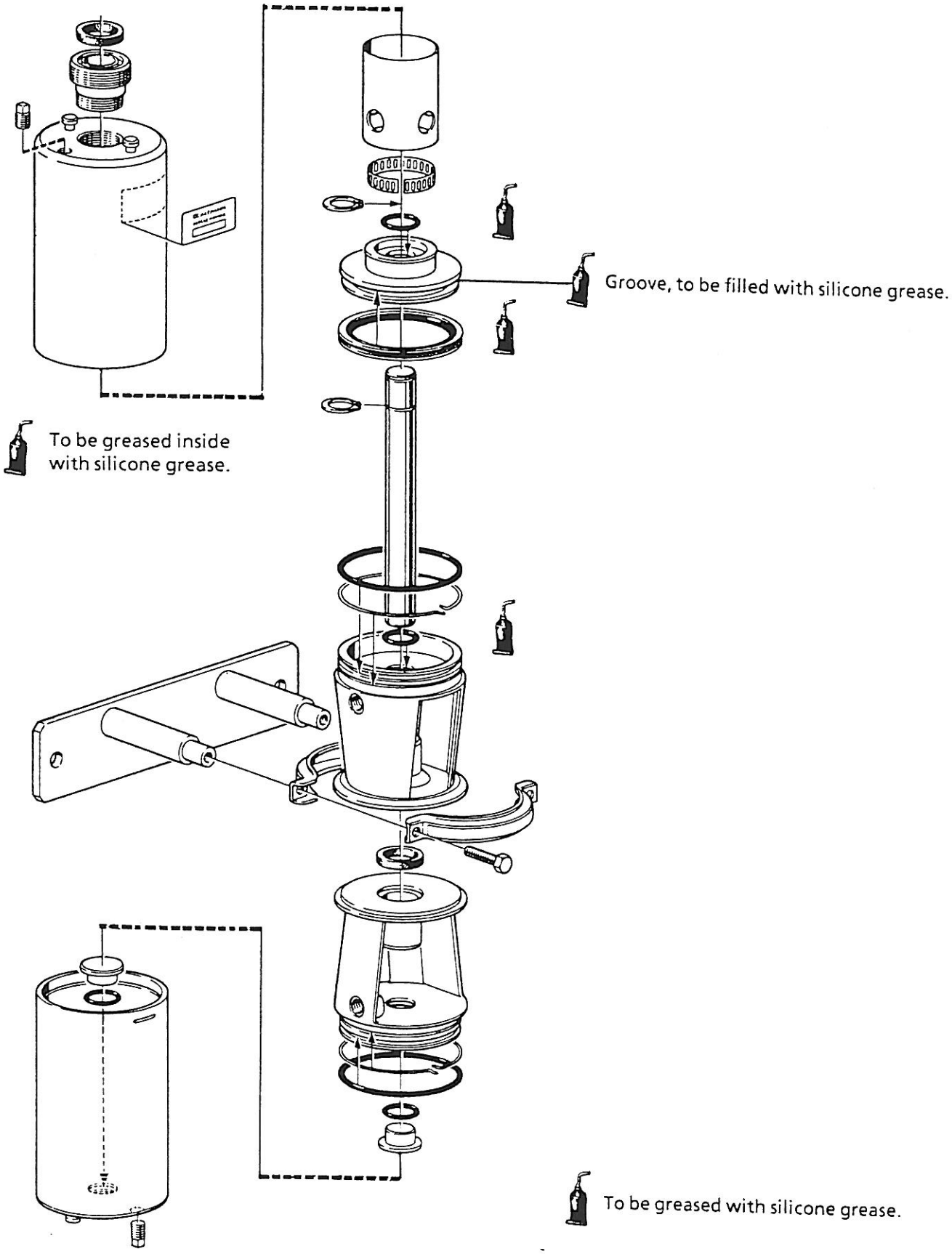
OPERATING WATER MODULE 220		



OPERATING WATER MODULE 220		

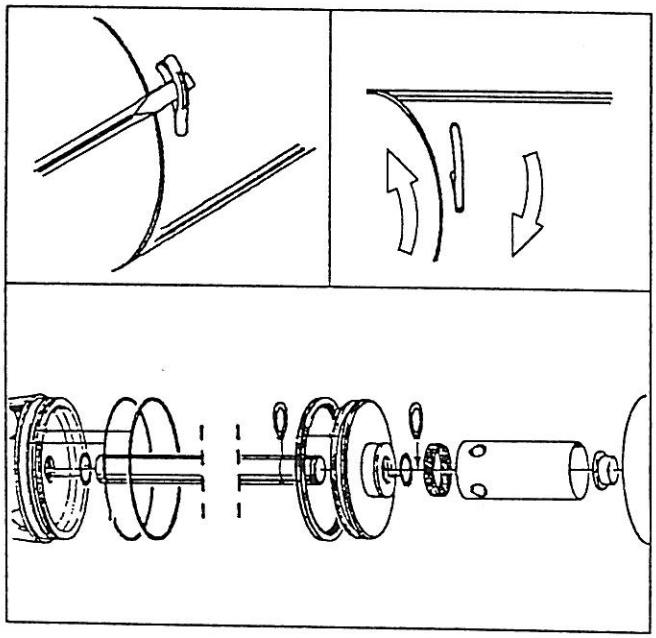


OPERATING WATER MODULE 220		



DISASSEMBLY

If required, the OWM unit should be disassembled according to the following procedure.



1. Remove the connections for operating water, compressed air and electricity.
   Remove the OWM unit from the separator frame.
   Turn the cylinder relative to the intermediate part until the end of the locking wire appears.

2. Use a screw driver and release the end of the locking wire from the OWM housing. Then turn the cylinder anti-clockwise relative to the intermediate part. The locking wire is thereby forced out.
   Note! Be careful to keep the cylinder straight against the intermediate part.

3. Pull off the cylinder with the piston.

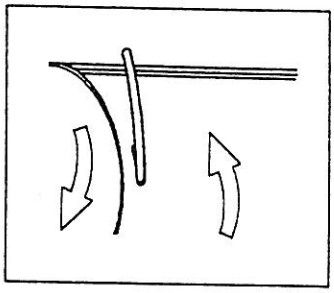
4. Remove the piston from the cylinder for inspection. Clean and inspect the condition of dismantled parts:

   - Check cylinder, piston and rod for scratches and scuffing marks.

   - Check the retaining rings of the piston for corrosion.

   Renew if necessary.

5. Lubricate the seal ring groove of the piston against the cylinder wall with silicone grease. Lubricate the cylinder wall with silicone grease.



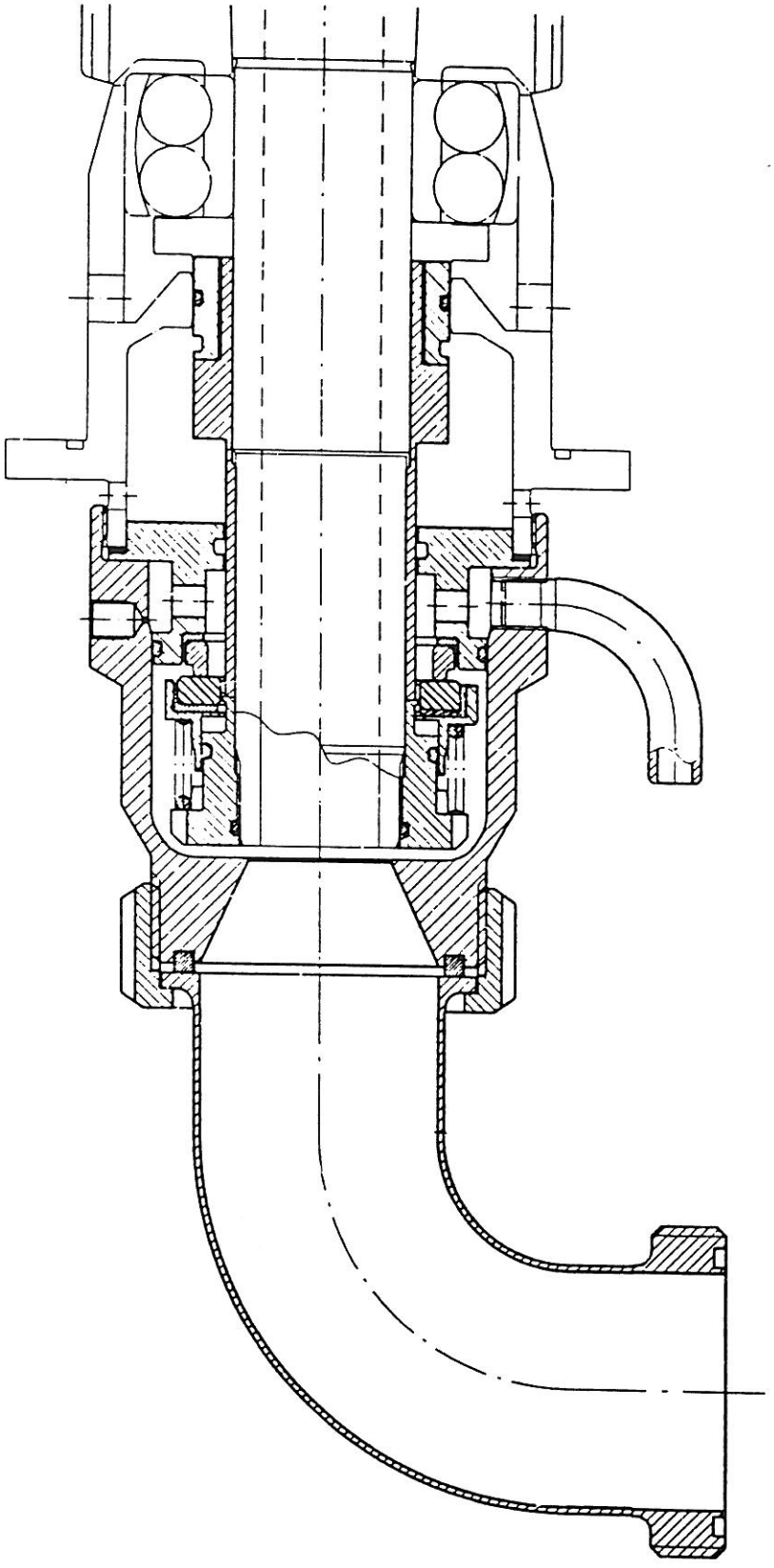
ASSEMBLY

1. Renew O-rings and necessary parts. Assemble the OWM unit opposite to disassembly.

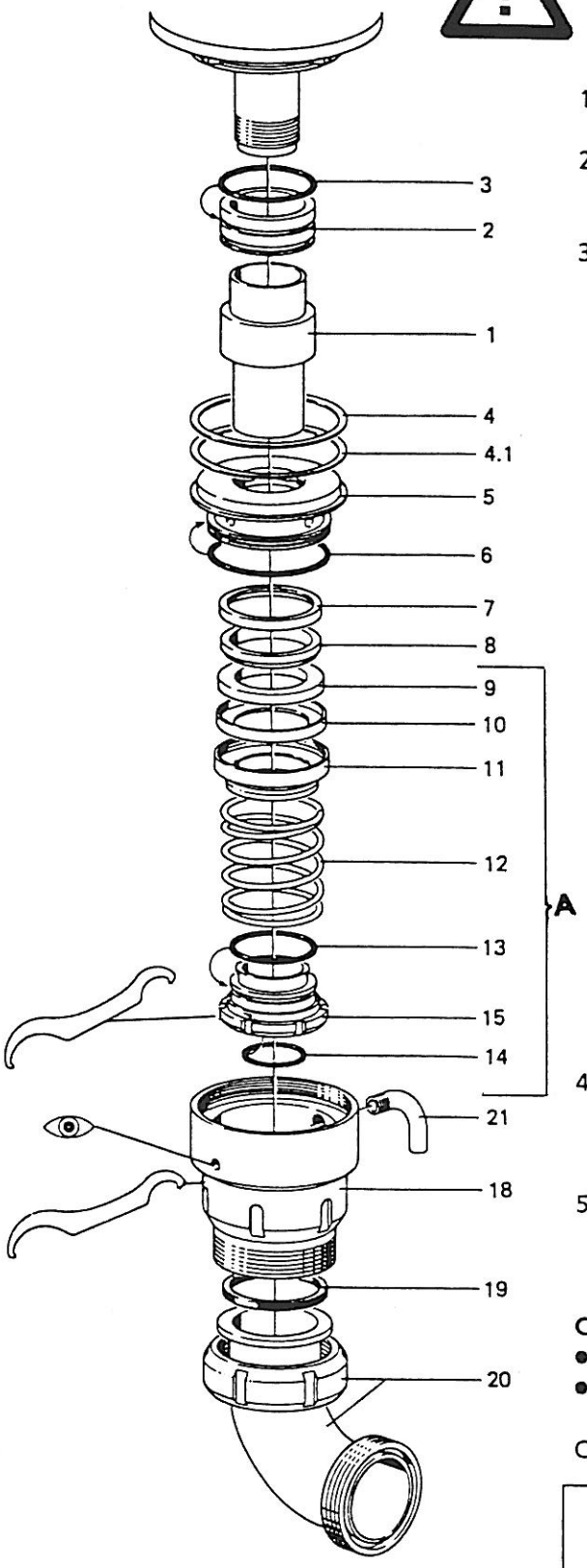
2. Secure the cylinder to the intermediate part with the locking wire by turning the cylinder clockwise relative to the intermediate part. Push the end of the locking wire into the groove, using a screwdriver.

3. Fit all connections.

INLET		



INLET	DISASSEMBLY	



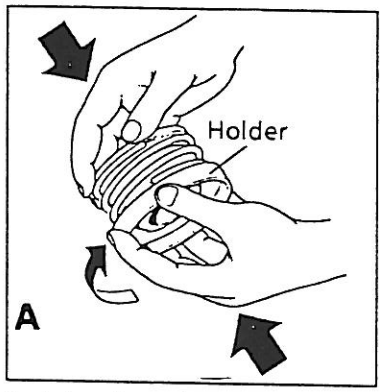
NEVER UNDO ANY PART OF THE MACHINE UNTIL THE BOWL IS **AT A STANDSTILL.**

1. Undo the ring nut and remove the elbow **20**.

2. Unscrew the inlet housing **18** with a hook spanner (right hand thread).

3. Unscrew the guide sleeve **15** with a hook spanner (right hand thread). The following parts will accompany the sleeve as one unit:
   - O-ring **14**
   - O-ring **13**
   - Spring **12**
   - Wear ring holder **11**
   - Gasket **10**
   - Wear ring **9**

   all joined together by a bayonet holder between guide sleeve and wear ring.

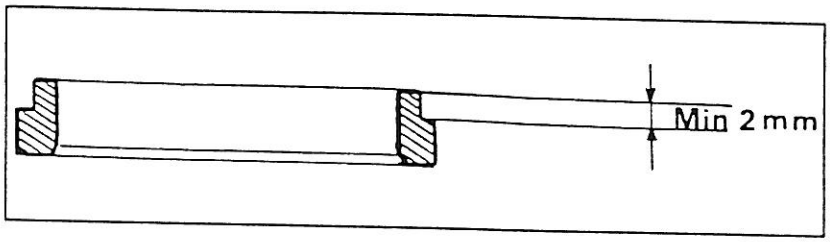


4. Seal ring **8**, gasket **7** and intermediate part **5** with O-ring **6** and height adjusting rings **4** can now be brought straight down, also the sleeve **1**.

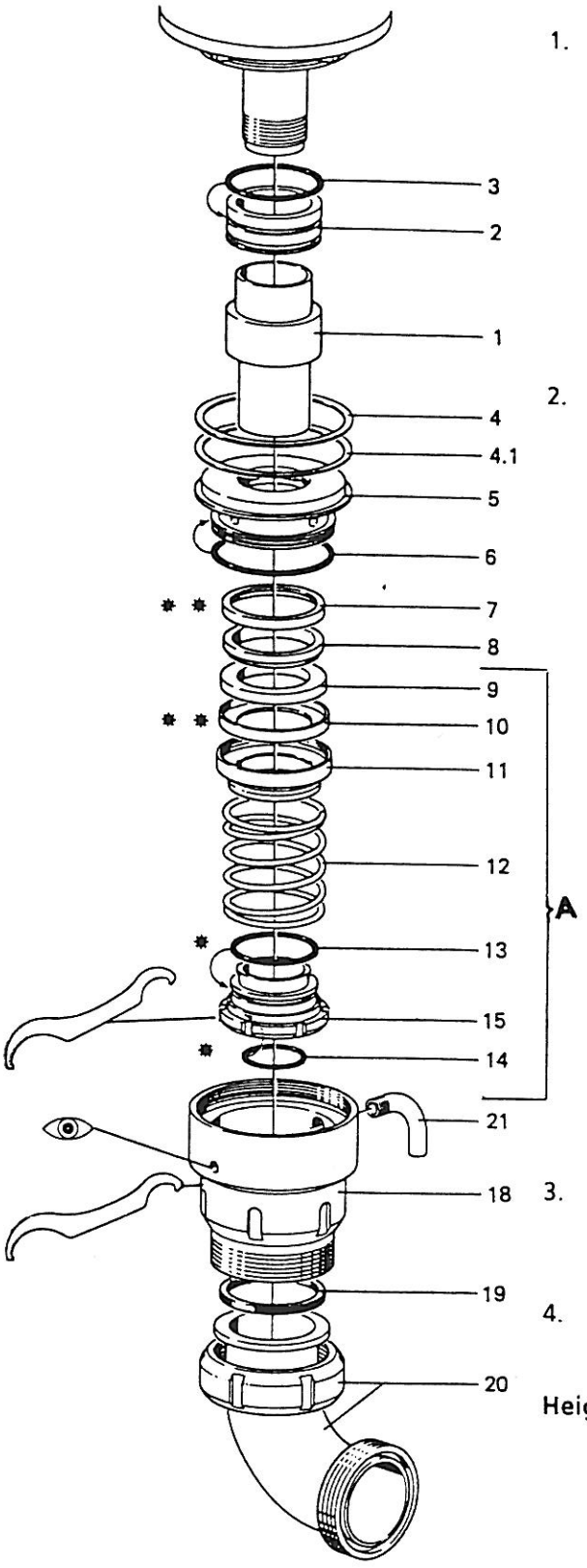
5. Finally, remove the throttling ring **2** (carbon ring) and O-ring **3** straight downwards. A machined groove at the bottom of the ring provides a grip.

Check especially:
- **Cooling water inlet hole (1.2 mm)** 👁
- **O-rings, seal ring, wear ring**

Checking the seal surface of a seal ring

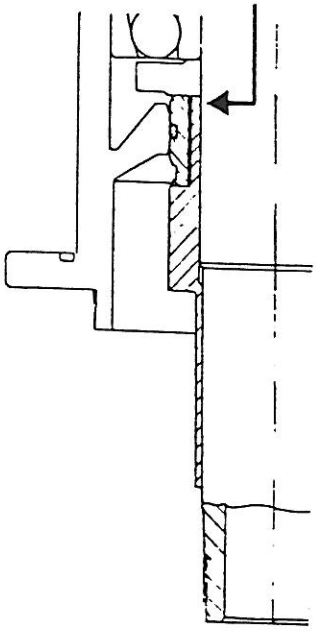


INLET	ASSEMBLY / HEIGHT ADJUSTMENT	



1. Assemble the unit A, i.e. the guide sleeve **15** and the wear ring holder **11** (bayonet holder) with other parts:
   - Wear ring **9**
   - Gasket **10**
   - Spring **12**
   - O-ring **13**
   - O-ring **14**.

2. Place the throttling ring **2** (carbon ring) with O-ring **3** on the sleeve **1**. Push the sleeve **1** up the spindle until it is hard up against the stop – see arrow.



3. Push up intermediate part **5** with height ring **4** (possibly also height adjusting ring **4.1**), O-ring **6**, gasket **7** and seal ring **8** on to the sleeve **1**.

4. Screw on the unit **A**, preassembled according to paragraph 1 above, using a hook spanner.

Height adjustment: next page.

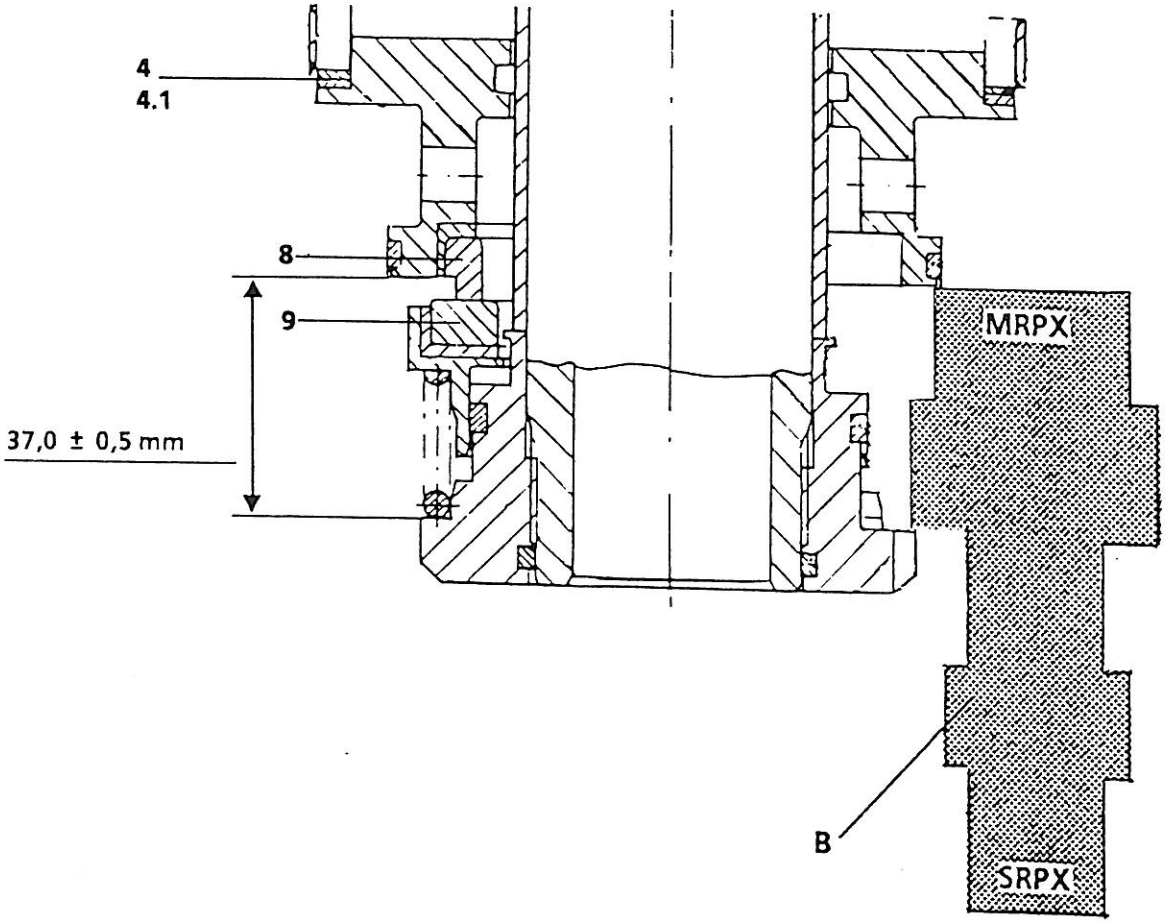
Lubricate with:

* Silicone grease

** Soapy water

5. HEIGHT ADJUSTMENT

Correct height setting will provide the correct clamping force between seal ring **8** and wear ring **9**. A clamping force that is too low will cause leakage of process liquid into the cooling water side. If the clamping force is too high, the seal ring will be rapidly worn out.



Check the height setting after every assembly. The bowl must be mounted on the spindle when this check is made.

Note! When checking the height by means of the templet (**B**), the spring **12**, the wear ring holder **11**, the wear ring **9**, the gaskets **7** and **10** and the seal ring **8** are not mounted.

Measure the height dimension given as 36.5 – 37.5 mm in the figure. If necessary, obtain the correct dimension with the aid of the height adjusting rings **4** (thickness 1.0 mm).

If measured dimension is less than 36.5 mm: Remove one height adjusting ring

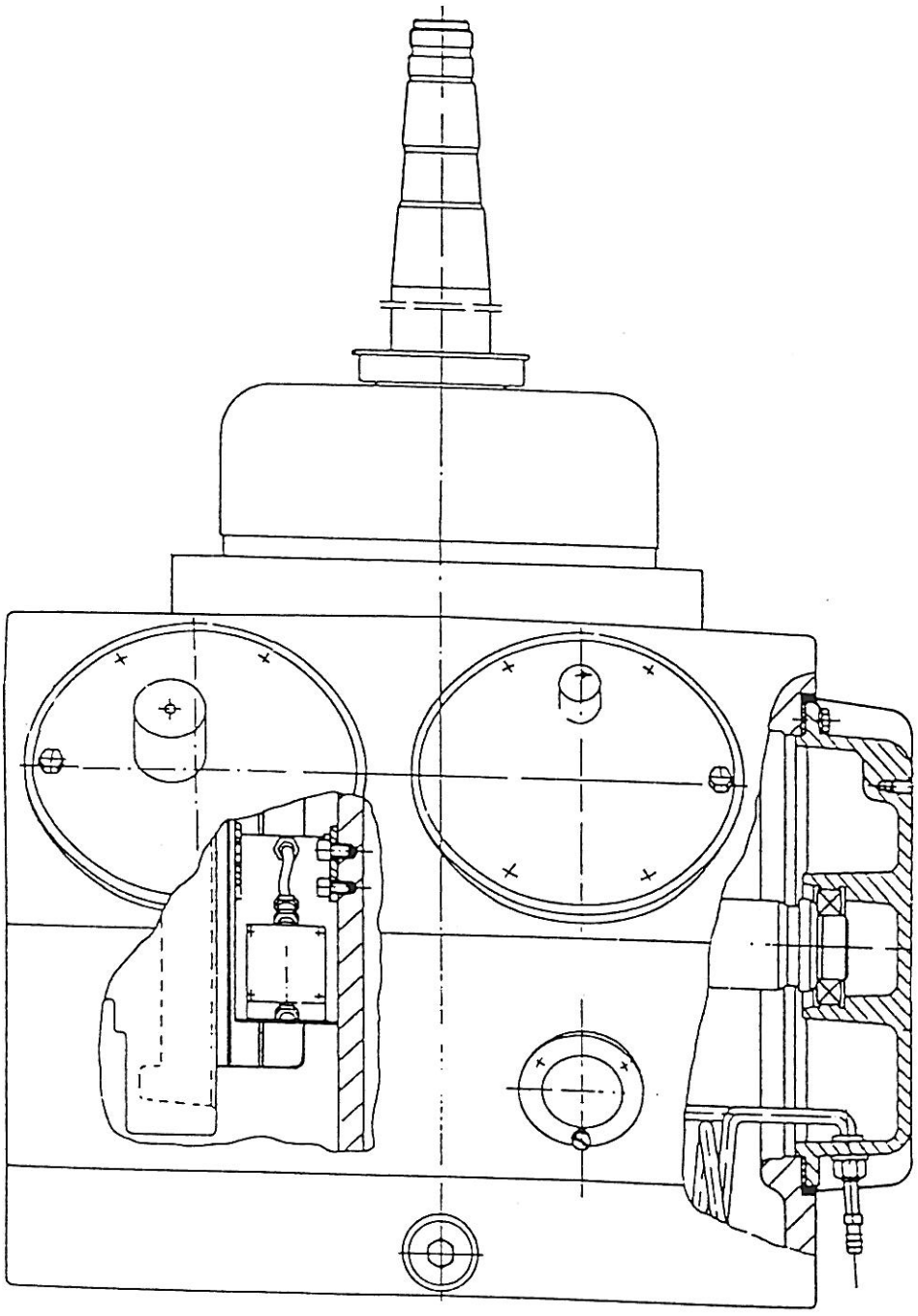
If measured dimension is greater than 37.5 mm: Insert one height adjusting ring

Rotate the bowl by hand and check that it can turn freely.

6. Screw on inlet housing **18** with a hook spanner. The diametrical positions of cooling water inlet and outlet can be adjusted, if necessary, with height adjusting ring **4.1** (thickness 0.5 mm).

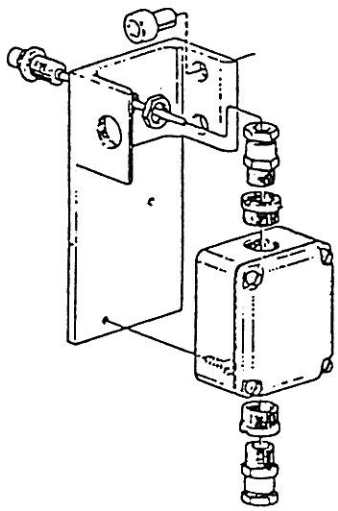
7. Connect the elbow **20** to the inlet housing.

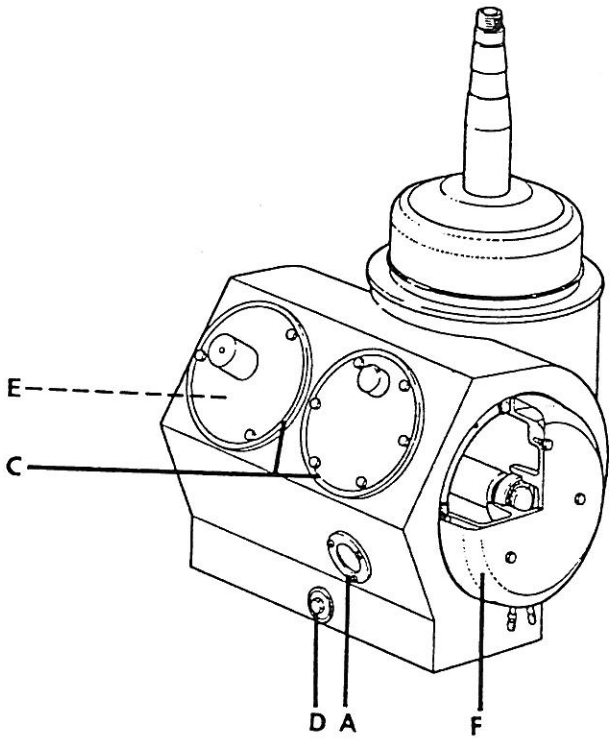
FRAME PARTS		



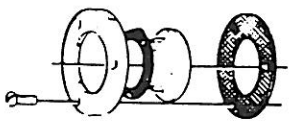
FRAME PARTS

E Speed sensor

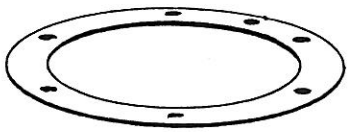




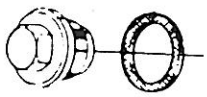
A Oil gauge glass



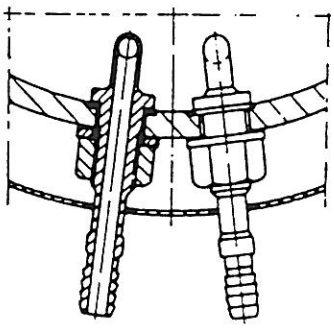
C Gasket for brake protecting cover and worm wheel guard

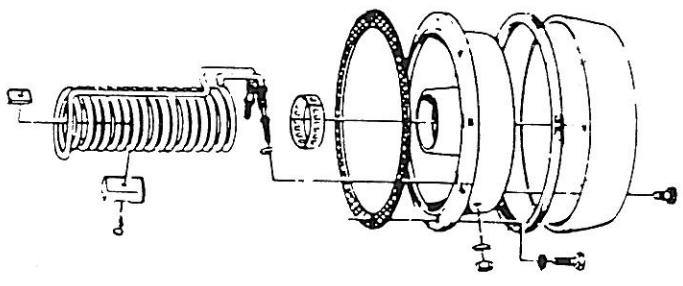


D Oil drain plug

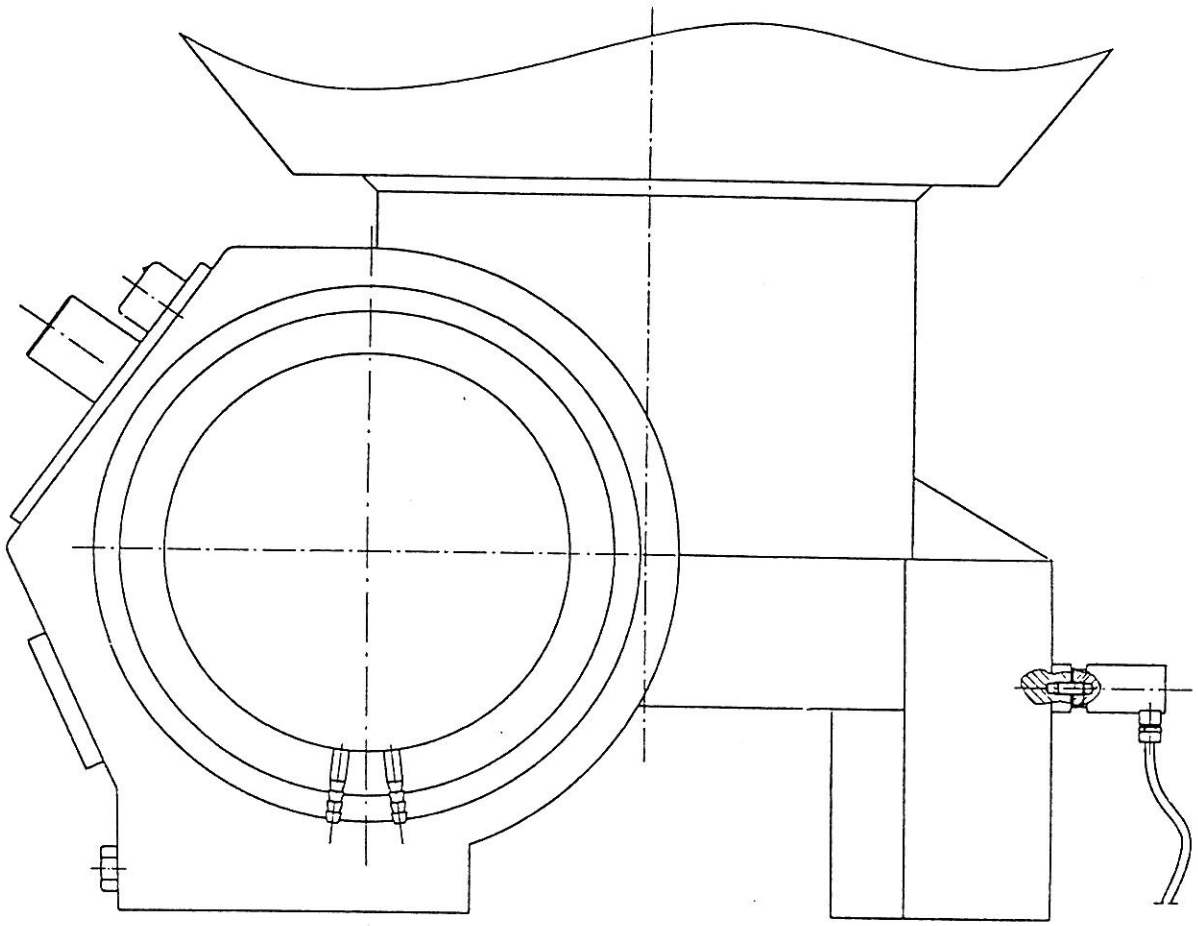


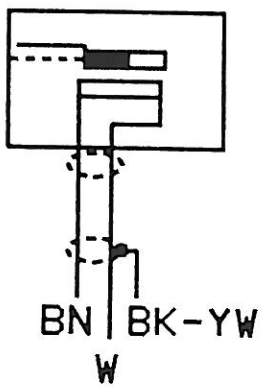
F Cooling coil
Bearing shield

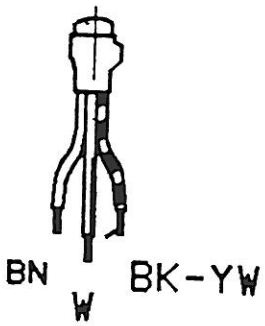




FRAME PARTS	VIBRATION SENSOR (Optional)	

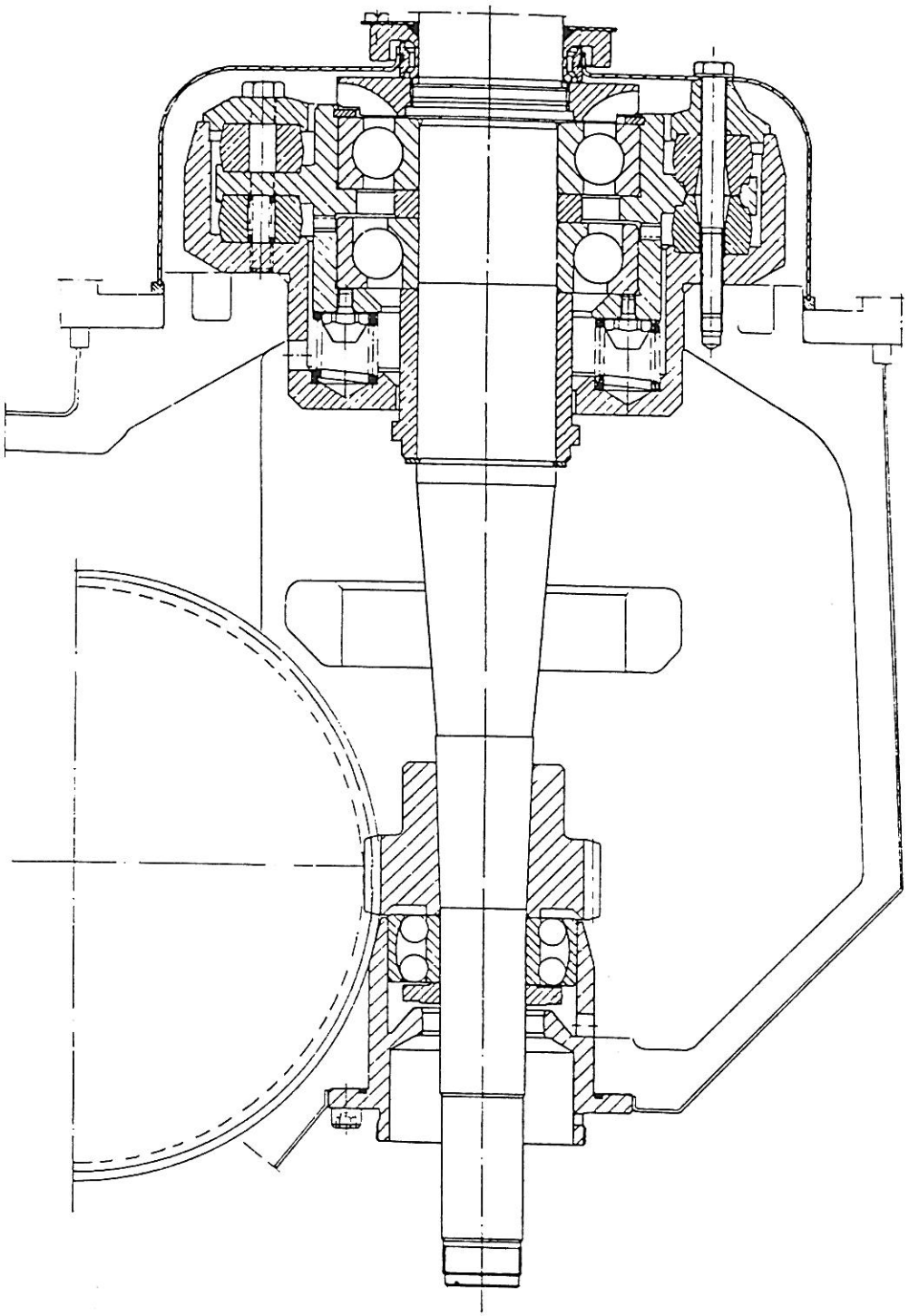




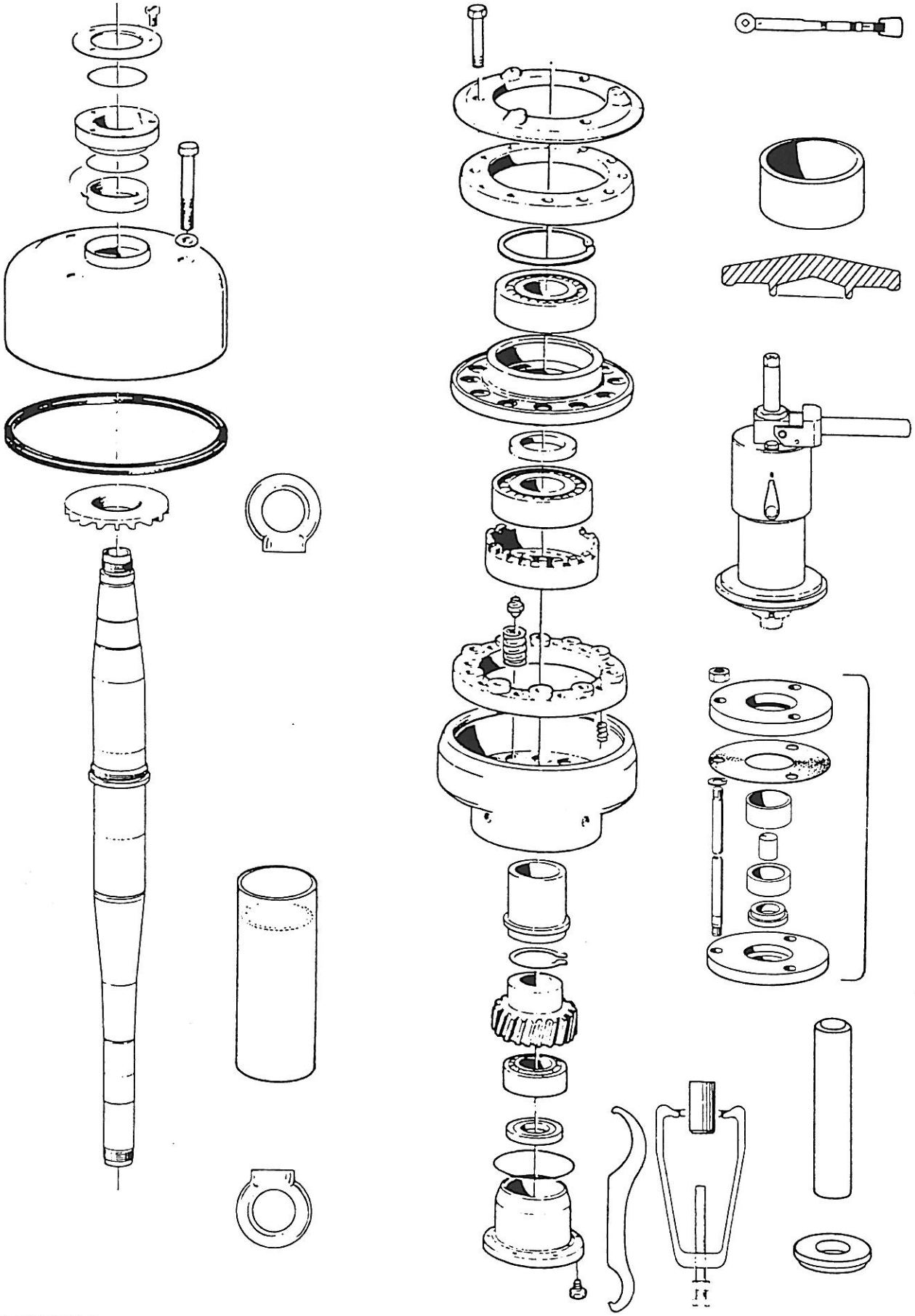


BN	= BROWN
W	= WHITE
BK-YW	= BLACK / YELLOW

VERTICAL DRIVING DEVICE		



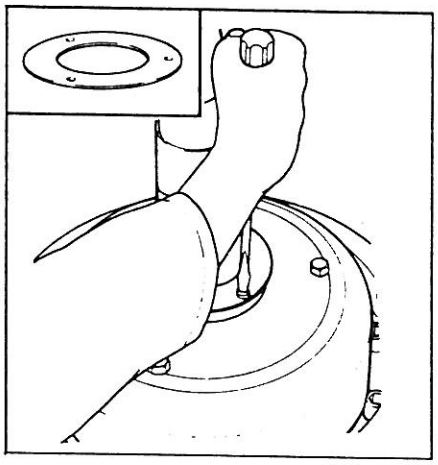
VERTICAL DRIVING DEVICE		



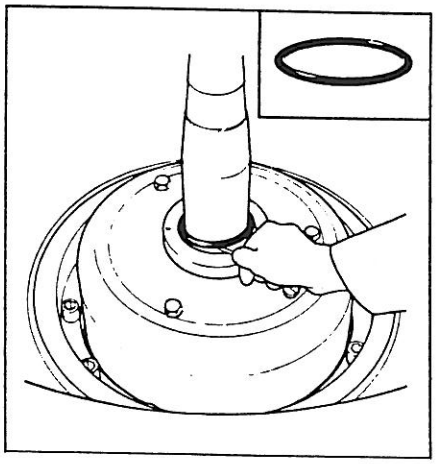
VERTIKAL DRIVING DEVICE	DISASSEMBLY	

Drain off oil from worm gear housing. The assembly is then accessible after the following parts have been removed in the order stated:

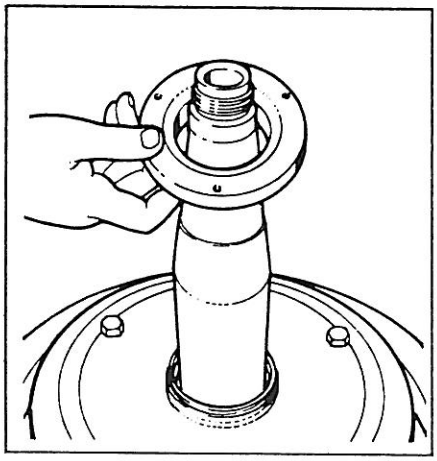
- OUTLET
- FRAME HOOD
- INLET
- BOWL and PARING DISC DEVICE FOR OPERATING WATER



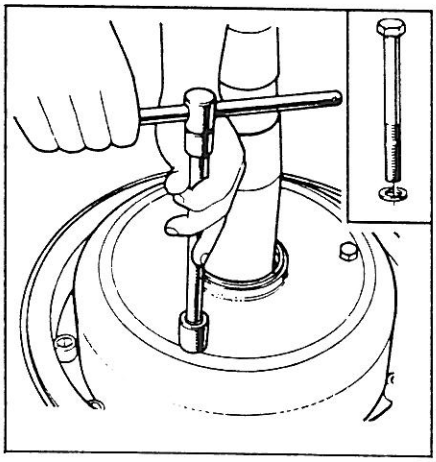
1



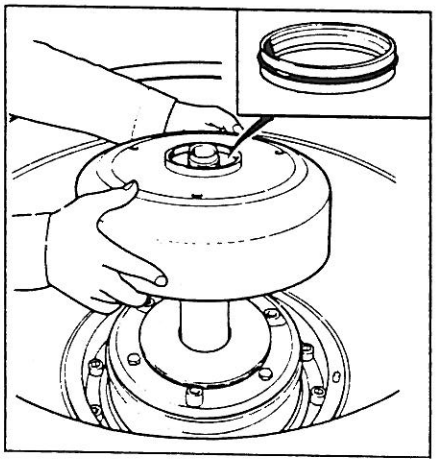
2



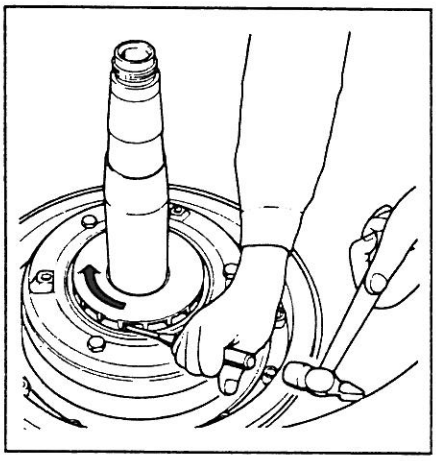
3 Just pull – there are no threads.



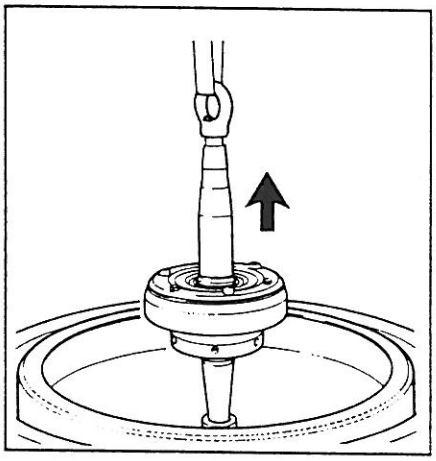
4



5

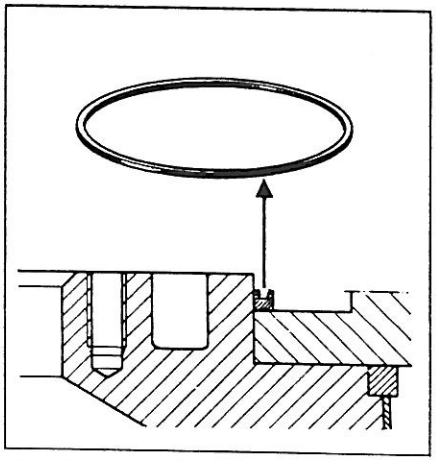


6 Hit with light blows on the wings of the oil fan.

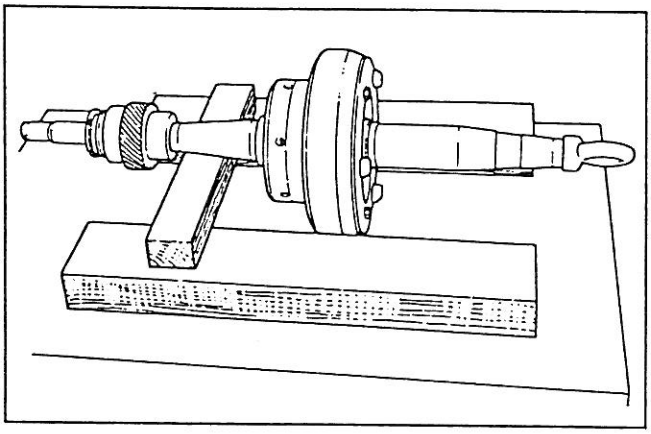


7 To avoid damaging the teeth when lifting the bowl spindle, lift slowly and with great care.

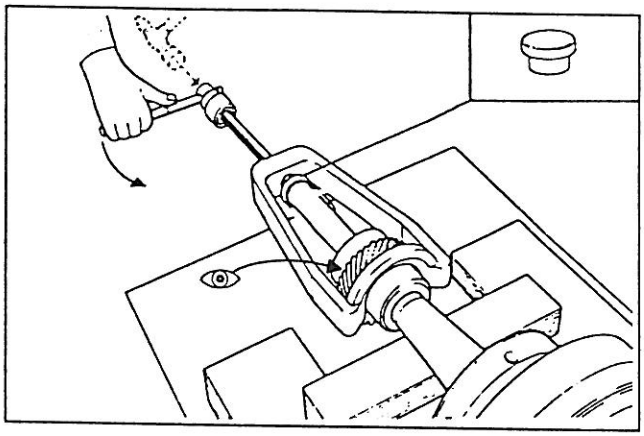
Note: Never lift anything but the vertical driving device with the spindle lifting eye!



8 Remove the seal ring.

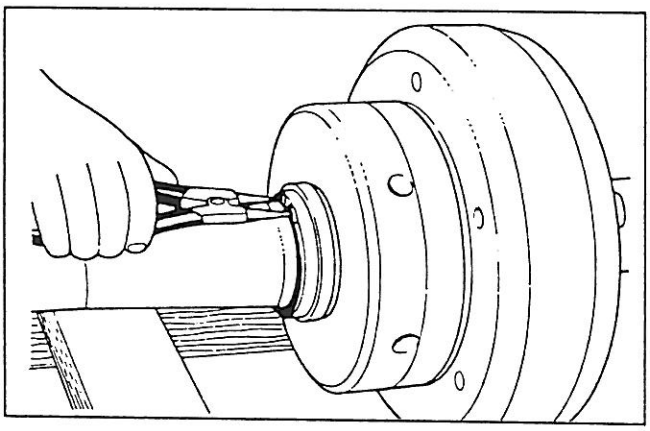


9 Make a wooden support to be used during certain sub-operations.

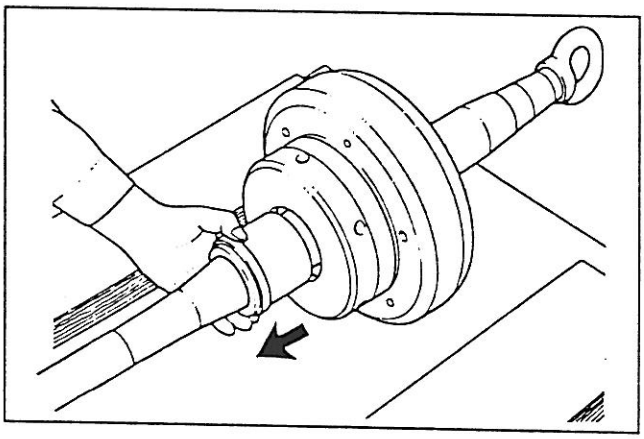


10 - 11 Pull off the ball bearing and the worm. Now and then hit on the head of the centre screw.

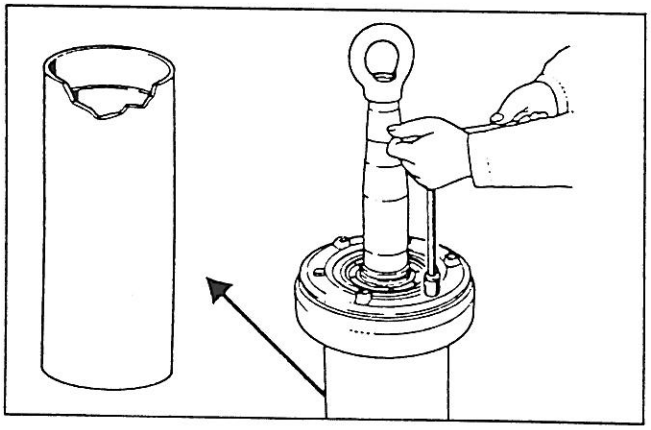
Wear of teeth under CHECK POINTS.



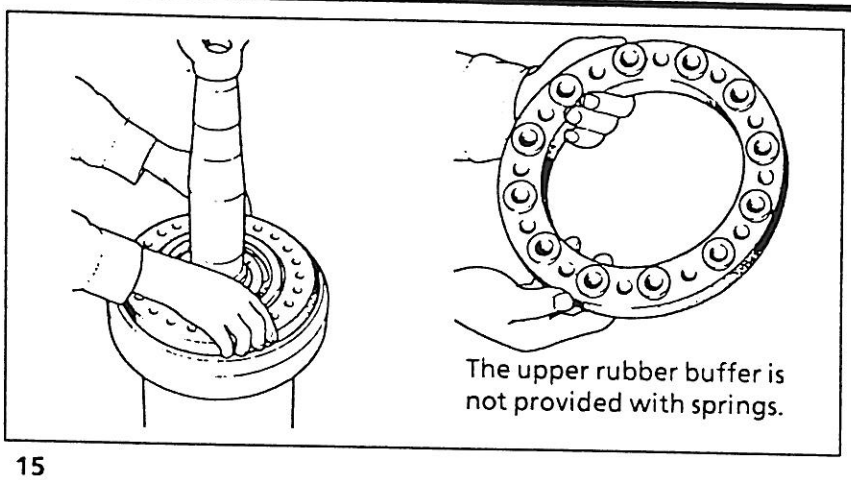
12 Remove the snap ring.



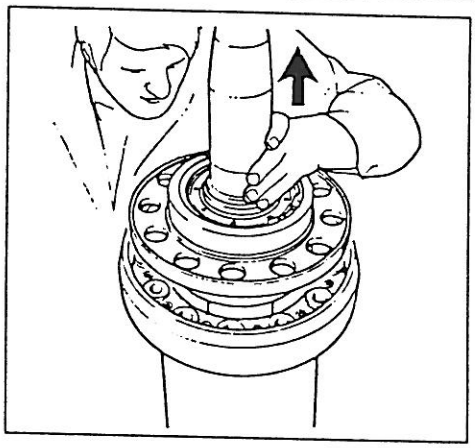
13 Just pull – there are no threads.



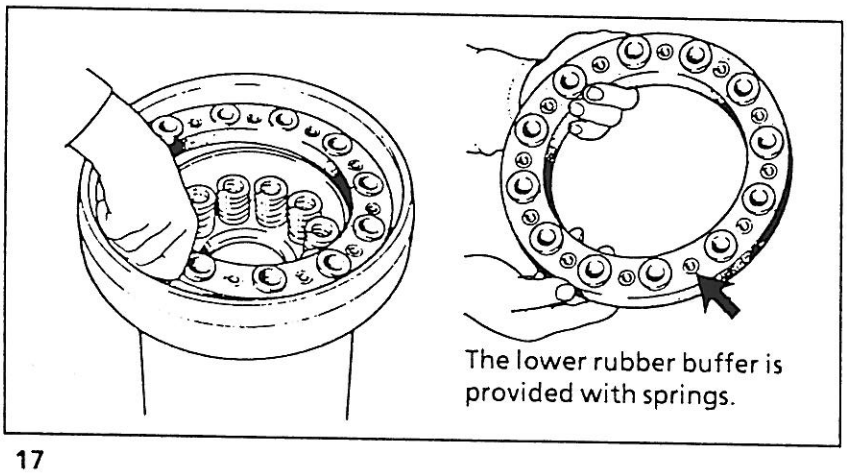
14 Place the spindle in the tube included in the set of tools. Loosen the screws of the top bearing cover alternately and a little at a time. Remove the cover.



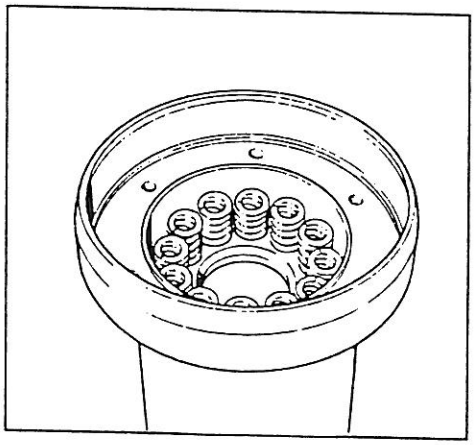
15



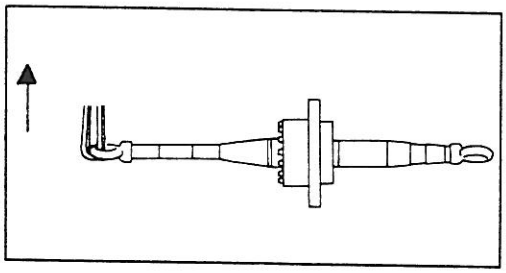
16 Lift the spindle out of the spring support.



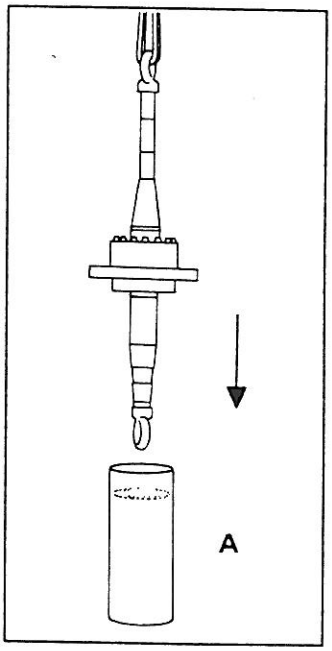
17



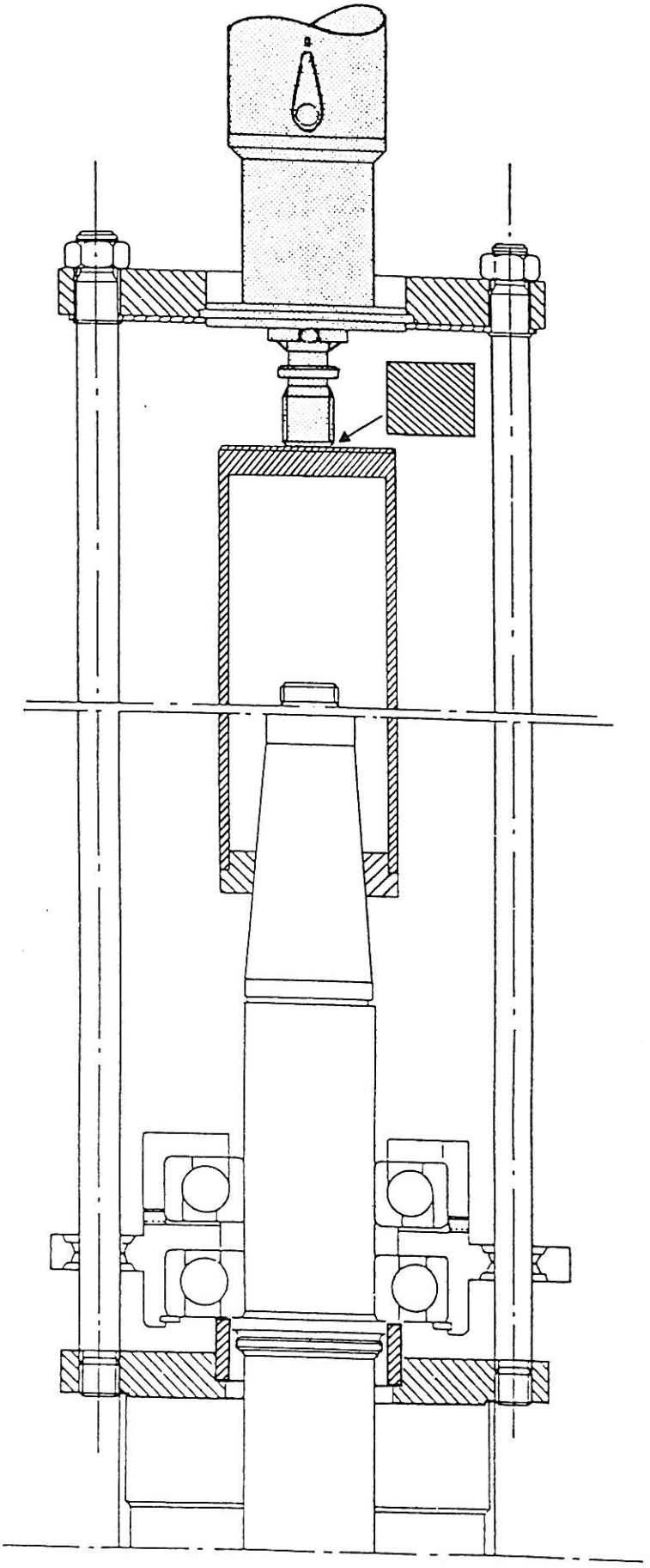
18 Remove the springs.



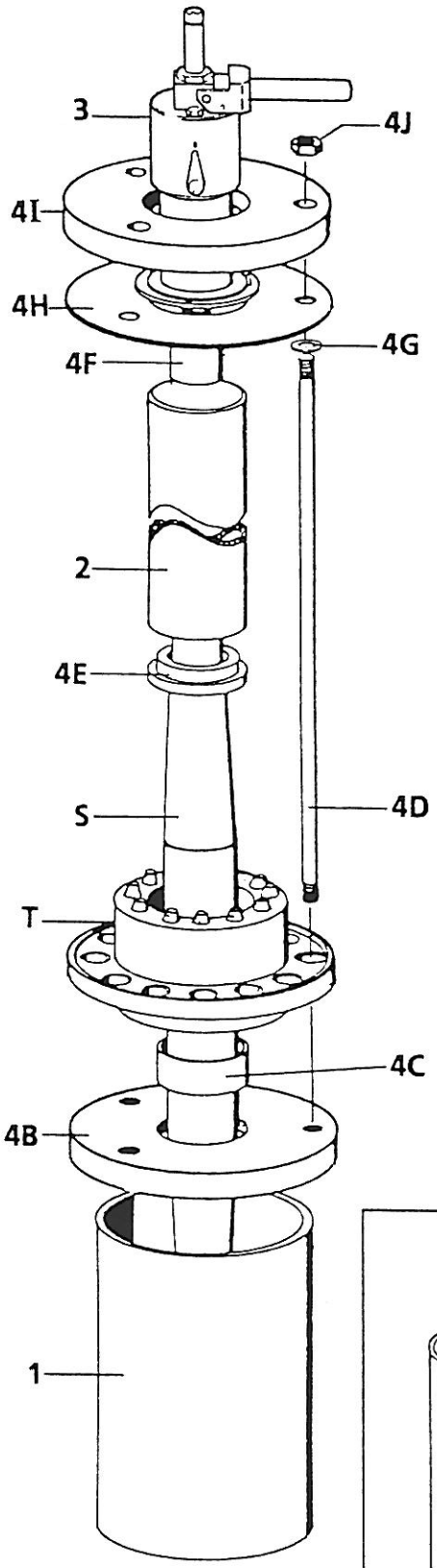
19



VERTICAL DRIVING DEVICE	DISASSEMBLY	



VERTICAL DRIVING DEVICE	DISASSEMBLY	

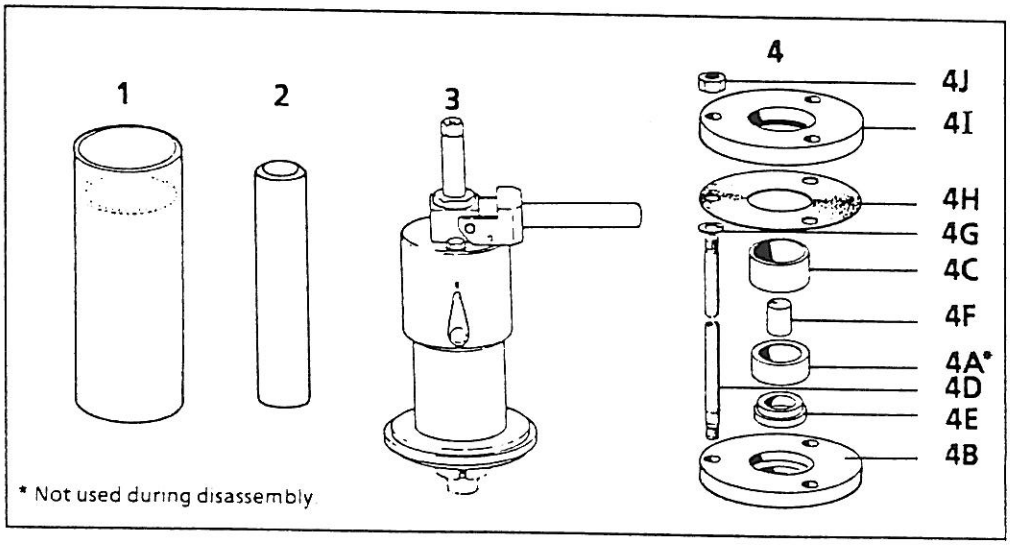


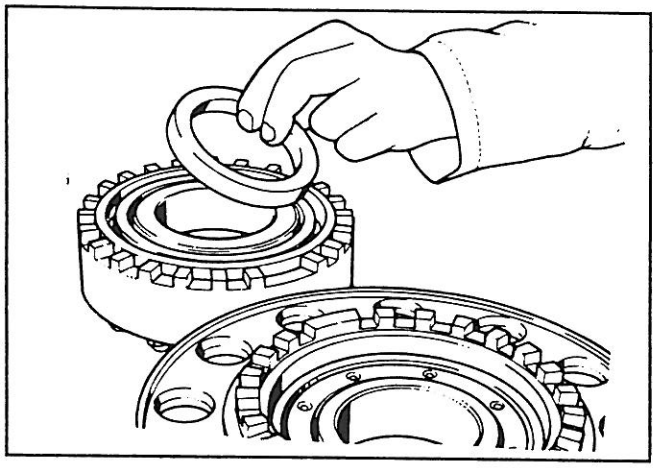
Disassembly of top bearings support from the spindle.
Tools:

1.	Tube	544288-01
2.	End tube	531296-81
3.	Compression tool	543135-06
4.	Disassembly and assembly tool	545540-80

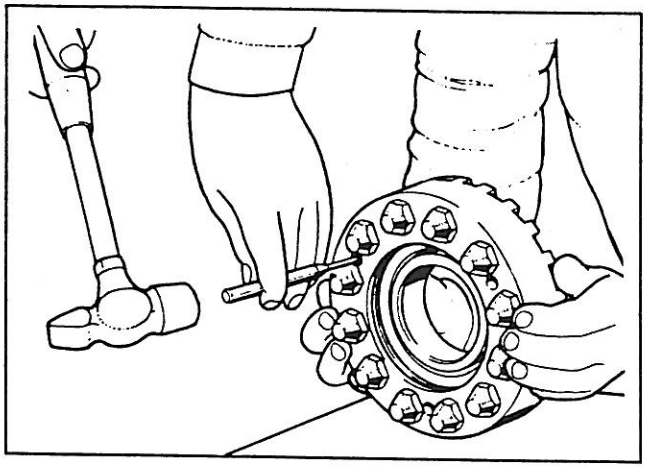
- Arrange the tube (1) on a firm support. Fill the tube with rags to protect the spindle from damage when pressing out.
- Fit the bottom plate (4B) on the tube (1).
- Fit the sleeve (4C) with inside diameter Ø 90 mm on the bottom plate (4B).
- Place the spindle (S) upside down in the bottom plate (4B). Check that the inner race of the ball bearing is in contact with the face of the sleeve (4C).
- Mount the three rods (4D) by fitting them through the holes in the top bearing support (T) and screwing them into the bottom plate (4B).
- Fit the support ring (4E) on the spindle (S). **Note!** The inside diameter of this ring is tapered.
- Fit the end tube (2) over the spindle (S) and let it rest on the support ring (4E).
- Check that the retaining rings (4G) have been fitted. Then fit the washer (4H) for the compression tool (3) onto the rods (4D).
- Fit the compression tool (3). **Note!** The piston must be in the top position.
- Fit the top plate (4I) and secure the assembly with the three nuts (4J).
- Arrange the handle of the compression tool (3) in Pos. 2 and then pump until the piston has reached the bottom position.
- Bring the handle into Pos. 1 and pump until the piston reaches its upper position.
- Place the spacer (4F) between piston and end tube (2).
- Set the handle to Pos. 2 again and continue to pump until the cartridge is released from the ball bearings.

Note! Pump slowly during the final stage of pressing out to avoid damage to the spindle when this is released.

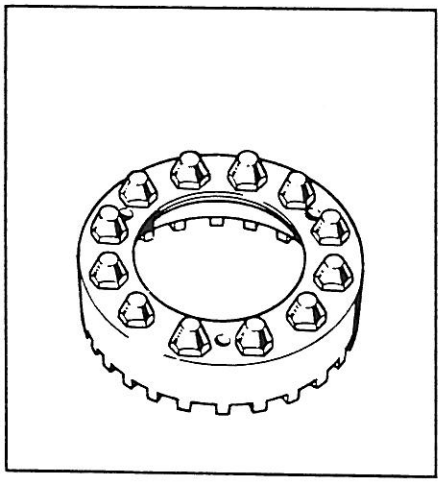




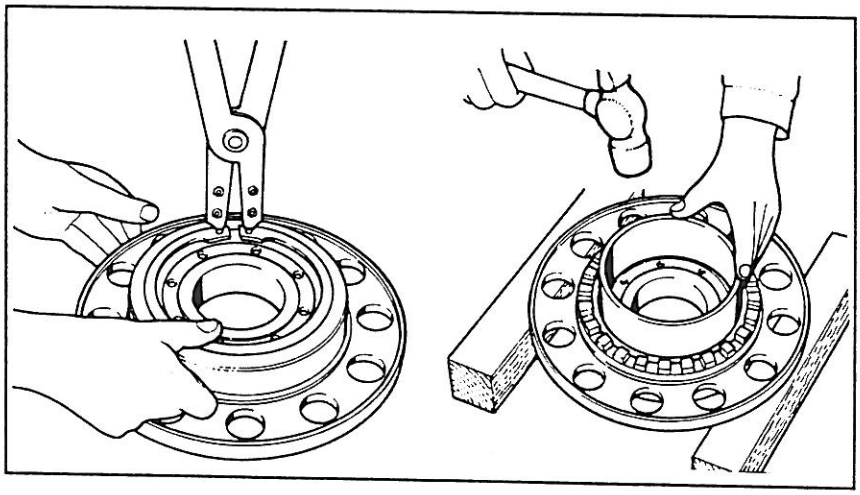
20 The parts knocked-loose are the upper and lower ball bearing housings and the spacing sleeve.



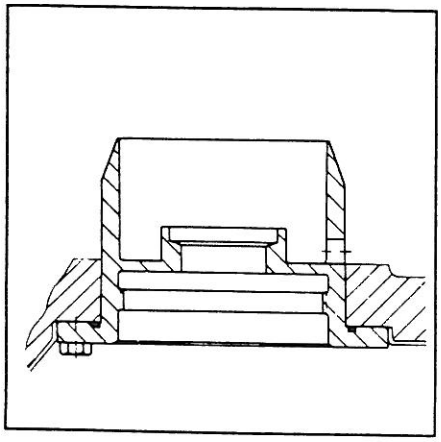
21 Force out the ball bearing.



22 Check the guide pins. Replace any damaged pins but do not loosen the others.

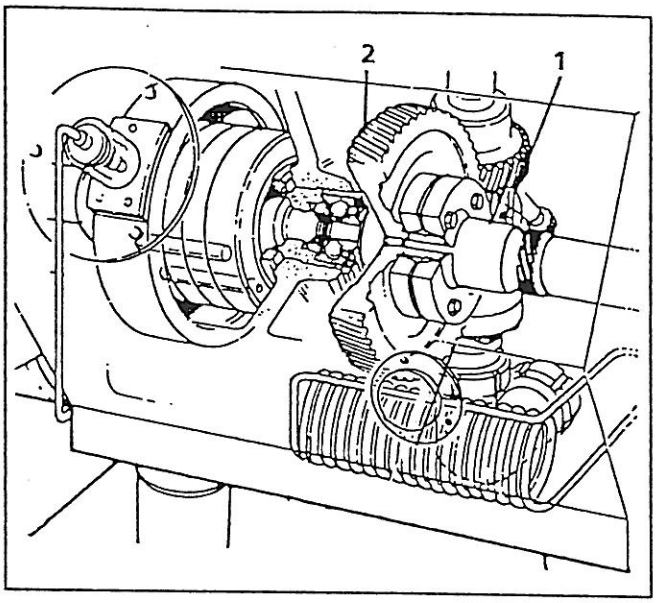


23 1. Remove the snap ring. 2. Force out the ball bearing.



The bottom bearing housing should normally remain sitting in the frame. It should be dismounted only when it is necessary to replace it, when its O-ring must be replaced or when the separator is to be reconditioned.

WORM AND WORM WHEEL (WORM GEARING)

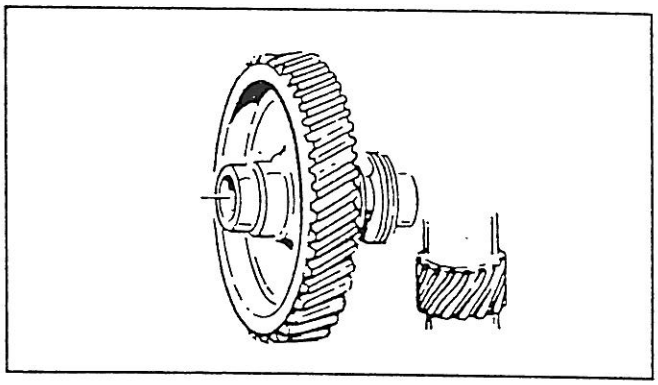


1 Worm **2** Worm wheel

Check the teeth of worm wheel and worm for wear. Examine the contact surfaces and compare the tooth profiles. The gearing may work satisfactorily even when worn to some degree. Replace worm at the same time as the worm wheel.

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

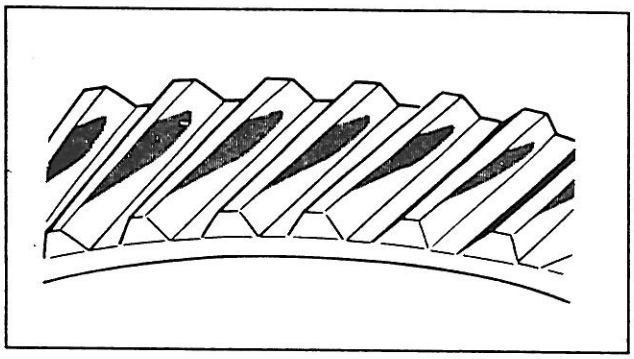
To avoid damaging the teeth when lifting the bowl spindle, ***first*** push the worm wheel aside. For the same reason put the spindle in place ***before*** mounting the worm wheel.



Important!

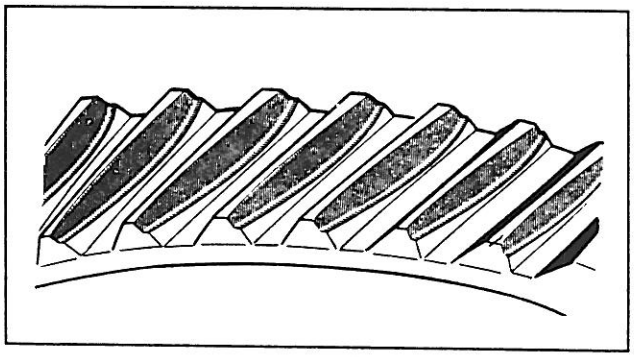
When replacing the gearing, always ascertain that the new parts have the same number of teeth as the old ones so the bowl speed remains unchanged.

Examples of various tooth appearances after operation



Satisfactory teeth

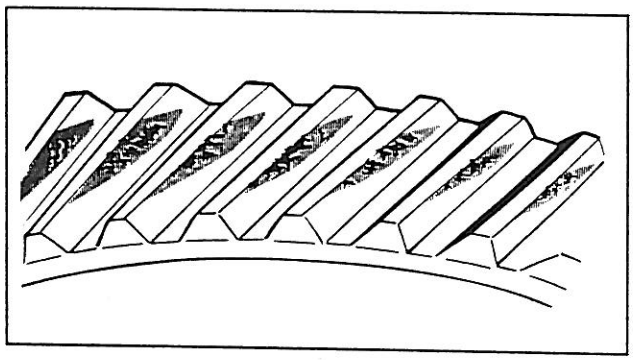
Uniform wear of contact surfaces. Surfaces are smooth.
Good contact surfaces will form on the teeth when the gear is subjected only to moderate load during a running-in period.



Worn teeth

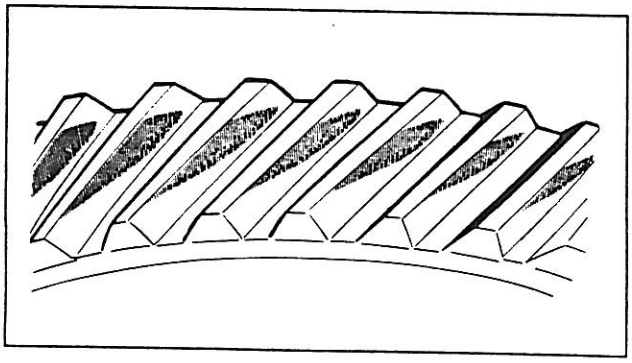
Permissible wear is as a rule 1/3 of the thickness of a tooth, provided that

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



Spalling

Small bits of the teeth have split off, so-called spalling. Generally due to excessive load or improper lubrication. Damage of this type need not necessitate immediate replacement, but careful checking at short intervals is imperative.



Pitting

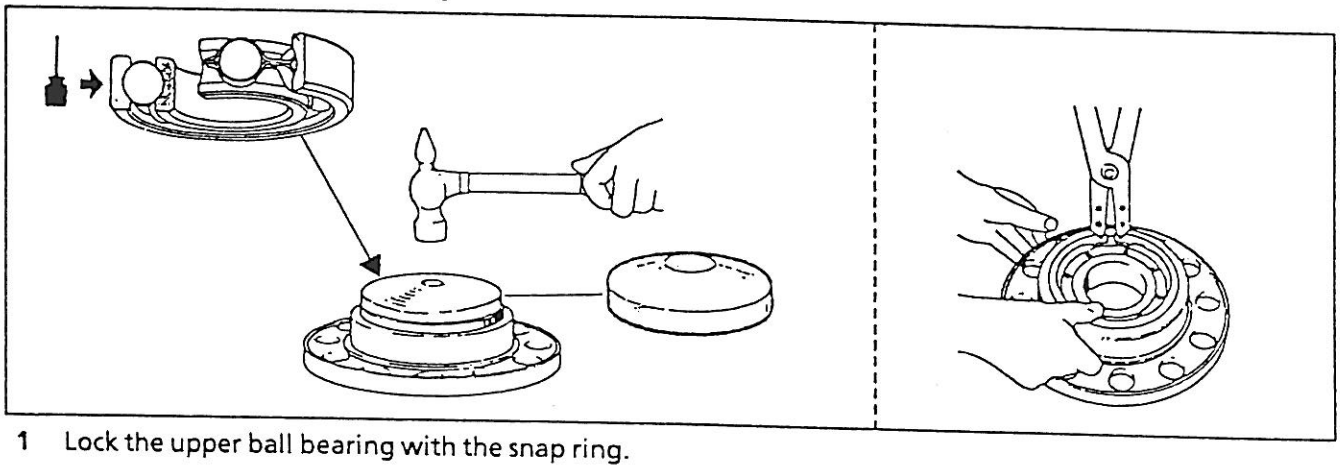
Small cavities in the teeth, so-called pitting. This is often due to excessive load or improper lubrication. Damage of this type need not necessitate immediate replacement, but careful checking at short intervals is imperative.

VERTICAL DRIVING DEVICE	ASSEMBLY	

NOTE!

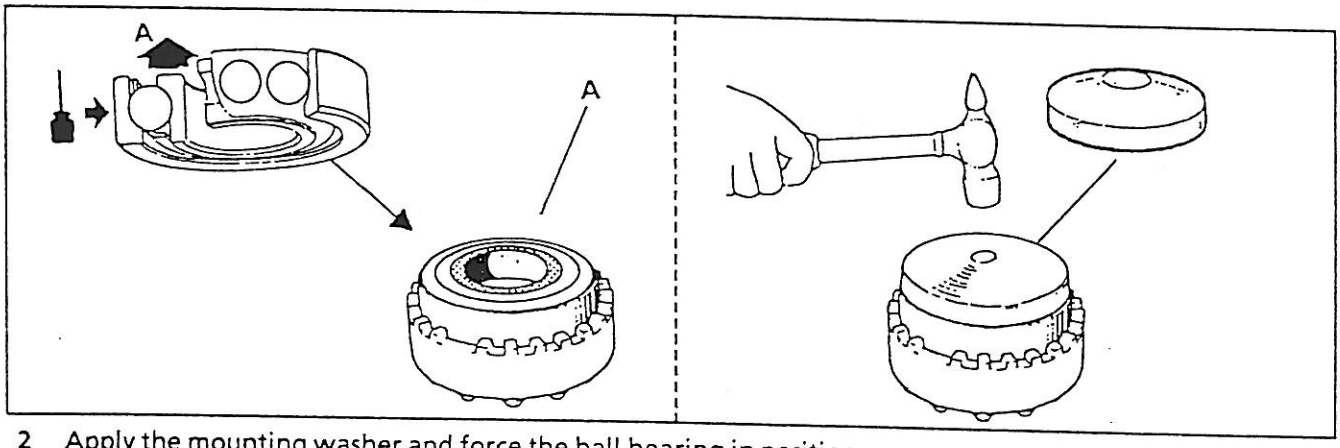
- The deep groove ball bearing is to be fitted in the upper housing and the angular contact ball bearing in the lower one.
- Before fitting the bearings, wipe off the bearing seats of the spindle and apply some oil to the seats.
- See chapter "General Advice. Ball and roller bearings."

Fitting the deep groove ball bearing



1 Lock the upper ball bearing with the snap ring.

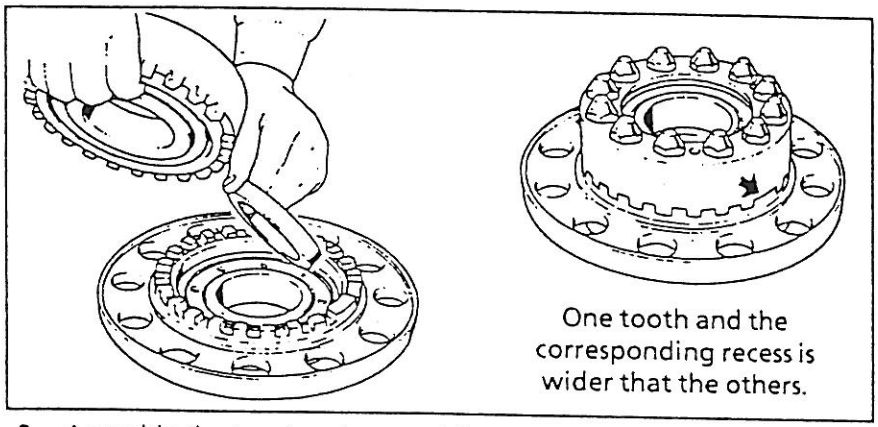
Fitting the angular contact ball bearing



2 Apply the mounting washer and force the ball bearing in position.

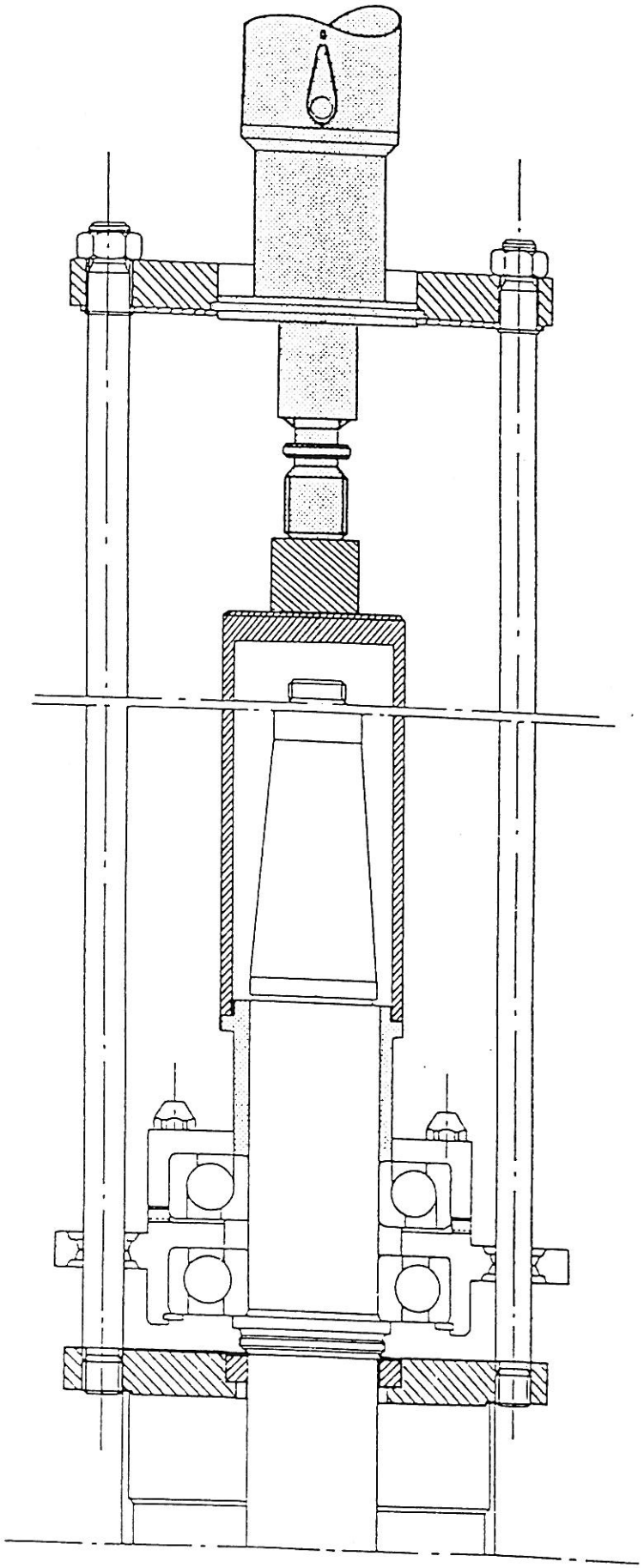
IMPORTANT: Turn the angular contact ball bearing the right way - the WIDE shoulder of the INNER race must face upwards (A). A bearing of this kind turned upside down cannot carry any load. It collapses when loaded resulting in breakdown of the machine.

Assembly of the bearing housing



3 Assemble the two housings and the space sleeve into a unit.

VERTICAL DRIVING DEVICE	ASSEMBLY	



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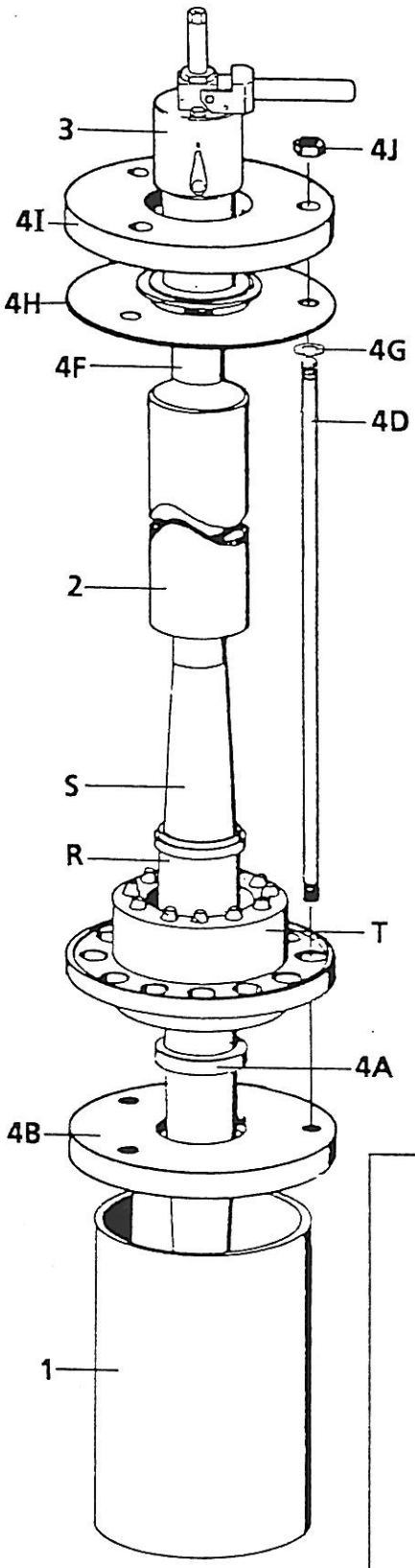
VERTICAL DRIVING DEVICE	ASSEMBLY	



Assembly of top bearings on the vertical drive.

Tools to be used:

1. Tube	544288-01
2. End Tube	531296-81
3. Compression Tool	543135-06
4. Disassembly/Assembly Tool	545540-80

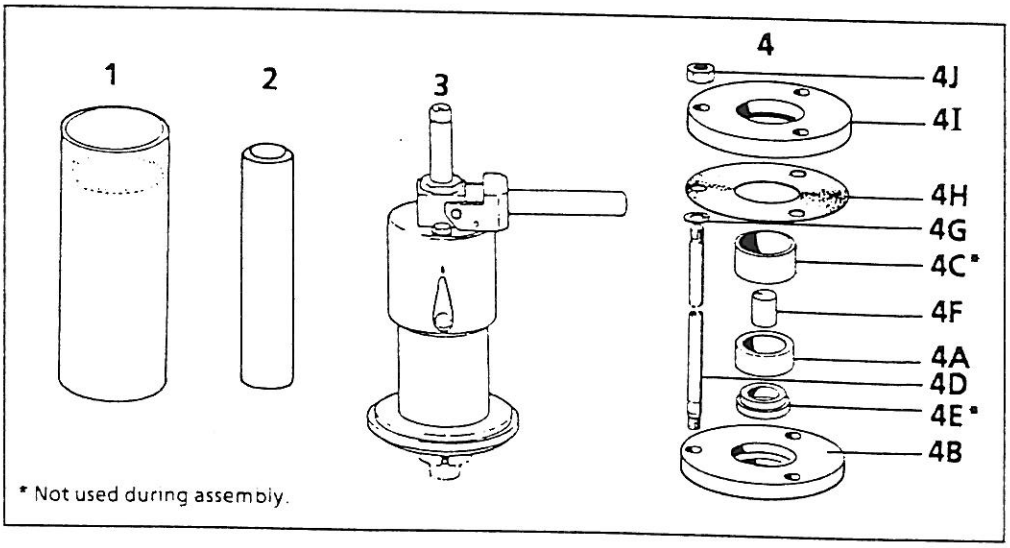
- Arrange the tube (1) on a firm support.
- Fit the bottom plate (4B) on the tube (1).
- Fit the ring (4A) with inside diameter Ø 77 mm in the bottom plate (4B).
- Place the spindle (S) upside down in the bottom plate (4B).
  Note! The collar on the spindle (S) must be resting on the ring (4A).
- Fit the ball bearing housing (T) onto the spindle (S).
  Note! The top bearing is to be mounted upside down. See fig.
- Mount the sleeve (R), which must be in contact with the inner race of the ball bearing.
- Fit the end tube (2) on the sleeve (R).
- Screw the three rods (4D) into the bottom plate (4B).
- Check that the retaining rings (4G) have been fitted. Fit washer (4H), compression tool (3) and top plate (4I). Secure the assembly by tightening the three nuts (4J).

Arrange the handle of the compression tool (3) in Pos. 2 and pump until the piston has reached the bottom position.

Move the handle to Pos. 1. Pump up the piston into the top position.

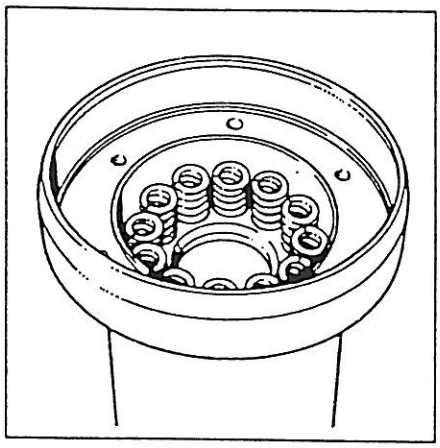
Place the spacer (4F) between end tube (2) and piston of the compression tool (3). Bring the handle to Pos. 2 and continue compressing until the inner race of the ball bearing is in contact with the collar on the spindle(S).

Remove the tool and continue with the mounting of the other parts for the vertical drive.

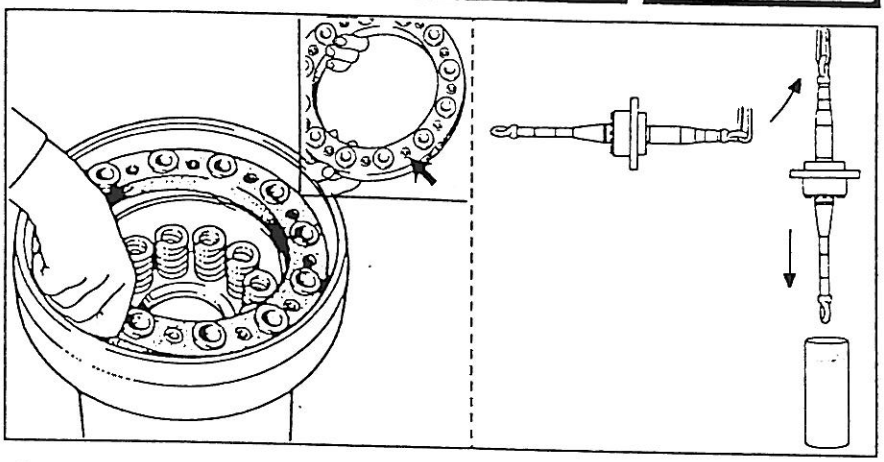


* Not used during assembly.

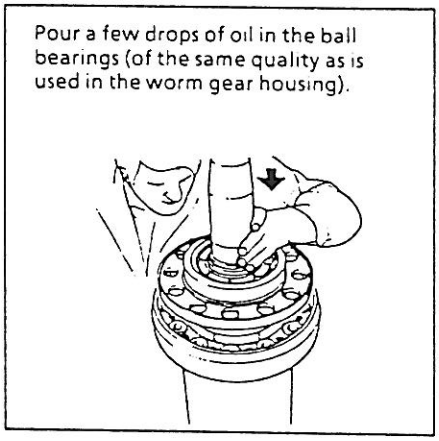
VERTICAL DRIVING DEVICE	ASSEMBLY	



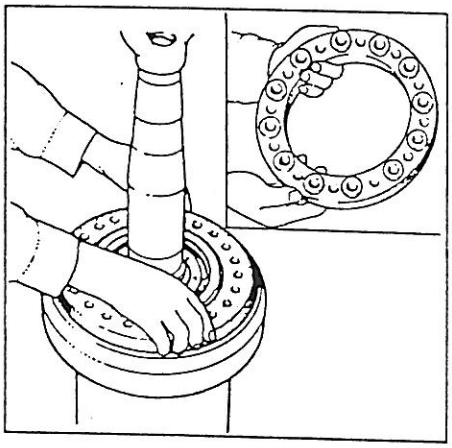
7 Fit the top bearing support in the tube end and put the springs in place.



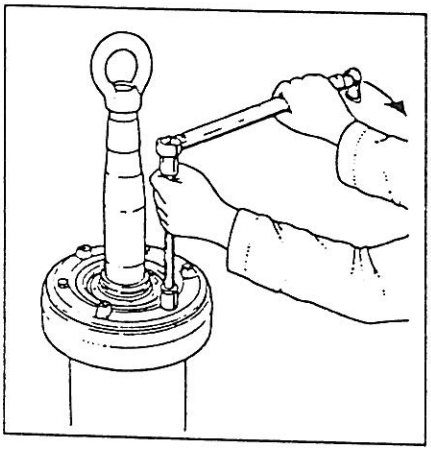
8 Mount the rubber buffer *with* springs.



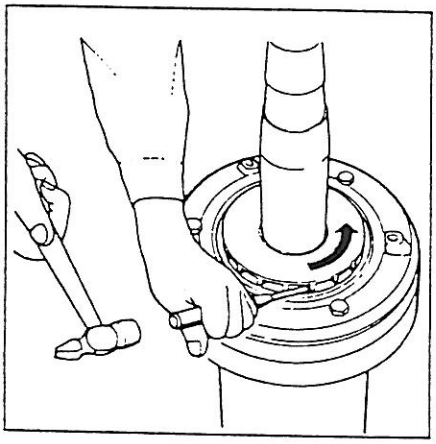
9 Lower the spindle into the top bearing support. Ascertain that the guide pins enter the springs.



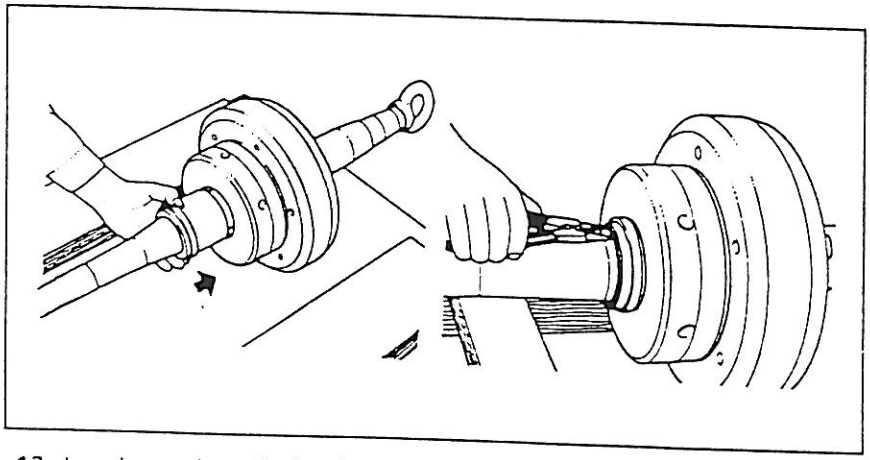
10 Mount the rubber buffer *without* springs.



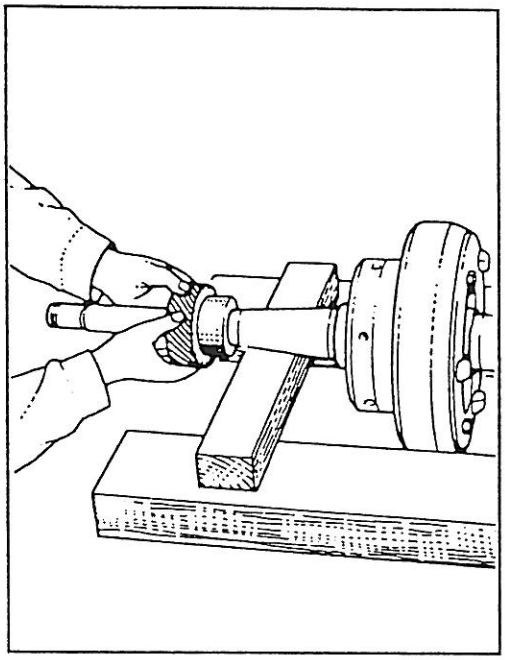
11 Mount the cover and tighten its screws alternately, a little at a time. Do not use pneumatic tools. Final tightening torque: 60 Nm.



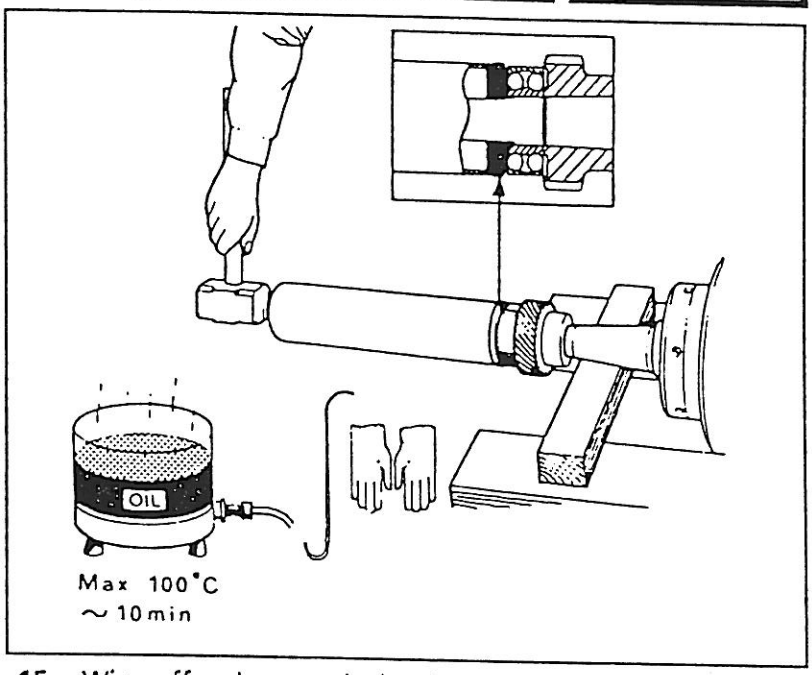
12 Hit with light blows on the wings of the oil fan.



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



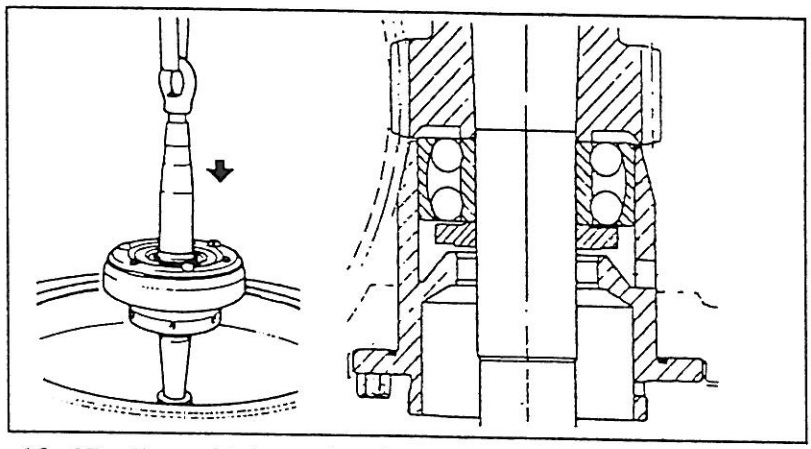
14 Make sure that the conical surfaces inside the worm and on the spindle are clean and free from oil before the worm is fitted.



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

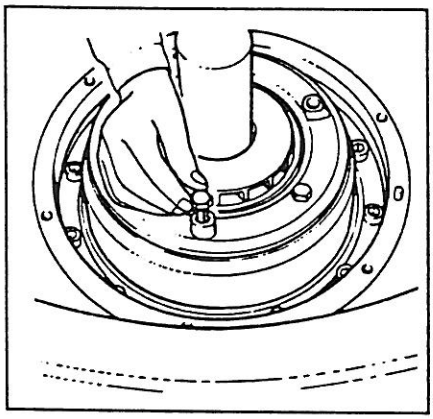
The bearing can be assembled either in hot or in cold condition.

Assembly in hot condition (recommended by Alfa Laval): Heat the bearing in oil or in a heating cabinet. If the oil heating method is used, the oil must be absolutely clean. Fit the bearing. When it has cooled, fit the ring and the driving-on tool as shown in the figure and hit it a few times to ascertain that the bearing is in the correct position.

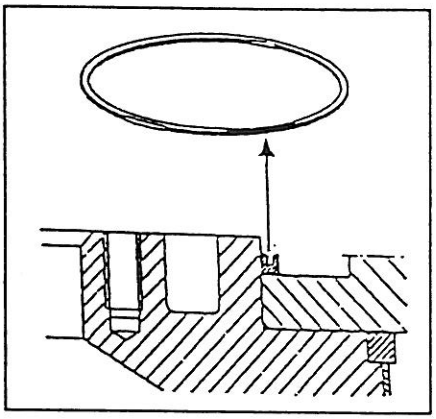


16 - 17 To avoid damaging the teeth, the spindle should be lowered with great care. Guide the bearing into the bottom bearing housing. If it does not quite bottom in its seat, knock lightly on the spindle top with a tin hammer.
Wait, however, to knock it down entirely until next suboperation – 18 – is carried out.

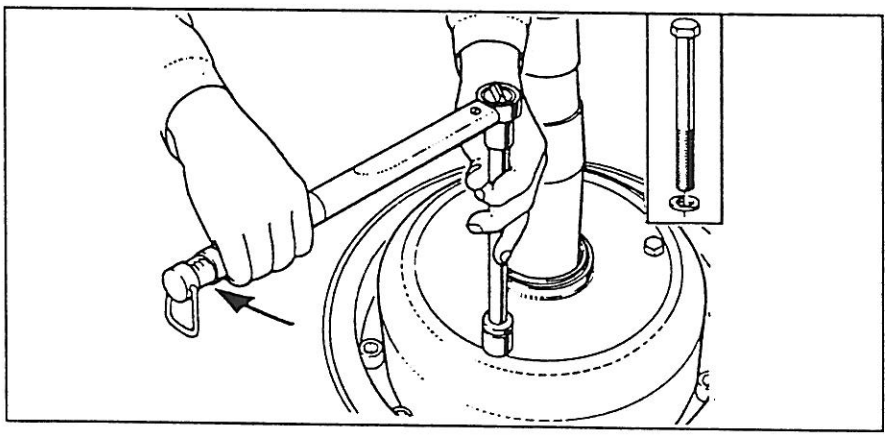
VERTICAL DRIVING DEVICE	ASSEMBLY	



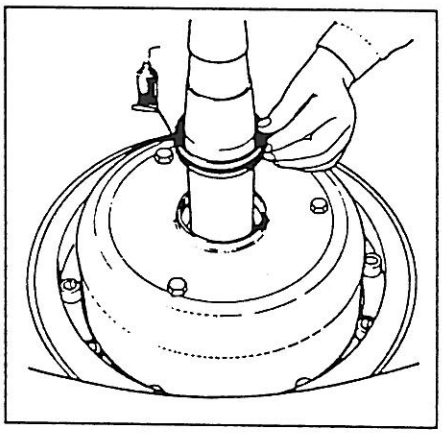
18 Make sure that the ball bearing housings are in their correct angular position by means of one of the screws that fastens the top bearing. Then lower the spindle to the bottom.



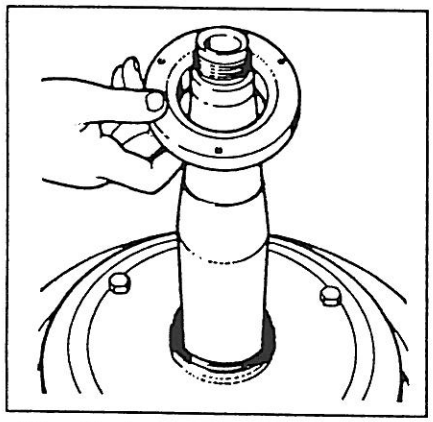
19 Fit the seal ring. Lower the guard into position.



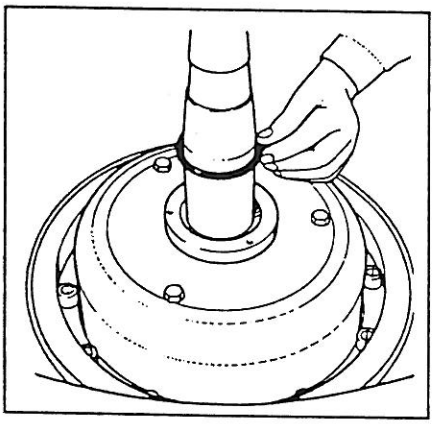
20 Fit new seal rings under the screw heads. Tighten the screws alternately, a little at a time. Do not use pneumatic tools.
Final tightening torque: 40 Nm.
 Radial wobble under CHECK POINTS.



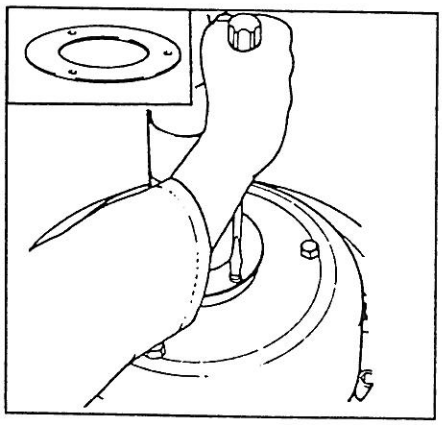
21 Fit the seal.



22 Fit the protecting collar and push it <u>firmly</u> down against the oil fan.

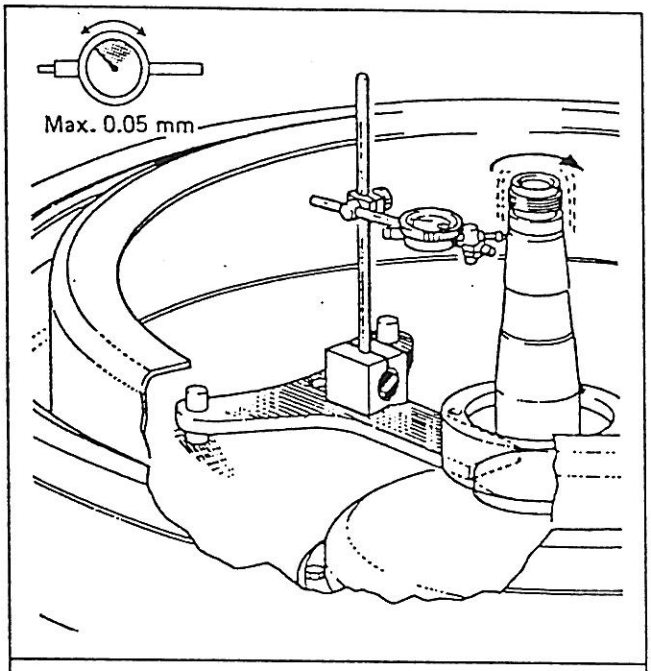


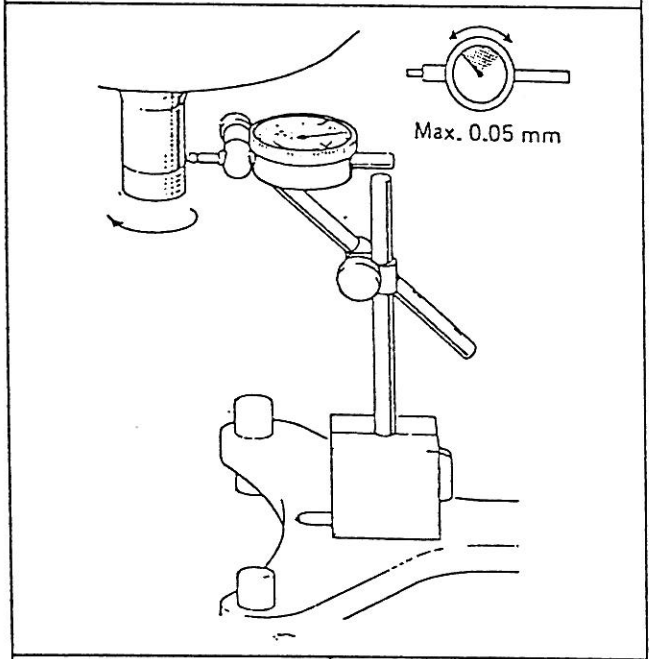
23 Fit the O-ring dry - do not grease.

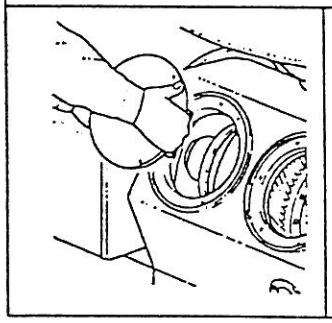


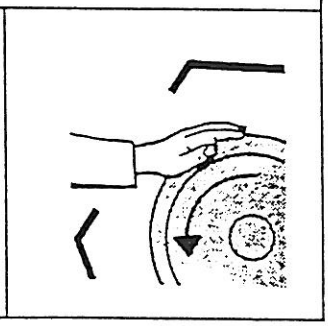
24 Fit the protecting plate and tighten the screws.

VERTICAL DRIVING DEVICE	CHECK POINTS RADIAL WOBBLE OF BOWL SPINDLE	









- Excessive radial wobble at the top of the spindle is indicated by uneven running of the bowl (vibration).

Check the wobble as a precautionary measure at each intermediate service (IS), before every disassembly and after every assembly of the spindle.

Set up a dial indicator on a magnetic stand. Use the key for the large lock ring as a support for the stand - see the figures. (The key can also rest on the protecting cap of the top bearing.)

Measure the wobble at the taper end of the top of the spindle.

Maximum permissible wobble is 0.05 mm

If the wobble is excessive, the spindle unit must be removed from the frame and dismantled for closer examination. Get in touch with your Alfa Laval representative. The spindle may need to be replaced.

When the separator has a hollow spindle, the wobble should also be checked at the cylindrical part right at the bottom of the spindle above the threads.

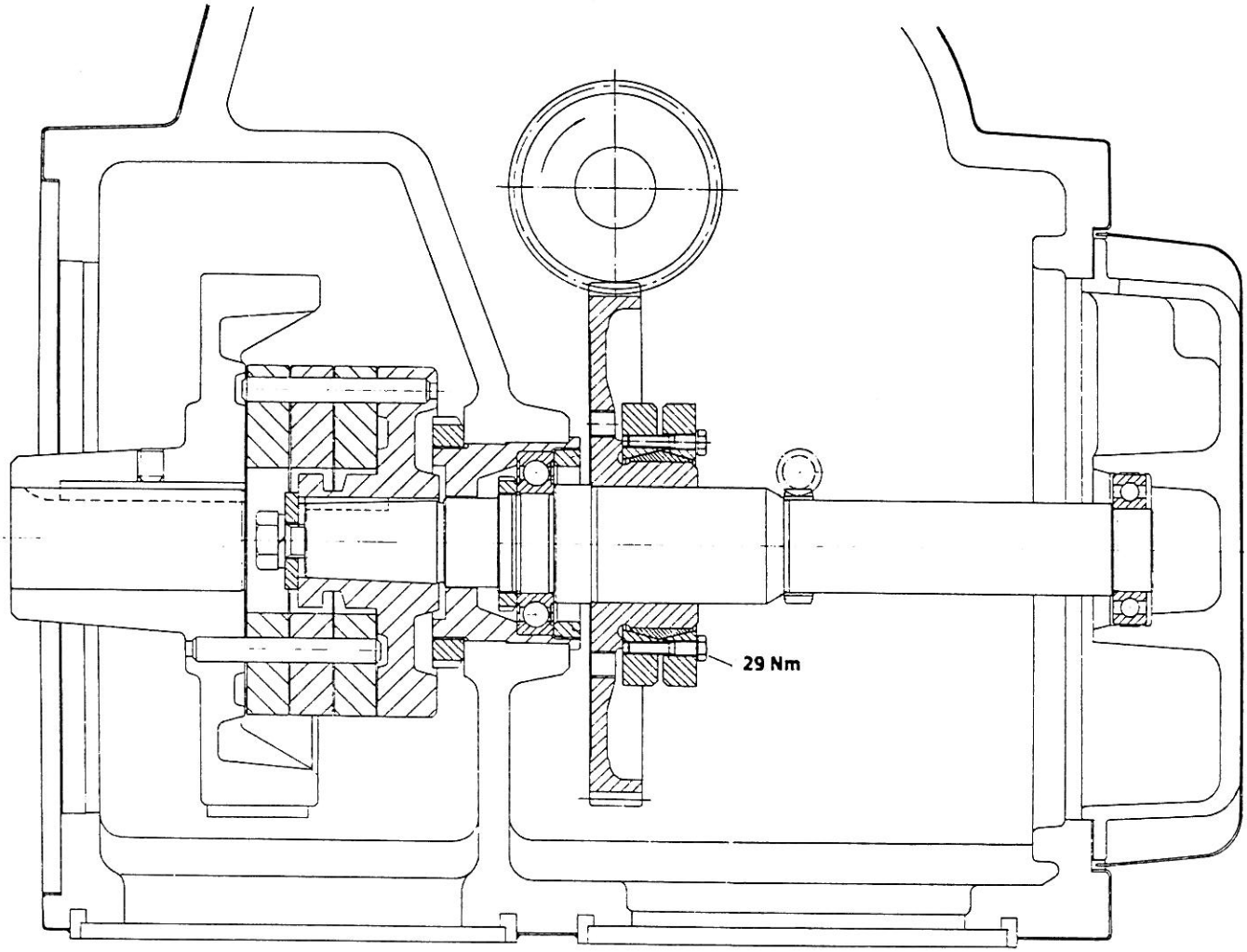
Maximum permissible wobble is 0.05 mm

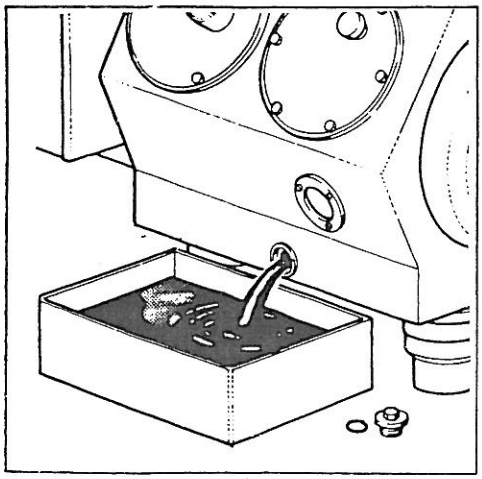
Excessive wobble can cause abnormal wear in the axial seal and result in leakage.

IMPORTANT!

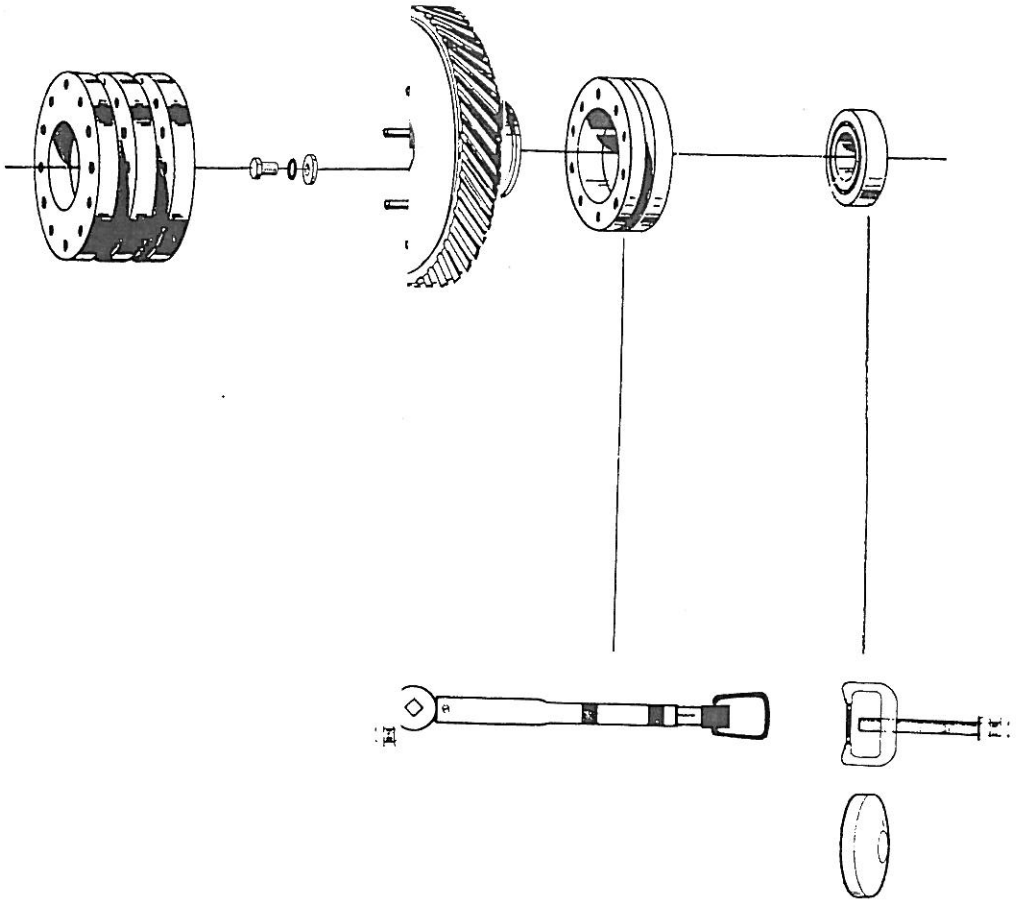
During indication the spindle must be revolved with the aid of the coupling drum.

HORIZONTAL DRIVING DEVICE		

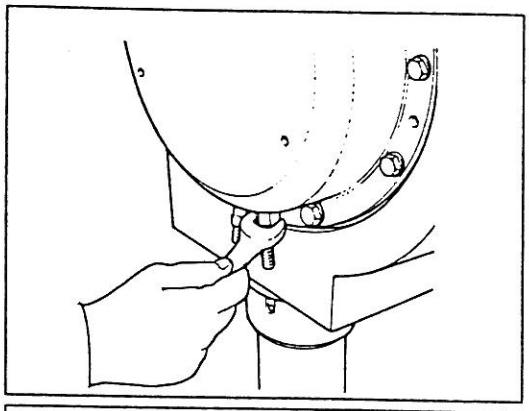




NOTE! THE OIL MAY BE HOT

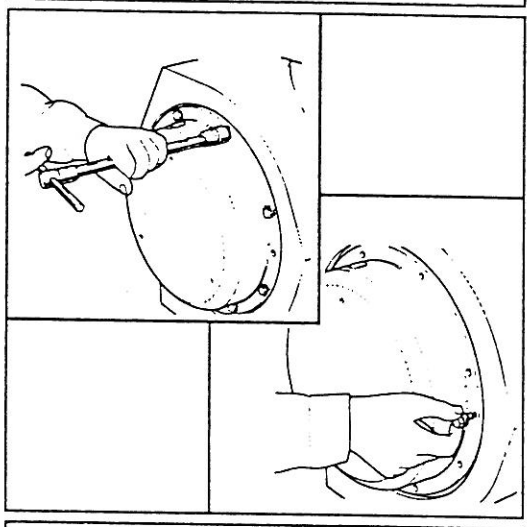


HORIZONTAL DRIVING DEVICE	DISASSEMBLY	

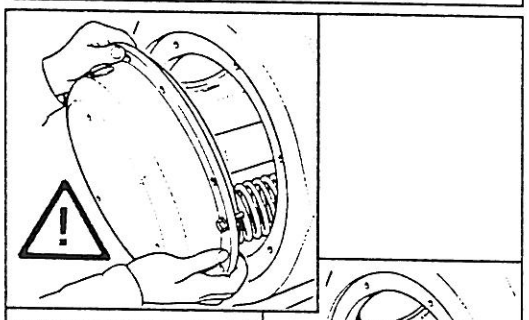


The horizontal driving device is dismantled as follows. It will be easiest to loosen the clamping of the worm wheel if the bowl and spindle are still fitted in the machine.

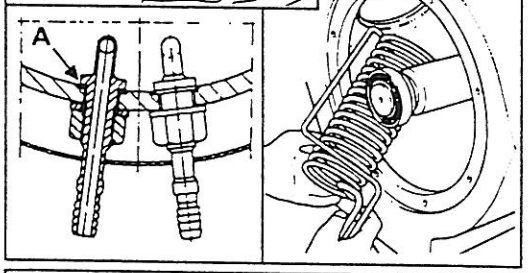
1. Drain off oil from worm gear housing.
   WARNING! The oil may be hot!
2. Remove the worm wheel guard with the revolution counter.
3. Remove the brake cover.
4. Disconnect the cooling water connections.
   Remove the bearing shield cover.
5. Remove the nuts and washers of the cooling coil and press the two tube ends into the bearing shield.



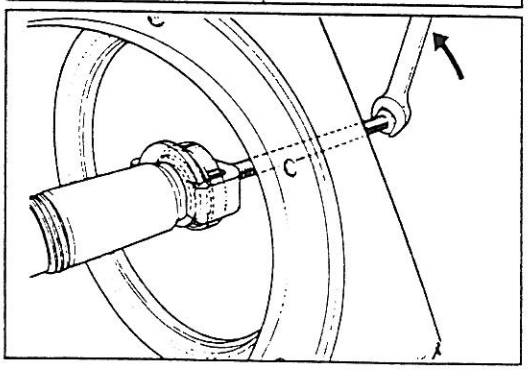
6. Remove the bearing shield: ease it off by means of two of the fastening bolts.



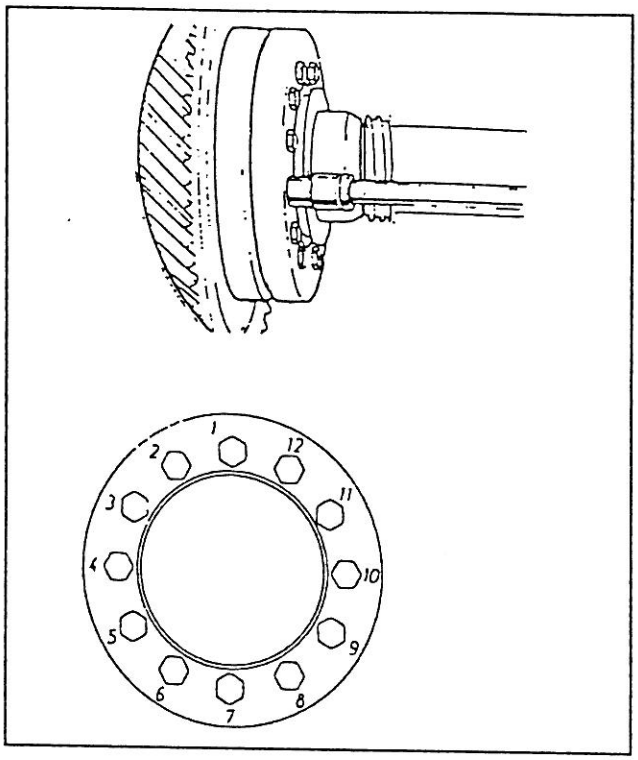
CAUTION! The shield is quite heavy. Hold it firmly when loosening it or use two longer screws as guiding pins in order not to drop it (it is 15 kg cast iron).



7. Lift out the cooling coil and take care of the gaskets (A).



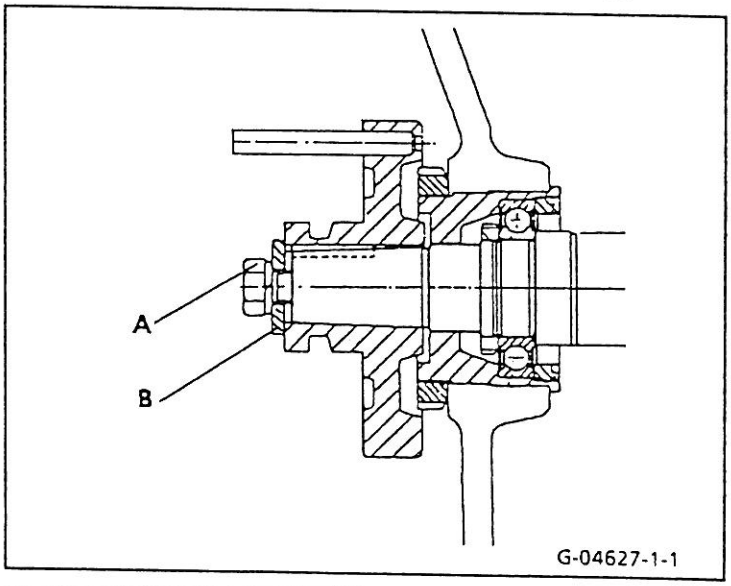
8. Fit the puller tool and pull off the ball bearing.



9. Loosen the clamp screws uniformly and successively around the clamping rings in the order stated. In the first round, do not loosen them more than 1/4 turn to avoid wryness in the clamping rings. Do not screw out the clamp screws entirely.

10. Remove the clamping element and the worm wheel.

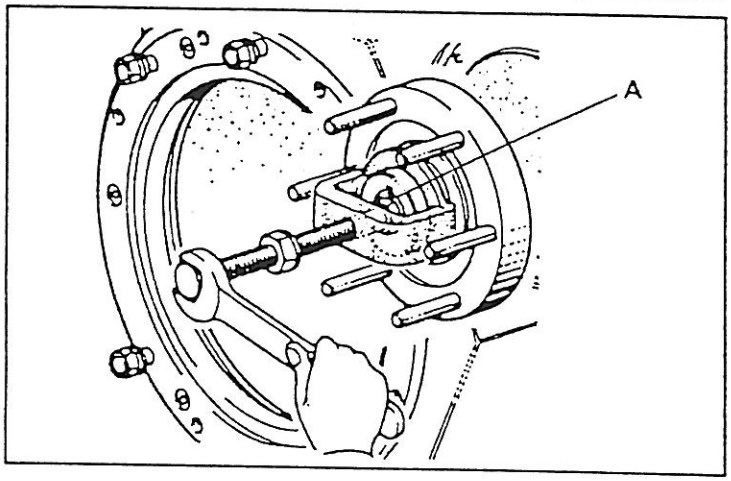
CAUTION! The worm wheel is quite heavy. Hold it firmly when loosening it. Watch your fingers, risk for jamming injuries!



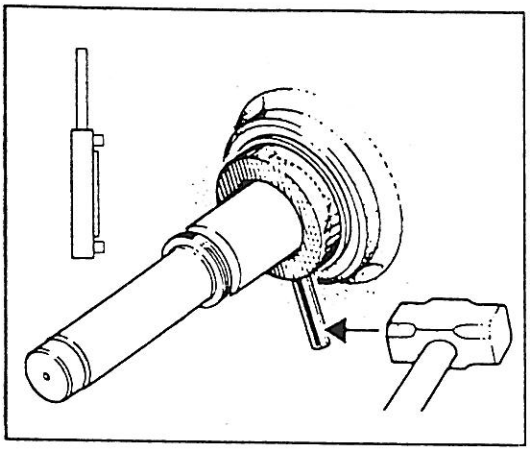
11. Remove the motor.
See chapter "Motor."

12. Remove the rubber discs from the coupling.

13. Unscrew the center screw (A) and remove the plain washer (B). Then tighten the screw (A) again to protect the shaft during next operation.

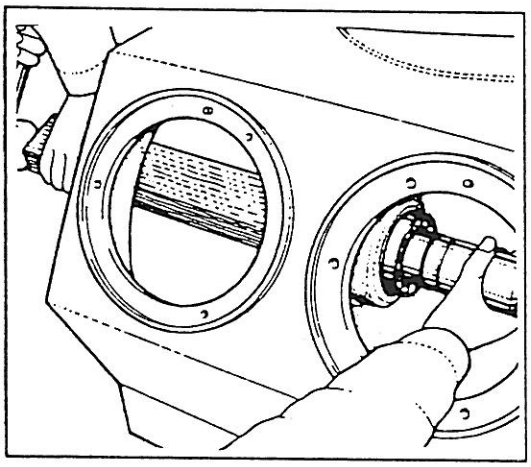


14. Fit the puller tool and pull off the coupling.

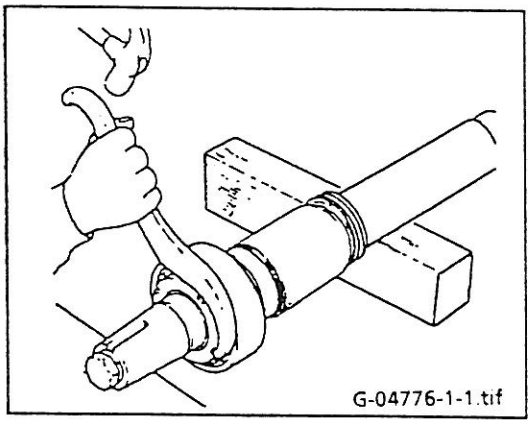


15. Remove the lock ring.
Use the pin spanner or a drift.

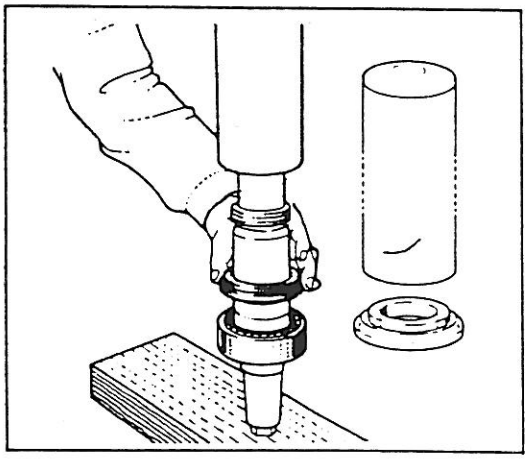
Note! Left-hand thread.



16. Knock loose the worm wheel shaft from the motor side with a piece of wood and a tin hammer.

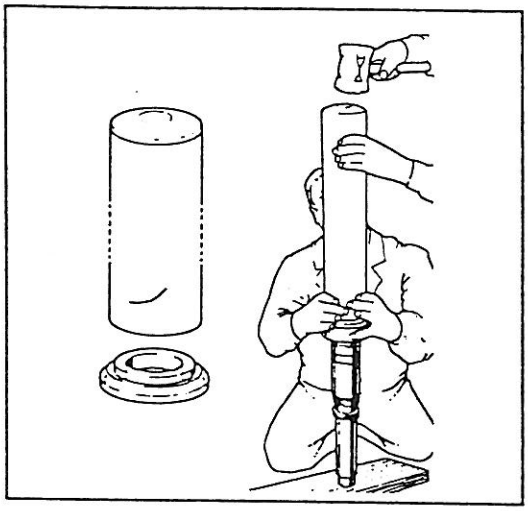


17. Screw off the round nut.



18. Remove the ball bearing. Position the smaller sleeve against the inner race of the ball bearing. Put a piece of paper or cloth inside the tube in order to avoid damage on the shaft.

HORIZONTAL DRIVING DEVICE	ASSEMBLY	

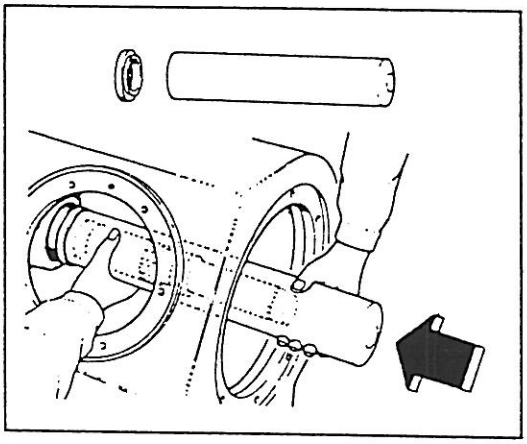


Clean and oil the bearing seat on the worm wheel shaft.

1. Mount the ball bearing in cold condition by using the tools. Use the larger sleeve which acts against the inner race of the ball bearing.

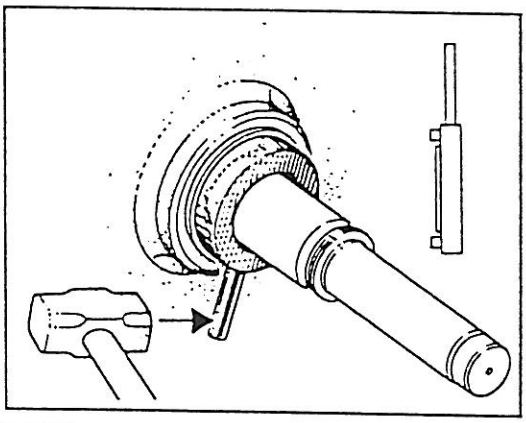
   This procedure is recommended by Alfa-Laval.

   DO NOT heat this ball bearing in oil!

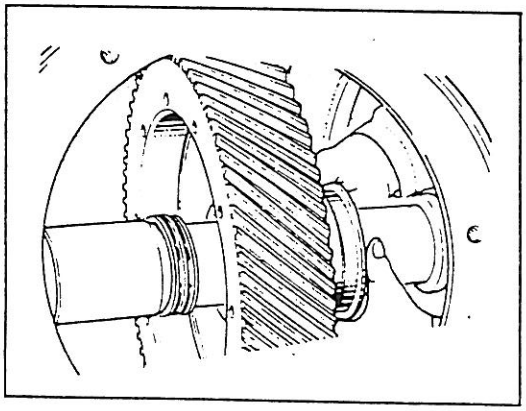


2. Screw the round nut onto the shaft (compare 17 on previous page).

3. Clean the bearing seat in the frame. Apply some oil on the outer race of the ball bearing and force the worm wheel shaft into position. Use the sleeve which acts against the outer race of the ball bearing. Use a tin hammer.



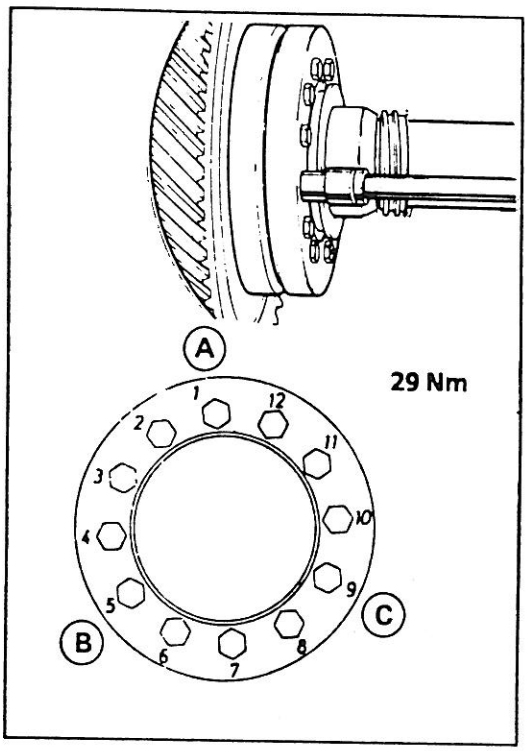
4. Mount the lock ring. Use the pin spanner or a drift.
   Note! Left-hand thread.



5. Fit the coupling half. Note the key. Fit the center screw (with spring washer and plain washer) and tighten it. Fit the elastic plates.

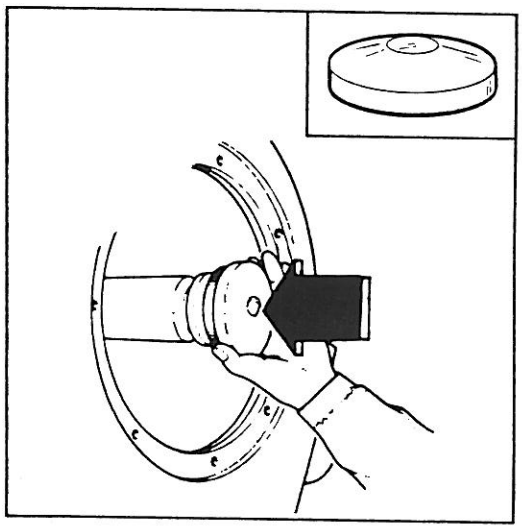
6. Before fitting the worm wheel and the clamping element clean all surfaces thoroughly with a clean cloth. Push the worm wheel on the shaft as far as possible.

HORIZONTAL DRIVING DEVICE	ASSEMBLY	



7. Oil the inner surface of the clamping element. The oil must be of the same quality as is used in the worm gear housing. Slip the clamping element onto the worm wheel.

8. First tighten the three clamp screws A, B and C, but only so little that the clamping element just sticks on the worm wheel shaft. Then tighten the clamp screws uniformly and successively around the clamping ring in the order (1 - 12) stated in the figure. Tightening torque 29 Nm. Do not tighten crosswise. This must be repeated several turns around until full torque on every screw is reached. Check continuously that the clamping rings remain plane parallel.



9. Mount the bearing. Apply the mounting washer and hit a few blows on the latter to ascertain that the bearing is in correct position. Use a tin hammer.

10. Make certain that the worm gear housing and the magnet of the cooling coil have been properly cleaned. Insert the cooling coil.

11. Clean the bearing seat in the end shield.
Fit the gaskets on the cooling water connections.
Fit the gasket on the bearing shield and fit the shield.
If necessary, force the shield into position by tightening the screws in the shield, or knock carefully with a tin hammer against the central part of the shield.

12. Fit the bearing shield cover and the nuts and washers of the cooling coil connections.

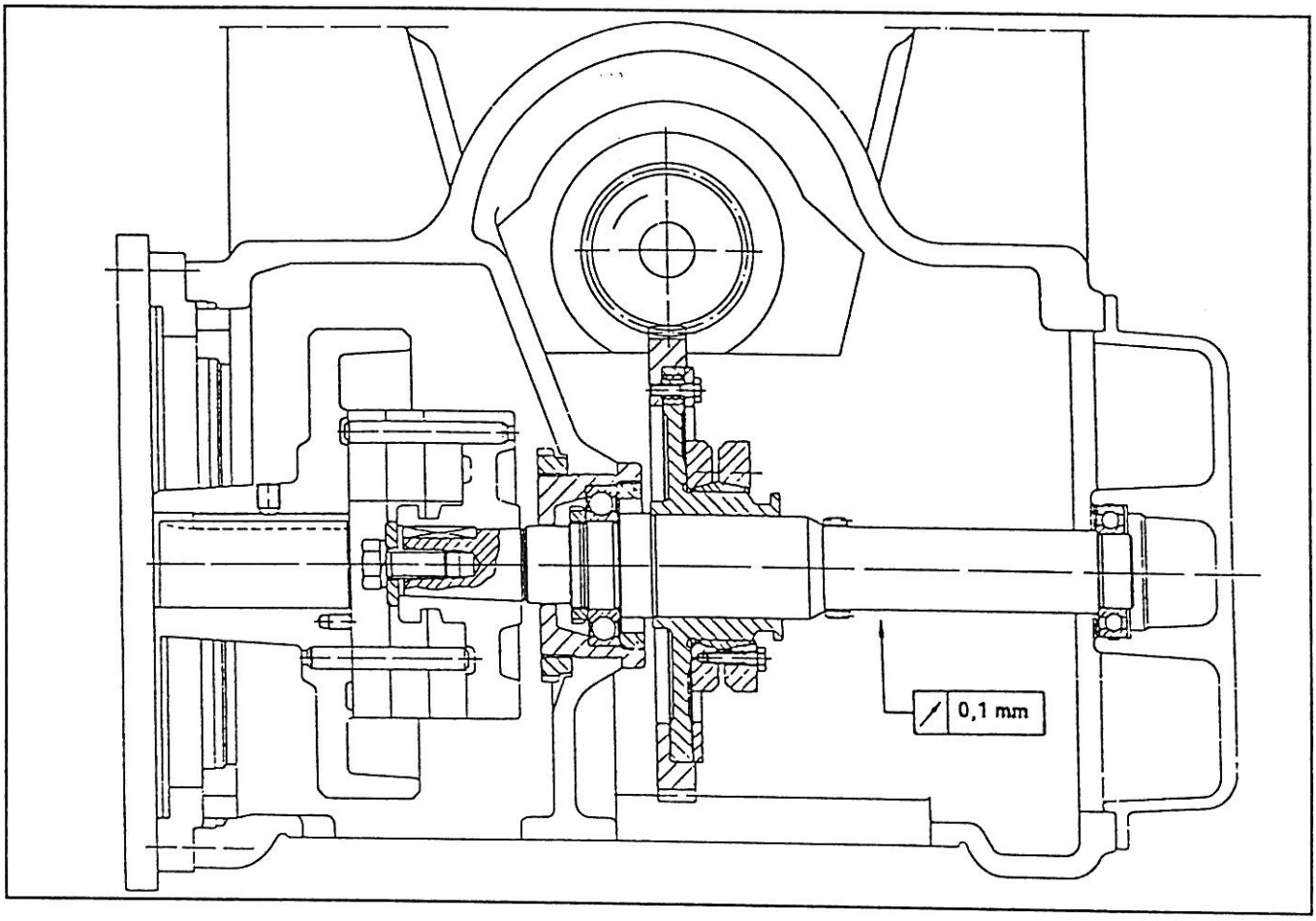
13. Fill oil before the worm wheel guard is mounted.
Quantity and quality: See Lubrication Schedule.

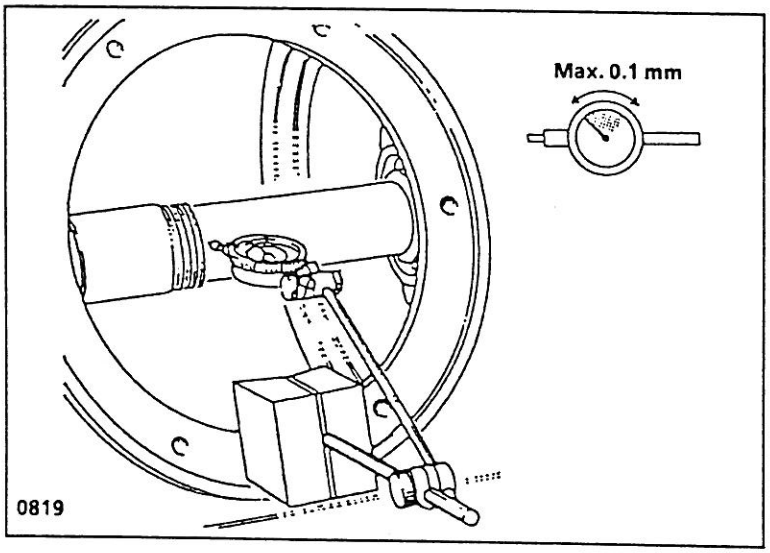
14. Fit the gasket and the worm wheel guard.

15. Fit the motor. Fit the seal strip and the protection cap of the motor.

16. Fit the gasket and the brake cover.

HORIZONTAL DRIVING DEVICE	CHECK POINTS RADIAL WOBBLE OF WORM WHEEL SHAFT	





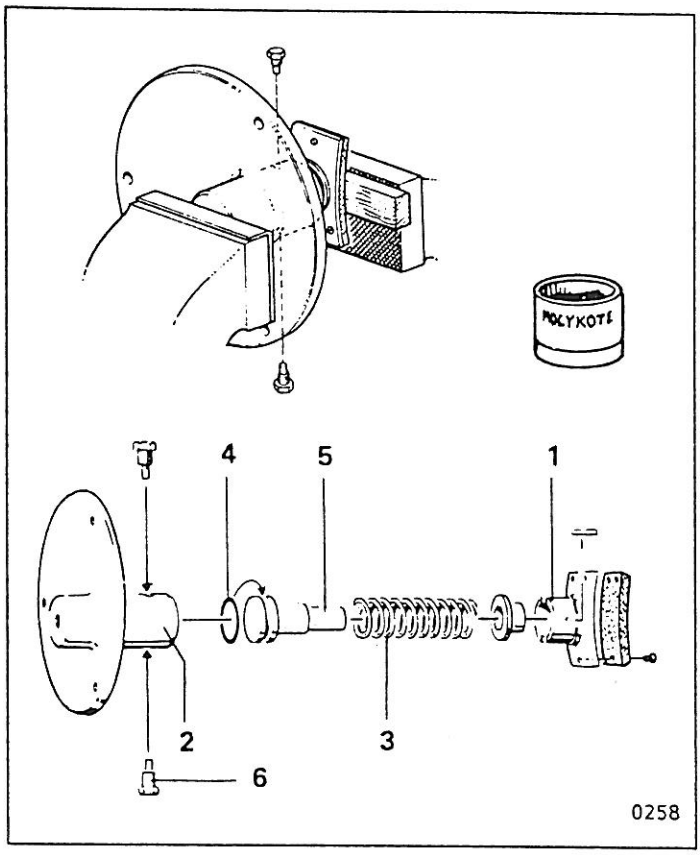
- Excessive wobble on the worm wheel shaft may cause vibration and noise.

Clamp a dial indicator in a magnetic support and fasten the latter to the plane for the worm wheel guard (the gasket should be removed). Revolve the worm wheel shaft by hand.

Max. permissible radial wobble is 0.1 mm

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

Checking for formation of rust



- Formation of rust on the brake parts may cause the brake to jam.

Remove any rust and brake dust from surface of the brake shoe (1) and the corresponding guiding surface in the cover (2). Rub the surfaces for instance with Molykote Paste 1000. Replace the spring (3) if it has lost its stiffness. Oil the spring when mounting.

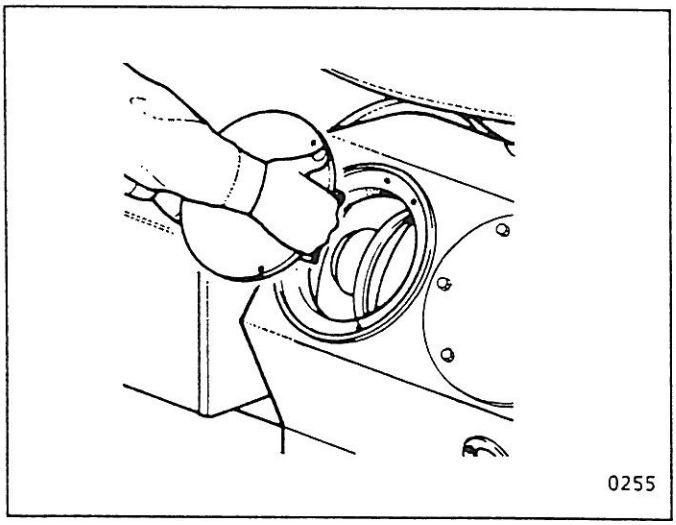
Inspect O-ring (4) as well as piston (5) and its cylinder. Rub the cylinder for instance with Molykote Paste 1000.

Note! When assembling depress the brake shoe entirely in the brake cover before tightening set screws (6), otherwise the set screws may jam the brake shoe.

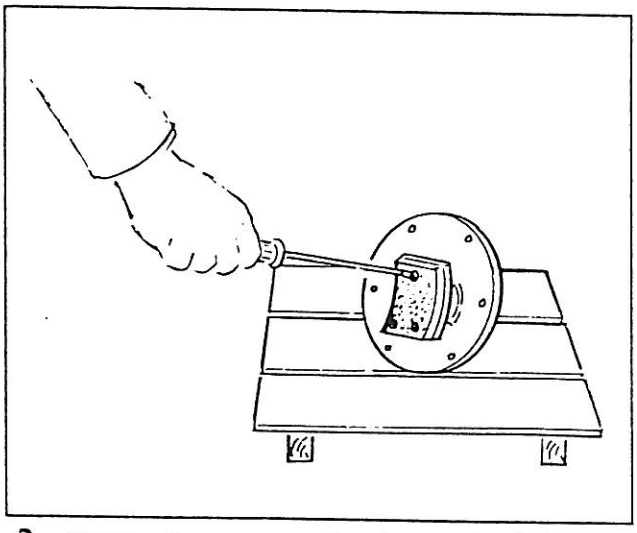
Supply compressed air to check the brake function.

Changing brake lining

- A worn lining will lengthen the braking period.

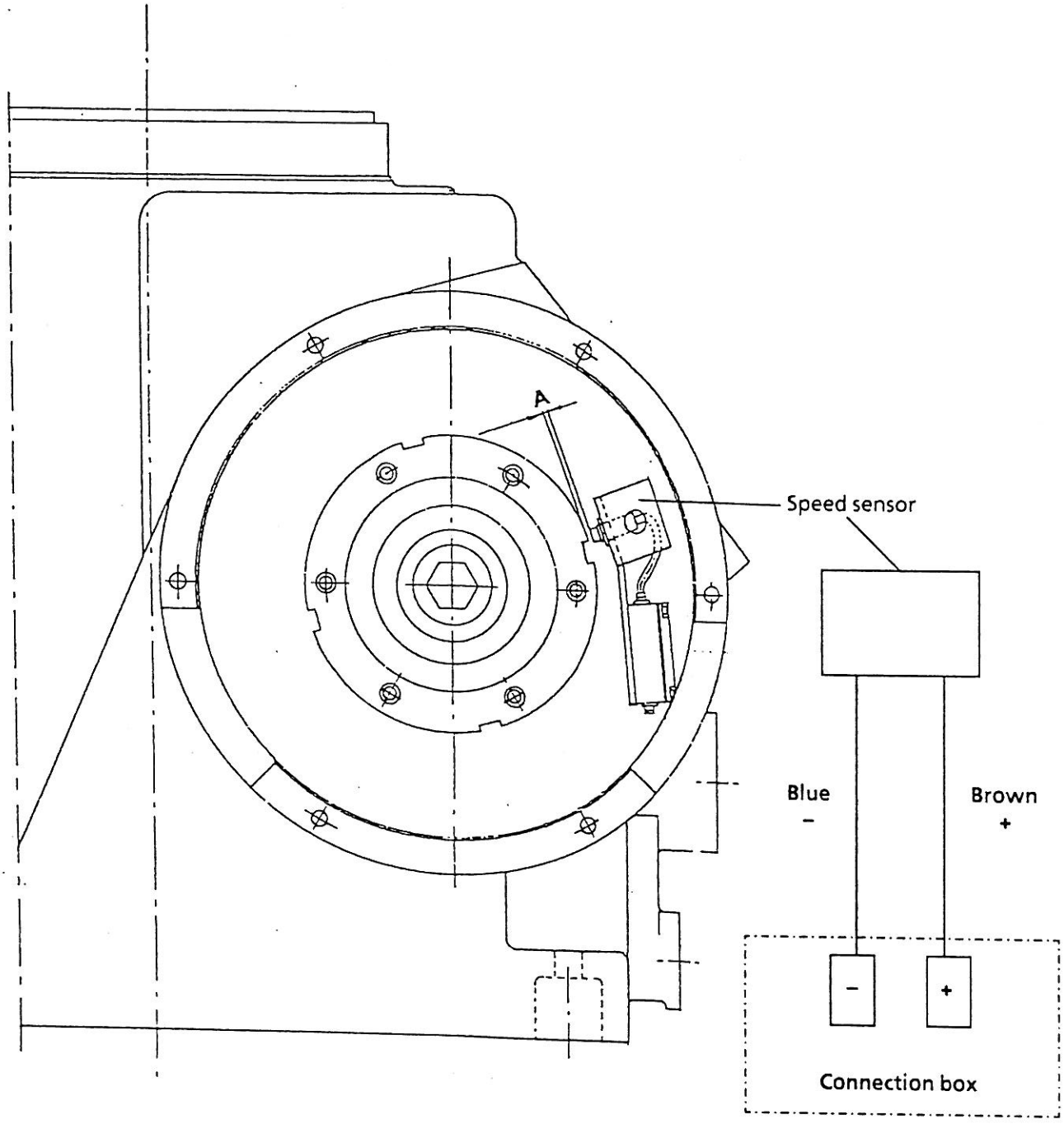


1 Remove the brake cover.



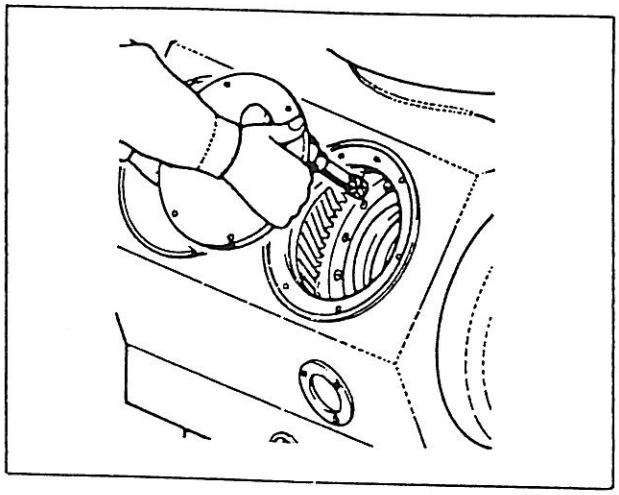
2 Remove the screws and exchange the lining.
Note! The screws are slotted at both ends.

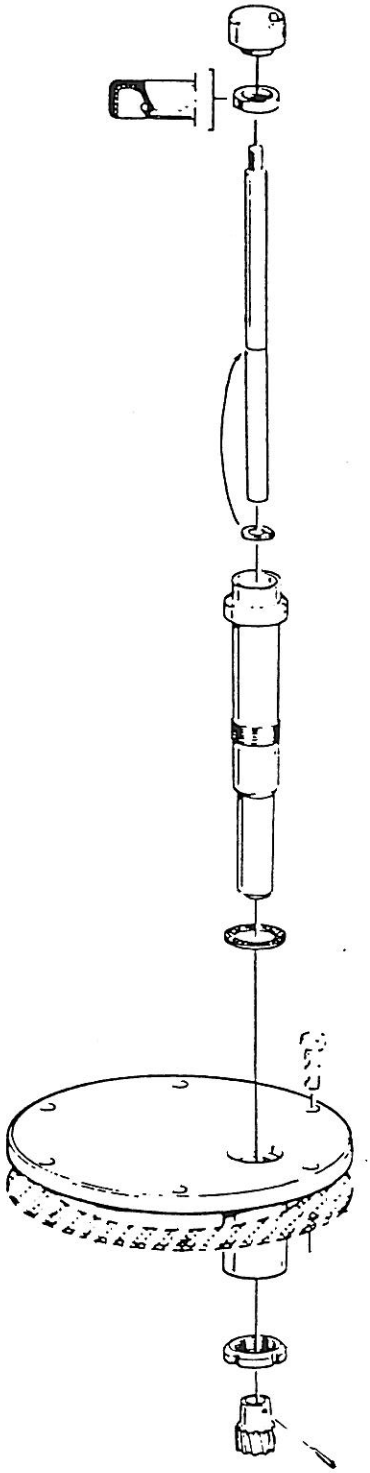
SPEED SENSOR for remote indication (Optional)		



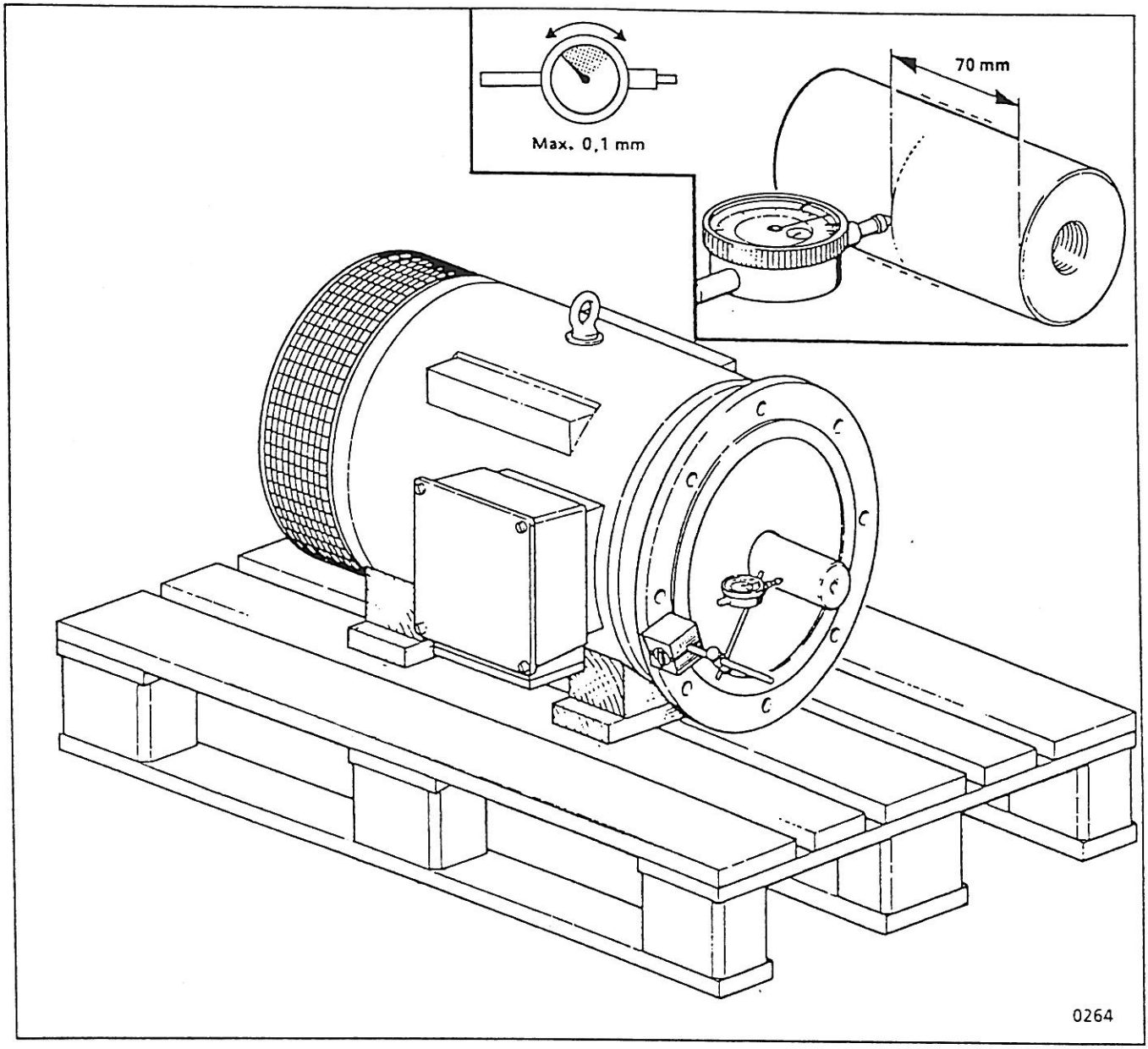
The speed sensor is accessible when the brake cover has been removed. The distance (A) between speed sensor head and the wheel should be adjusted to 2.0 ± 0.5 mm.

WORM WHEEL GUARD (with revolution counter)		





MOTOR	CHECK POINTS RADIAL WOBBLE OF MOTOR SHAFT	



o Excessive wobble on the motor shaft may cause vibration and noise.

Clamp a dial indicator in a magnetic support, and fasten the latter to the flange of the motor. Revolve the motor shaft by hand. Read the wobble on the shaft according to measurement in the figure.

Max. permissible radial wobble: see figure.

If the wobble is excessive, contact the Alfa Laval representative.

CHECK POINTS – MOTOR

Insulation test of motor

Procedure:

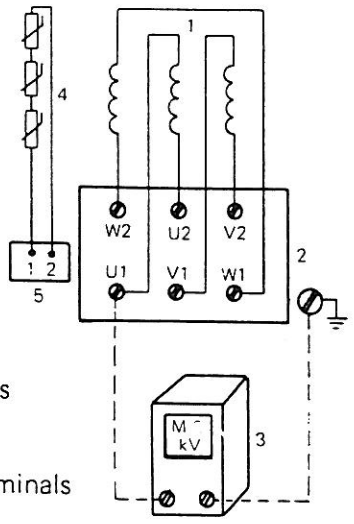
1 Undo the fuses (for safety's sake)
2 Use the insulation tester (megger) to measure between each phase winding and earth (motor frame)
3 Then measure between the phases: U1 to V1, U1 to W1 and V1 to W1.

Measured values

The measured values for a new, dry motor winding are usually higher than 50 MΩ. Reductions can occur due to damp, and values down to about 1 MΩ (or 1000 Ω times the working voltage, e.g. 1000 x 380 = 0.38 MΩ) do not necessarily indicate serious damage. Lower values than this should lead to an investigation of the cause and steps to remedy it.

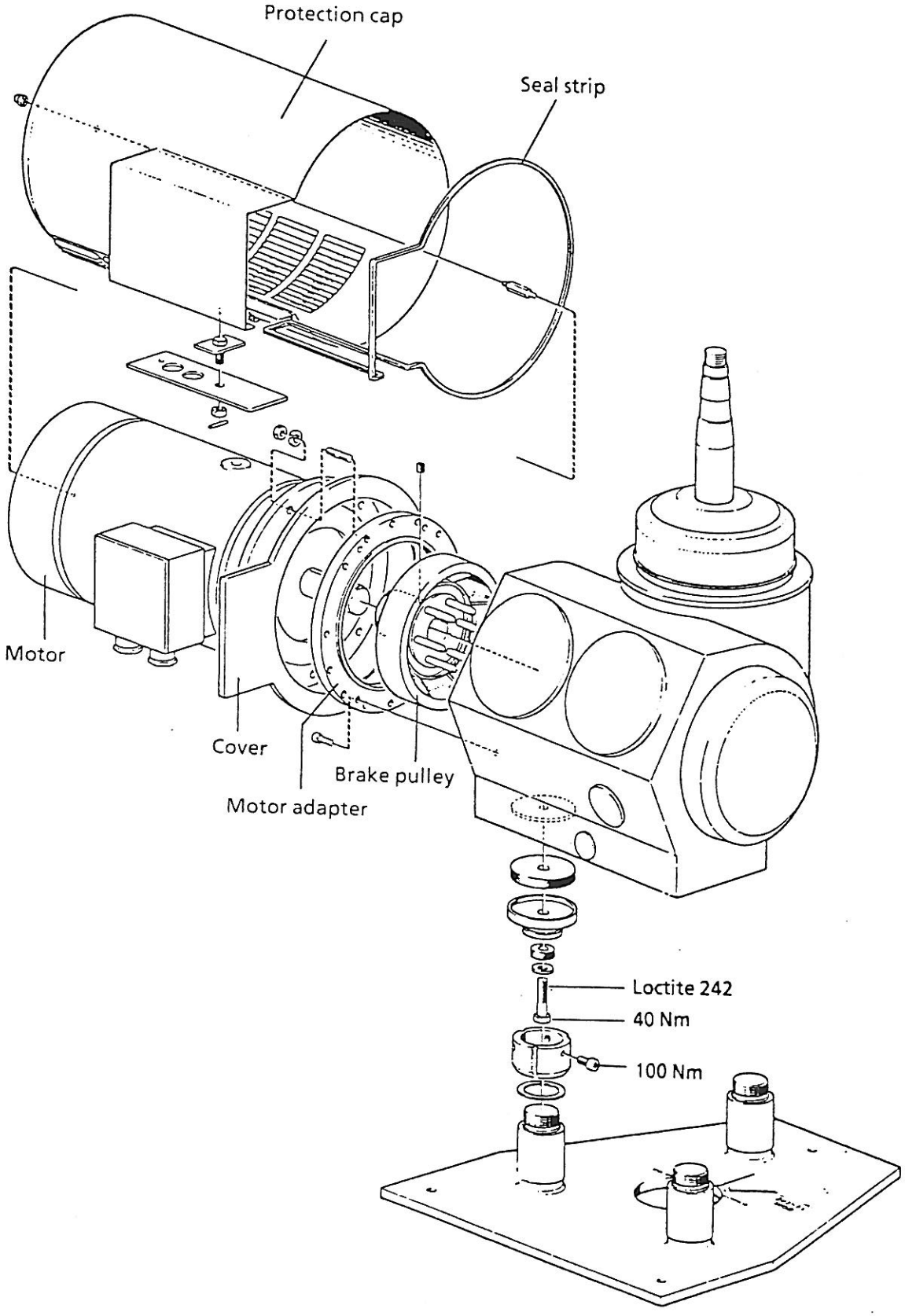
By repeating the measurement directly after a period in service it can be seen whether the moisture has dried out due to the operating heat.

NOTE: The **thermistors** are part of an electronic circuit and must be treated with great care. The megger voltage can easily damage these thermistors. Do not measure their insulation resistance to a winding or motor frame unless there is special reason to suspect a short circuit.

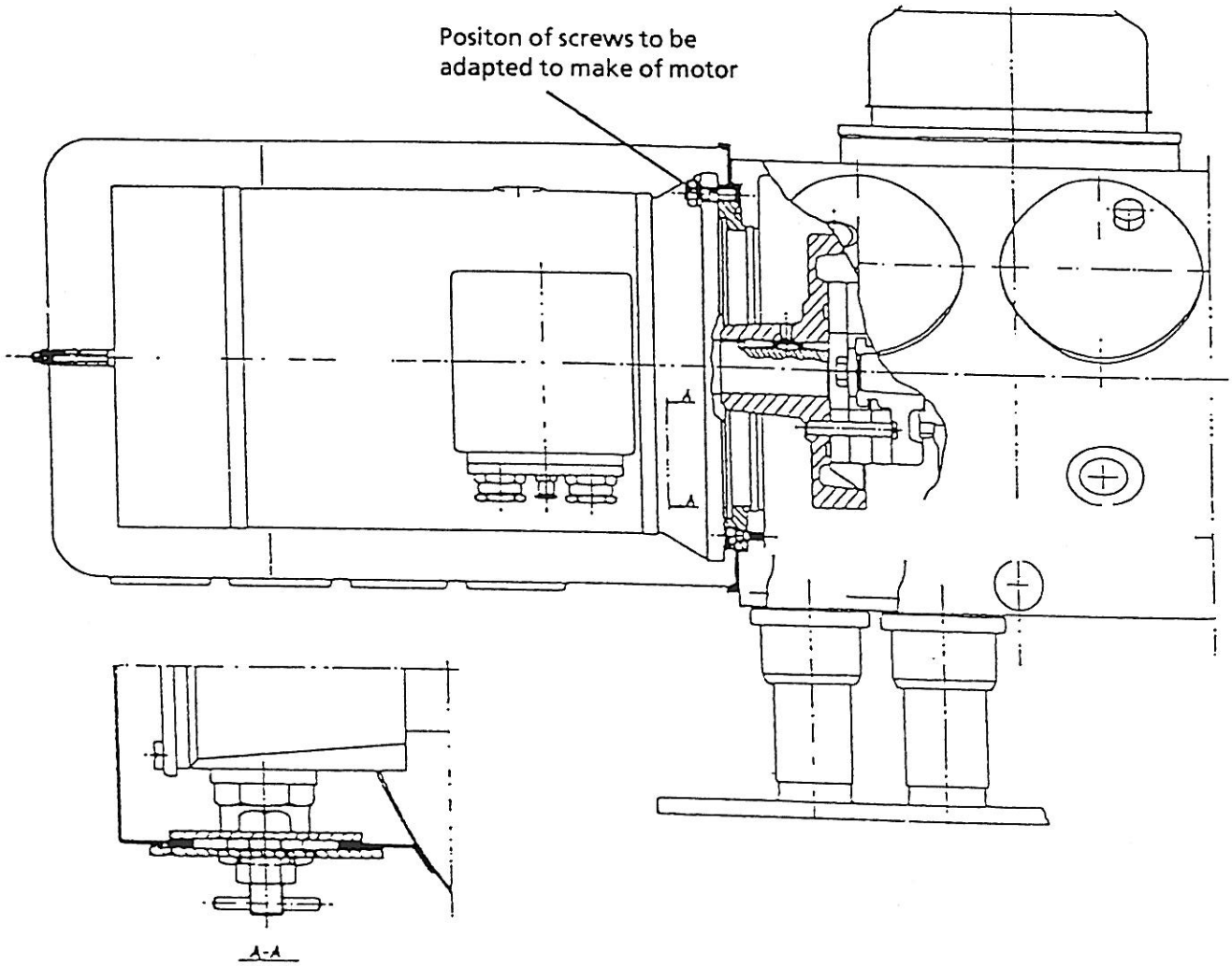


1 Phase windings
2 Motor terminals
3 Megger
4 Thermistors
5 Thermistor terminals

PARTS FOR MOUNTING OF MOTOR		

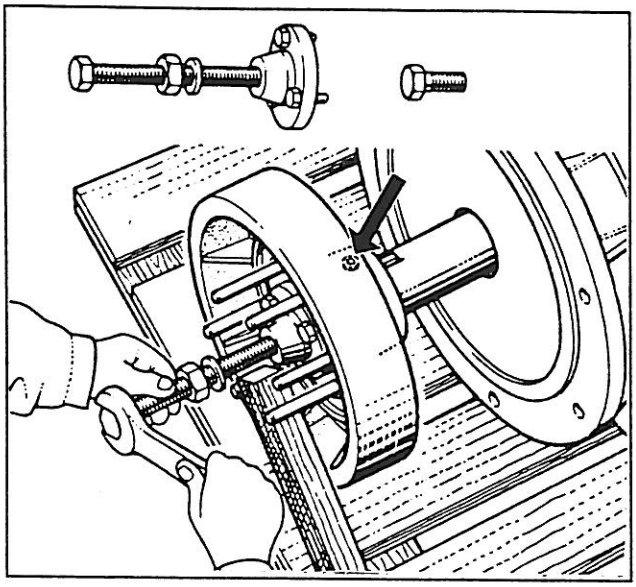


PARTS FOR MOUNTING OF MOTOR		



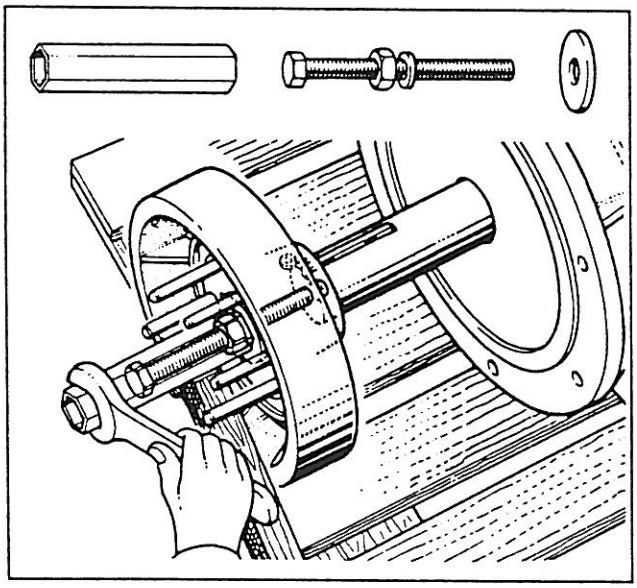
REMOVING THE MOTOR

- Disconnect the electric cables to the motor.
- Fit the lifting eye on top of the motor and tighten it securely.
- Hook up the motor in a hoist. Use a rope between the lifting hook and the lifting eye. Stretch the rope with the hoist.
- Loosen and undo the six nuts fixing the motor flange to the separator frame.
- Pull out the motor from the separator frame and lift it away.



Disassembly

Loosen the lock screw (arrow). Apply some grease on the center screw of tool. Mount a M20 screw on motor shaft. The screw will serve as a support when pulling off the coupling. (The screw from the worm wheel shaft may be used, then don't forget to remount it).

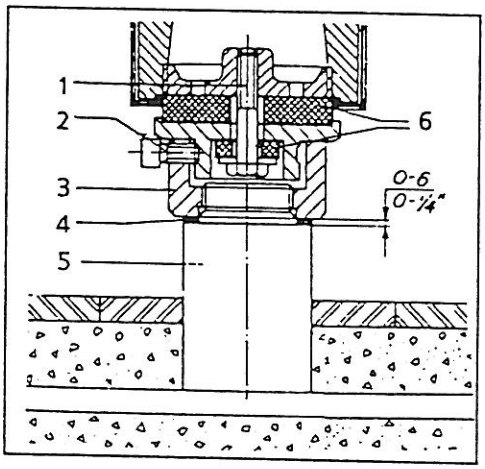


Assembly

Fit washer in coupling disc. Lubricate motor shaft, for instance with Molykote paste 1000. Knock the coupling on to the motor shaft as far as possible by means of a piece of wood and a hammer. Screw home the nut on the mounting tool (the center screw of the dismantling tool) and screw it into the motor shaft.

Apply some grease on the washer ahead of the nut and press the coupling into position by tightening the nut using the socket sleeve and a screw wrench. Lock it with the lock screw.

PARTS FOR MOUNTING OF MOTOR		



1 Screw and washer
2 Set screw
3 Holder
4 Adjusting washer
5 Foundation foot
6 Vibration damper

MOUNTING ON THE FOUNDATION FEET

Check the vibration dampers and replace them when necessary, all at the same time. Apply Loctite 242 on the screws (1) and tighten them. Tightening torque 40 Nm (4 kpm). The dampers must be replaced at least every second year.

Level against the upper face of the three holders (3). When necessary screw the holders so as to compensate for the inclination. Any gap between a holder and the foundation foot must be filled with one or more adjusting washers (4).

Lower the frame on to the foundation feet.

Tighten the set screws (2) *by hand* (or by a hand tool, if necessary) ***until all of them are in contact with the frame feet***, then tighten them with a tightening torque of 100 Nm. Mount the bowl and check that the frame is horizontal by means of a spirit level placed on the outer frame rim. Make a new adjustment if necessary.

Warning! Never mount the bowl or the cyclone unless the set screws (2) are tightened.

Mount in the order stated

- o Bowl
- o Motor with protecting cap
- o Cyclone
- o Frame hood
- o Inlet / Outlet

Two different groups of lubricating oils are 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 acc. to document 553218-05 and 553218-06

Ambient temperature °C	Alfa Laval lubricating oil group	Time in operation Oil change interval
between +5 and +45	B/320	1500 h
between ±2 and +65	D/320	2000 h

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

Oil quantity: See Technical Data

LUBRICATION	Lubrication chart, general	

Lubricating points:	Type of Lubricant:
Bowl spindle ball bearings and buffers are lubricated by oil mist	Lubricating oil as specified in "Recommended lubricating oils"
Bowl spindle taper	Lube oil, only a few drops for rust protection
Buffers of bowl spindle	Lube oil
Bowl: Sliding contact surfaces and pressure loaded surfaces such as lock rings, threads of lock rings, bowl hood, and cap nut.	Pastes as specified in "Recommended lubricants" If not specified otherwise, follow the supplier's recommendation about method of application.
Rubber seal rings.	Grease as specified in "Recommended lubricants"
Friction coupling ball bearings	The bearings are packed with grease and sealed and need no extra lubrication.
Electric motor	Follow manufacturer's instructions.

Lubricating point, specific instructions:

Instructions related to a specific design of the machine, refer to the general assembly drawings of the separator.

NOTE!

Some application processes demand special lubrication.

Alfa Laval Lubricating Oil Groups:

- Group A oil: a high quality gear oil on paraffin base with stable AW (anti wear) additives.
- Group B oil: a high quality gear oil on paraffin base with stable EP (extreme pressure)
- Group D oil: a synthetic base oil with additives stable at high operating temperatures.
- Do not mix different oil brands or oils from different oil groups.

  Always use clean vessels when handling lubricating oil.

  Great attention must be paid not to contaminate the lubricating oil. Of particular importance is to avoid mixing of different types of oil. Even a few drops of motor oil mixed into a synthetic oil may result in severe foaming.

  Any presence of black deposits in a mineral type oil is an indication that the oil base has deteriorated seriously or that some of the oil additives have precipitated. Always investigate why black deposits occur.

- If it is necessary to change from one group of oil brand to another it is recommended to do this in connection with an overhaul of the separator. Clean the gear housing and the spindle parts thoroughly and remove all deposits before filling the new oil.

NOTE!
Always clean and dry parts (also tools) before lubricants are applied.

IMPORTANT Check the oil level before start. Top up when necessary. Oil volume see document *"Technical Data"*.

- It is of utmost importance to use the lubricants recommended in our documentation. This does not exclude, however, the use of other brands, provided they have equivalently high quality properties as the brands recommended. The use of oilbrands and other lubricants than recommended, is done on the exclusive responsibility of the user or oil supplier.

Applying, handling and storing of lubricants

- Always be sure to follow lubricants manufacturer's instructions.

LUBRICATION	Recommended oil brands Document 553218-05	

A- L Lubrication oil group B	
Viscosity grade VG [1] Viscosity index VI [2]	B 320 > 92
SUPPLIER	DESIGNATION
Bel-Ray	100 Gear Oil
BP	Energol GR-XP 320
Castrol	Alpha SP 320
Esso/EXXON/ Standard oil/ Svenska Statoil	Spartan EP 320
Petrofina	Giran 320
Lubmarine/Beijer/ELF Brand designation acc.to ELF	Epona Z 320
Mobil	Mobilgear 632 Mobilgear SHC 320
Nynäs	GL 320
Optimol Ölwerke	Optigear BM 320
Q8/Kuwait	Goya 320
Shell	Lorina 320 Omala 320
Texaco	Meropa 320
Gulf	EP HD 320 (UK)
Soviet Standard	ITP-320

1) According to ISO 3448/3104

2) According to ISO 2909

A-L Lubricating oil group D	
Viscosity grade VG [1] Viscosity index VI [2]	D 320 > 130
SUPPLIER	DESIGNATION
Alfa Laval Separation AB	542690 -blue
Castrol	Alpha Syn T 320
Lubmarine/Beijer (ELF Brand designation according to ELF)	Epona SA 320
Optimol Ölwerke	Optigear HT 320
Q8/Kuwait	Schumann 320
Chevron	Ultragear 320
Esso/EXXON/ Standard oil/ Svenska Statoil	Teresstic SHP 320
Mobil	SHC 632
Shell	(Delima HT 320)* (Paolina 320)

1) According to ISO 3448/3104 [2]) According to ISO 2909

( )= available in a few countries

* These oil must be used when the frame temperature is about 80°C. If you can't measure the temperature:about 80°C is reached when you can touch the lower frame surface for a short time only.

PASTES AND BONDED COATINGS:

LUBRICANTS FOR FOOD APPLICATIONS.

Manufacturer	Designation	A-L No.	Application
Gleitmolybdän Dow Corning	Gleitmo 1809 TP 42	554336-01	Lockrings
Gleitmolybdän Dow Corning Lubrication Engineers Klueber Gleitmolydän	Gleitmo 1809 Molykote D LE 4025 46 MR 401 Gleitmo 805	554336-01	Screwjoints pins etc.

LUBRICANTS FOR NON-FOOD APPLICATIONS.

Manufacturer	Designation	A-L No.	Application
Gleitmolybdän	Gleitmo 805 K or 805 K varnish 901 Gleitmo Paste G rapid	537086-04	All pressure loaded surfaces
Dow Corning	Molykote paste 1000 spray D321 R varnish D321 R	537086-02 535586-01 535586-02	
Rocol	Antiscuffing paste (ASP)		
Klueber	Wolfracoat C paste		
Russian Standard	VNII NP 232 Gost 14068-90		

SILICONE GREASE:

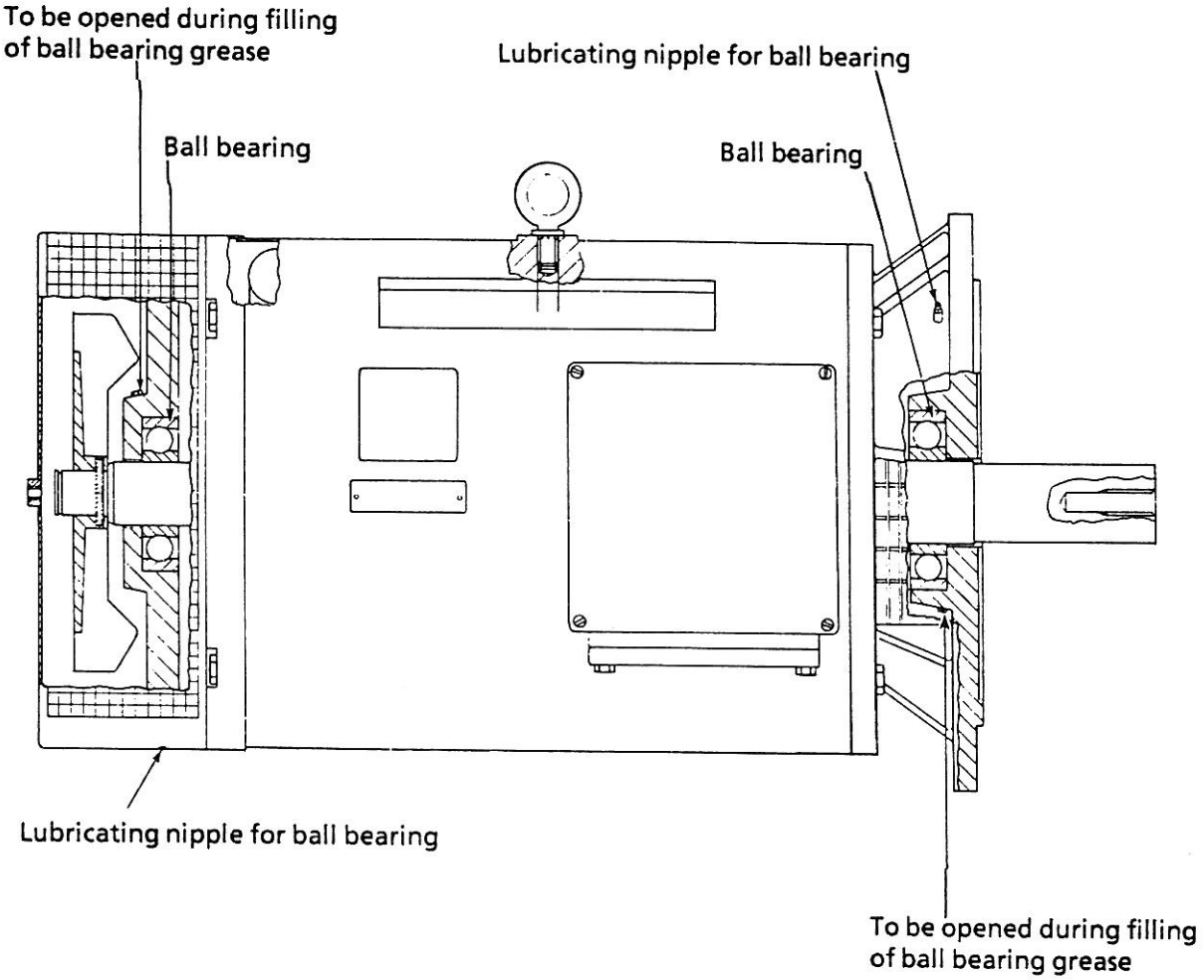
Manufacturer	Designation	A-L No.
Dow Corning	Molykote 111 compound 100gr 25gr	539474-02 539474-03
Gleitmolybdän	Silicone paste 750	
Wacker	Silicone Paste P (vacuum paste)	

GREASES FOR BALL AND ROLLER BEARINGS:

Manufacturer	Designation	A-L No.
BP	Energrease MMEP2 Energrease LS2	
Castrol	Spheerol SW2 EP Spheerol EPL2	
Chevron	Duralith grease EP2	
Exxon	Beacon EP2	
Mobil	Mobilith SHC 460 Mobilux EP2	
Gulf	Gulflex MP2	
Q8	Rembrandt EP2	
Shell	Cailithia EP Grease T2 Alvania EP Grease 2 or R.A	
SKF	LGEP2 or LGMT2	
Texaco	Multifak AF B2 Multifak premium 2,3	
Russian Standard	Fiol 2M, Litol 24 TU 38.201.188 - latest edition	

MOTOR

Lubrication of motor (Brook UC 225 LH)
Follow motor supplier's recommendations



Lubricating grease for motor	Ball bearing grease
	SHELL–Alvania 3