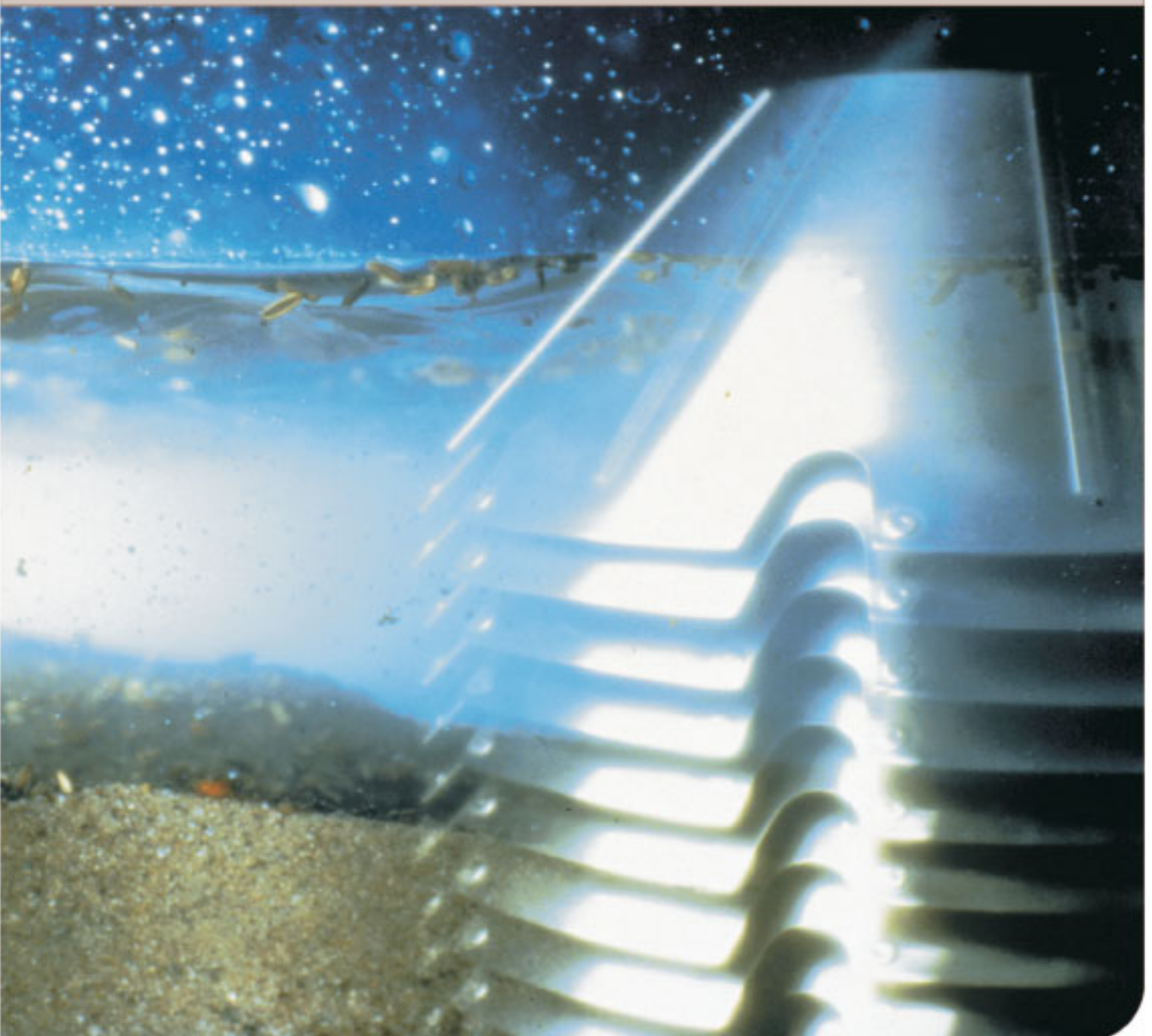




Separator Manual
High Speed Separator

P 605



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Original instructions

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

Not following the instructions can result in serious accidents.

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



1 *Read This First*

This manual is designed for operators, maintenance personnel and service engineers working with the Alfa Laval separator

If the separator has been delivered and installed by Alfa Laval as a part of a processing system, this manual should be viewed as part of the System Documentation. Study carefully all instructions in any System Documentation.

In addition to this Separator Manual a Spare Parts Catalogue, SPC is supplied.

The Separator Manual consists of:

Safety Instructions

Pay special attention to the safety instructions for the separator. Accidents causing damage to equipment and/or serious injury to persons or personnel can result if the safety instructions are not followed.

Basic Principles of Separation

This chapter describes the purpose of separation and separation principles.

Design and function

This chapter contains a description of the separator.

Operating Instructions

This chapter contains operating instructions for the separator only.

Service, Dismantling, Assembly

This chapter gives instructions for the maintenance procedures. It also contains step-by-step instructions for dismantling and assembly of the separator for service and repair.

Fault Finding

Refer to this chapter if the separator functions abnormally.

If the separator has been installed as a part of a processing system, always refer to the trouble-tracing instructions, in the System Documentation.

Technical Reference

This chapter contains technical data concerning the separator and drawings.

Installation

This chapter contains specifications and recommendations concerning separator installation.



NOTE

A complete reading of this manual by personnel in contact with the machine is essential to safety. Do not allow personnel to clean, assemble, operate or maintain the separator until they have read and fully understood this manual. Ensure that all personnel who operate and service the separator are well-trained and knowledgeable concerning the machine and the work to be carried out.

2 Safety instructions



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

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

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

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

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

The following basic safety instructions therefore apply:

- **Use the separator only for the purpose and parameter range specified by Alfa Laval.**
- **Strictly follow the instructions for installation, operation and maintenance.**
- **Ensure that personnel are competent and have sufficient knowledge of maintenance and operation, especially concerning emergency stopping procedures.**
- **Use only Alfa Laval genuine spare parts and the special tools supplied.**



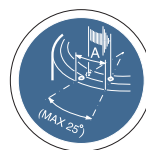
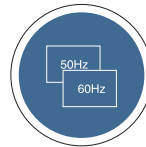
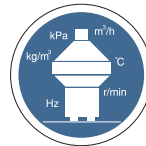
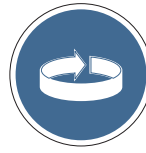
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Disintegration hazards

- When power cables are connected, always check direction of motor rotation. If incorrect, vital rotating parts could unscrew.
- If excessive vibration occurs, stop separator and keep bowl filled with liquid during rundown.
- Use the separator only for the purpose and parameter range specified by Alfa Laval.
- Check that the gear ratio is correct for power frequency used. If incorrect, subsequent overspeed may result in a serious break down.
- Welding or heating of parts that rotate can seriously affect material strength.
- Wear on the large lock ring thread must not exceed safety limit. Φ -mark on lock ring must not pass opposite Φ -mark by more than specified distance.
- Inspect regularly for **corrosion** and **erosion** damage. Inspect frequently if process liquid is corrosive or erosive.





Entrapment hazards

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



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



Electrical hazard

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



Crush hazards

- Use correct lifting tools and follow lifting instructions.



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



Noise hazards

- Use ear protection in noisy environments.



Burn hazards

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



**Skin irritation hazards**

- When using chemical cleaning agents, make sure you follow the general rules and suppliers recommendation regarding ventilation, personnel protection etc.
- Use of lubricants in various situations.

**Cut hazards**

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

**Flying objects**

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

**Health hazards**

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





2.1 Warning signs in text

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



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



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



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



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



2.2 Environmental issues

Unpacking

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

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

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

Metal straps should be sent for material recycling.

Maintenance

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

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

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

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

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

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



2.3 Requirements of personnel

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

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

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



3 Basic principles of separation

3.1 Introduction

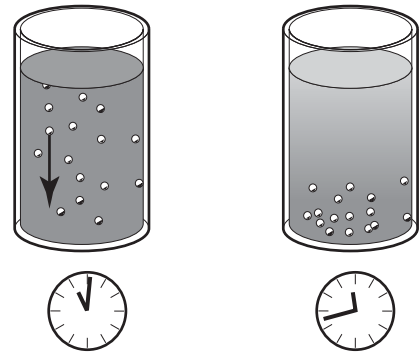
The purpose of separation can be:

- to free a liquid of solid particles,
- to separate two mutually insoluble liquids with different densities while removing any solids presents at the same time,
- to separate and concentrate solid particles from a liquid.

3.2 Separation by gravity

A liquid mixture in a stationary bowl will clear slowly as the heavy particles in the liquid mixture sink to the bottom under the influence of gravity.

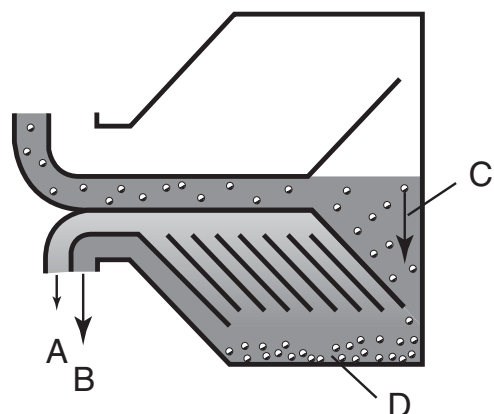
A lighter liquid rises while a heavier liquid and solids sink.



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Continuous separation and sedimentation can be achieved in a settling tank having inlet and outlet arranged according to the illustration.

Heavier particles in the liquid mixture will settle and form a sediment layer on the tank bottom.



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- A. Lighter liquid
- B. Heavier liquid
- C. Gravity
- D. Sediment layer of heavier particles

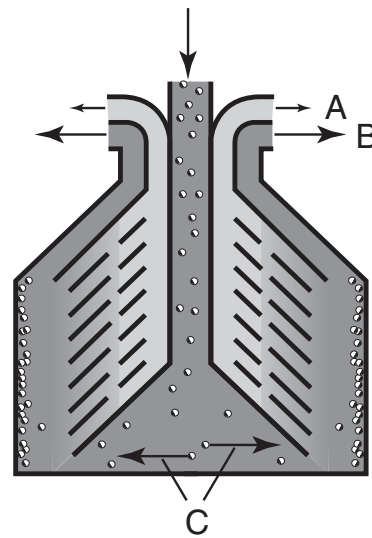
3.3 Centrifugal separation

In a rapidly rotating bowl, the force of gravity is replaced by centrifugal force, which can be thousands of times greater.

Separation and sedimentation is continuous and happens very quickly.

The centrifugal force in the separator bowl can achieve in a few seconds what takes many hours in a tank under influence of gravity.

The separation efficiency is influenced by changes in the viscosity, separating temperatures and in throughput.



G0870321

- A. Lighter liquid
- B. Heavier liquid
- C. Centrifugal force

3.4 Separating temperatures

For some types of process liquids a high separating temperature will normally increase the separation capacity. The temperature influences viscosity and density and should be kept constant throughout the separation.

<p>Viscosity</p> <p>Viscosity is a fluids resistance against movement. Low viscosity facilitates separation. Viscosity can be reduced by heating.</p> <div style="text-align: center;"> </div> <p style="text-align: center;">A B</p> <p style="font-size: small;">G0885921</p> <p>A. High viscosity B. Low viscosity</p>	<p>Density difference</p> <p>Density is mass per volume unit. The greater the density difference between the two liquids, the easier the separation. The density difference can be increased by heating.</p> <div style="text-align: center;"> </div> <p style="text-align: center;">A B</p> <p style="font-size: small;">G0885921</p> <p>A. High density (with low temperature) B. Low density (with high temperature)</p>
---	---

4 Separator basics

4.1 Design and function

4.1.1 Application

The separator is a high-speed centrifugal separator intended for marine and land applications. It is specifically designed for cleaning of mineral oils from water and solid particles (sludge). The cleaned oil is discharged continuously, while the sludge is discharged at intervals. The separator handles the following types of lubricating oils and low viscosity fuel oils:

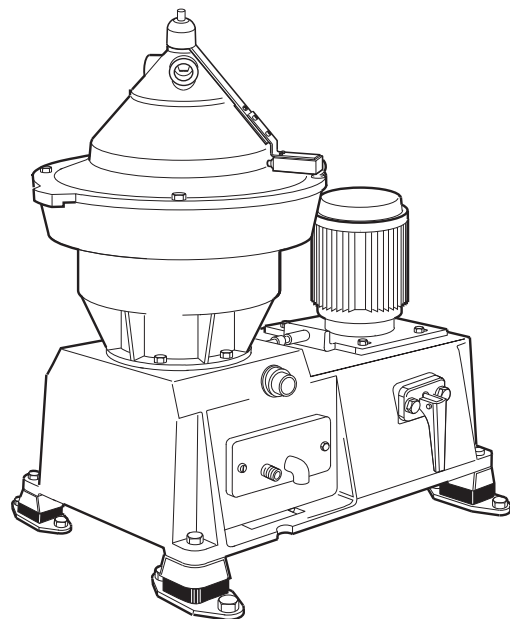
- Distillate, viscosity 1,5 - 5,5 cSt/40 °C
- Marine diesel oil, viscosity 13 cSt/40 °C
- Intermediate fuel oil and heavy fuel oil (viscosity 30-600 cSt/50 °C)
- Lubricating oil of R & O type, detergent or steam turbine.

The separator can be operated either as a purifier or as a clarifier.

When operated as a purifier the separator discharges the separated water continuously.

When the oil contains only small amounts of water the separator is operated as a clarifier, discharging the water together with the solid particles.

The separator has to be installed together with devices for control of its operation.



G0464881



Disintegration hazard

Use the separator only for the purpose and parameters (type of liquid, rotational speed, temperature, density etc.) specified in chapter 7 [Technical Reference on page 131](#) and in the Purchase Order documents.

Consult your Alfa Laval representative before any changes outside these parameters are made.

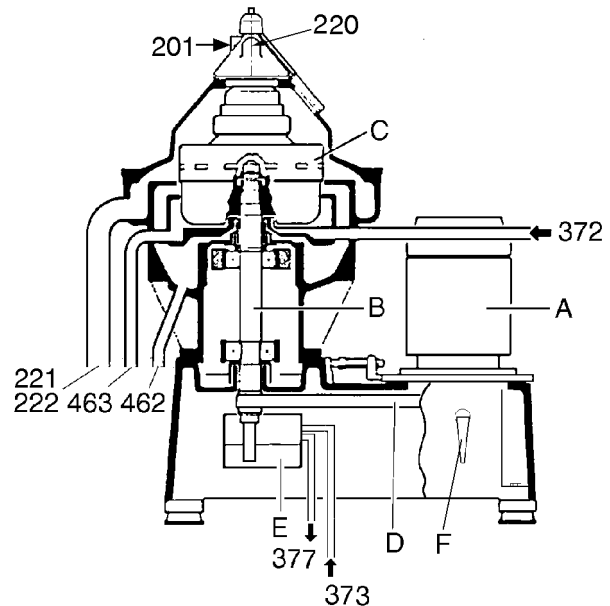
4.1.2 Design

The separator comprises a frame consisting of the frame lower part, the intermediate part and the frame top part with a frame hood.

The separator bowl (C) is driven by an electric motor (A) via a flat-belt power transmission (D) and bowl spindle (B). The motor drive is equipped with a friction coupling to prevent overload.

The bowl is of disc type and hydraulically operated at sludge discharges. The hollow bowl spindle (B) features an impeller which pumps closing water from a built-in tank to the operating system for sludge discharge.

The main inlets and outlets are shown with their connection numbers in the illustration. The connections are listed in chapter [Technical Reference](#) where the basic size drawing also can be found.



G0739541

- A. Electric motor
- B. Bowl spindle
- C. Bowl
- D. Flat belt
- E. Closing water tank
- F. Brake handle
- 201. Oil inlet
- 220. Oil outlet
- 221/222. Water/sludge outlet
- 372. Opening water inlet
- 373. Bowl closing water
- 377. Overflow
- 462. Drain
- 463. Drain

4.1.3 Outline of function

The separation process takes place in the rotating bowl. Unseparated oil is fed into the bowl through the inlet (201). The oil is cleaned in the bowl and leaves the separator through the outlet (220) via a paring chamber.

Impurities heavier than the oil are collected in the sludge space at the bowl periphery and removed automatically at regular intervals.

Permissible pressures and operating conditions are specified in chapter [7 Technical Reference on page 131](#).

The processing parts of the separator are shown in the illustration on next page.

There are no contacting surfaces between process rotating parts (the bowl) and stationary parts (inlet, outlet, feed devices), and the interfacing surfaces are not sealed. As the separation process is carefully balanced regarding pressures and fluid levels, any leakages will not occur as long as the correct running conditions are maintained.

4.1.4 Separating function

Liquid flow

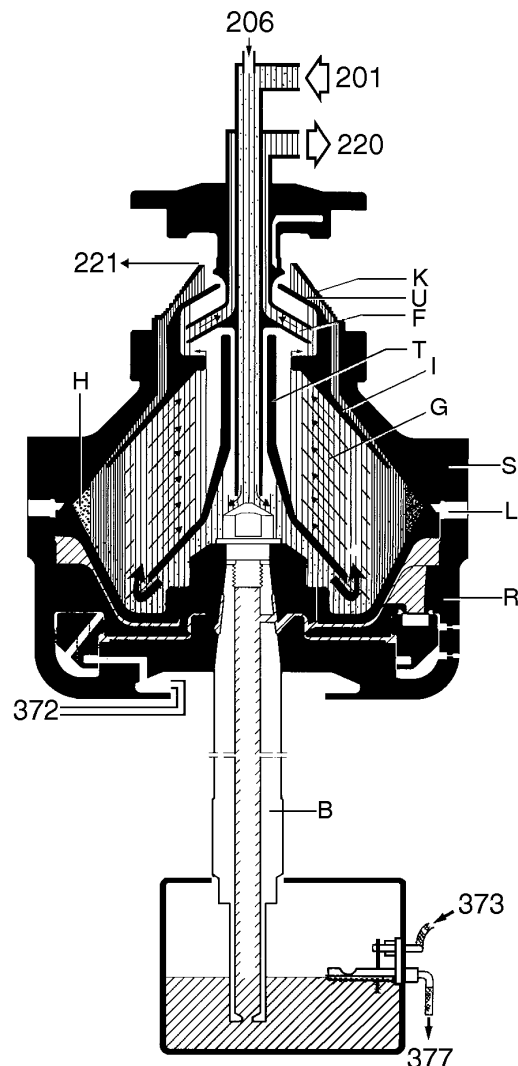
Separation takes place in the separator bowl to which unseparated oil is fed through the inlet pipe (201). The oil is led by the distributor (T) towards the periphery of the bowl.

When the unseparated oil reaches the slots of the distributor, it will rise through the channels formed by the disc stack (G) where it is evenly distributed into the disc stack.

The oil is continuously separated from water and sludge as it will flow towards the center of the bowl. When the cleaned oil leaves the disc stack it rises upwards and enters the paring chamber. From there it is pumped by the paring disc (F) and leaves the bowl through the outlet (220).

Separated sludge and water move towards the bowl periphery. In purification separated water rises along the outside of the disc stack, passes from the top disc channels over the edge of the gravity disc (K) and leaves the bowl into the common sludge and water outlet (221) of the separator.

Heavier impurities are collected in the sludge space (H) outside the disc stack and are discharged at intervals through the sludge ports (L).



G0112361

- F. Paring disc
- G. Disc stack
- H. Sludge space
- I. Top disc
- K. Gravity disc
- L. Sludge ports
- R. Bowl body
- S. Bowl hood
- T. Distributor
- U. Paring chamber cover
- 201. Oil inlet
- 206. Water seal and displacement water inlet
- 220. Oil outlet
- 221. Water outlet
- 372. Opening water inlet
- 373. Bowl closing water
- 377. Overflow

Water seal in purification

To prevent the oil from passing the outer edge of the top disc (I) and escaping through the water outlet (221), a water seal must be provided in the bowl. This is done by filling the bowl with water through the water inlet (206), before unseparated oil is supplied. When oil feed is turned on the oil will force the water towards the bowl periphery and an interface (X) is formed between the water and the oil. The position of the interface is determined by the size of gravity disc (K).

Displacement of oil

To avoid oil losses at sludge discharge, displacement water is fed to the bowl.

Prior to a discharge the oil feed is stopped and displacement water added through the water inlet (206). This water changes the balance in the bowl and the interface (X) moves inwards to a new position (Y), increasing the water volume in the sludge space. When the sludge discharge takes place sludge and water alone are discharged.

A new water seal will be established immediately afterwards. The oil feed is then turned on again.

Gravity disc

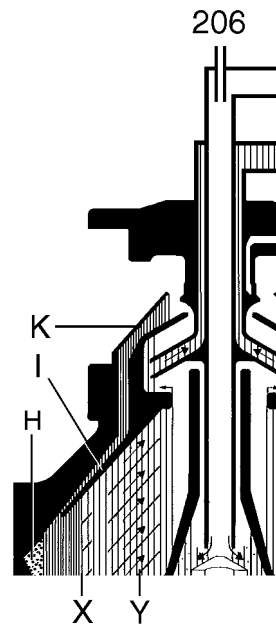
In the purification mode, the position of the interface (X) can be adjusted by replacing the gravity disc (K) for one of a larger or smaller size.

A gravity disc of a larger size will move the interface towards the bowl periphery, whereas a disc of a smaller size will place it closer to the bowl centre.

The correct gravity disc is selected from a nomogram, see [8.3.3 Gravity disc nomogram on page 171](#). The sizes of the gravity discs are normally stamped on the discs.

Clarifier disc

In the clarification mode, the gravity disc is replaced by a clarifier disc which seals off the water outlet. In this case no water seal is required and consequently there is no oil/water interface in the bowl. The clarifier disc is an optional disc with a hole diameter of 40 mm. This disc is not shown in the nomograms.



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Principle of liquid seal and displacement water in purification

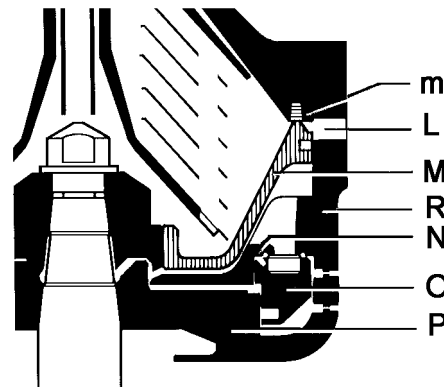
- H. Sludge*
- I. Top disc*
- K. Gravity disc*
- X. Normal interface position*
- Y. Interface position just before discharge*
- 206. Water inlet*

4.1.5 Sludge discharge function

Sludge is discharged through a number of ports (L) in the bowl wall. Between discharges these ports are covered by the sliding bowl bottom (M), which forms an internal bottom in the separating space of the bowl. The sliding bowl bottom is pressed upwards against a sealing ring (m) by force of the closing water underneath.

The sliding bowl bottom is operated hydraulically by means of operating water supplied to the discharge mechanism from an external freshwater line. Opening water is supplied directly to the operating system in the bowl while closing water is supplied to the built-in closing water tank, and pumped to the operating system through the bowl spindle.

The opening and closing only takes a fraction of a second, therefore the discharge volume is limited to a certain percentage of the bowl volume. This action is achieved by the closing water filling space above the upper distributor ring and pushing the sliding bowl bottom upwards. Simultaneously, the water in the chamber below the operating slide is drained off through the nozzles in the bowl body.



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Sludge discharge mechanism

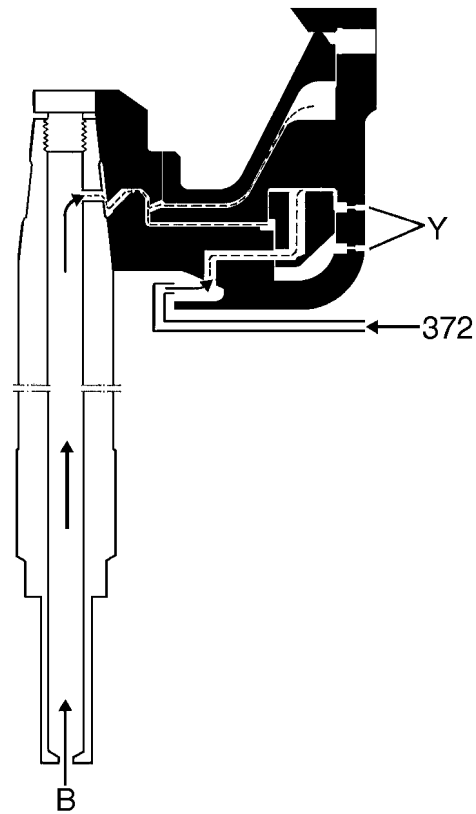
- L. Sludge ports*
- M. Sliding bowl bottom*
- m. Sealing ring*
- N. Upper distributing ring*
- O. Operating slide*
- P. Lower distributing ring*
- R. Bowl body*

Bowl opening

The key event to start a sludge discharge is the downward movement of the operating slide. This is accomplished by supply of opening water (372) to the discharge mechanism. Water is drained off through nozzles (Y) in the bowl body. The sliding bowl bottom is rapidly pressed downwards by the force from the liquid in the bowl, opening the sludge ports.

Bowl closing

After the sludge is discharged the sliding bowl bottom is immediately pressed up and the sludge ports in the bowl wall are closed.



G0112521

Supply of opening water and closing water

372. Opening water

B. Closing and make-up water through bowl spindle

Y. Nozzles

4.1.6 Power transmission

Bowl spindle

In addition to its primary role in the power transmission system, the bowl spindle also serves as:

- pump for the closing water
- supply pipe for the closing water
- lubricator for spindle ball bearings

Closing water is pumped through the hollow spindle (B) to the discharge mechanism in the bowl. For this purpose a pump sleeve (b4) is fitted in the lower end.

The two spindle bearings are lubricated with oil mist. An oil pump (b3) creates the oil mist, which is sucked through the upper ball bearing by a fan (b1). Oil is supplied via an oil filling device, which also serves as a level indicator.

Two identical ring-shaped rubber buffers (b2) support the top bearing housing. The buffers are held in place by a buffer holder and form channels through which the re circulated oil passes.

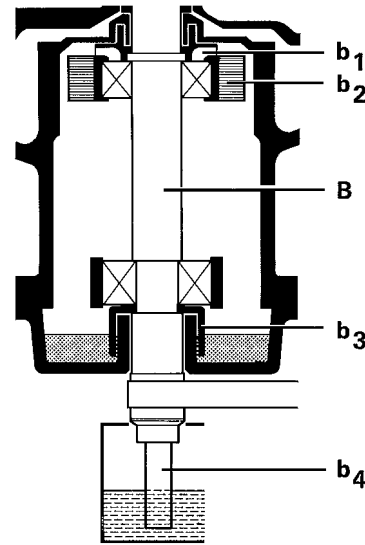
Belt drive

The bowl spindle is driven by a flat belt. Adaptation to 50 or 60 Hz power supply is made by selecting the motor belt pulley with the appropriate diameter. A longer belt is needed for the pulley for 50 Hz.

Correct tension is set by means of a spring-loaded belt tightener.

Friction coupling

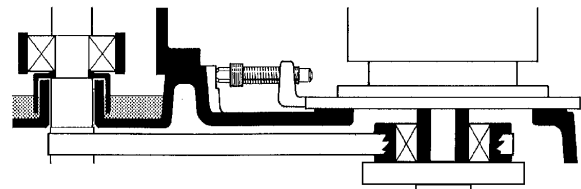
The friction coupling on the motor pulley ensures gentle start-up and prevents overload of the electric motor. Centrifugal force creates a torque that acts on the pulley through the friction elements.



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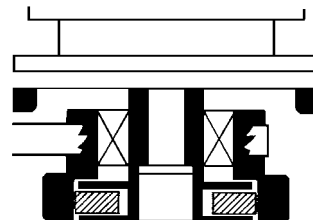
Bowl spindle assembly

- B. Bowl spindle*
b1. Fan
b2. Rubber buffers
b3. Oil pump
b4. Sleeve



G0112821

Bowl spindle assembly



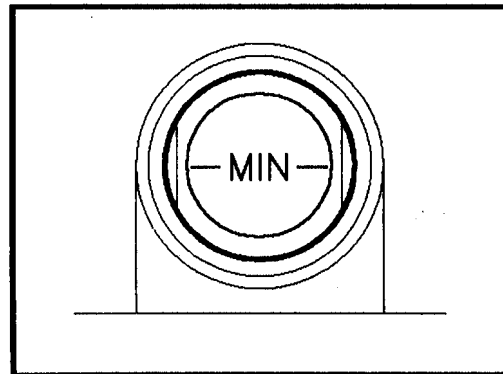
G0112911

Friction coupling

4.1.7 Sensors and indicators

Sight glass

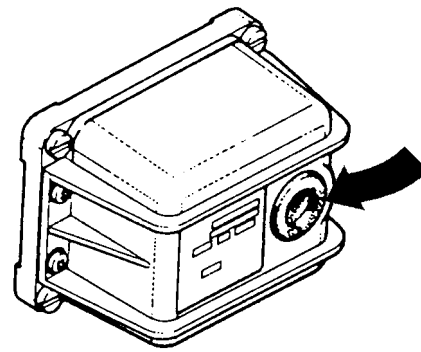
The sight glass shows the oil level in the oil sump.



Vibration switch (option)

The vibration switch, properly adjusted, trips on a relative increase in vibration.

The vibration switch is sensitive to vibration in a direction perpendicular to its base. It contains a vibration detecting mechanism that actuates a snap-action switch when the selected level of vibration is exceeded. After the switch has tripped it must be reset manually by pressing the button on the switch.



G0548421

Reset push button on vibration switch

4.2 Definitions

Back pressure	Pressure in the separator outlet.
Clarification	Liquid/solids separation with the intention of separating particles, normally solids, from a liquid having a lower density than the particles
Clarifier disc	An optional disc, which replaces the gravity disc in the separator bowl, in the case of clarifier operation. The disc seals off the heavy phase outlet in the bowl, thus no liquid seal exists.
Counter pressure	See Back pressure.
Density	Mass per volume unit. Expressed in kg/m ³ at a specified temperature, normally at 15 °C
Gravity disc	Disc in the bowl hood for positioning the interface between the disc stack and the outer edge of the top disc. This disc is only used in purifier mode.
Interface	Boundary layer between the heavy phase (water) and the light phase (oil) in a separator bowl.
Intermediate Service (IS)	Overhaul of separator bowl and inlet/outlet. Renewal of seals in bowl and inlet/outlet.
Major Service (MS)	Overhaul of the complete separator, including bottom part (and activities included in an Intermediate Service). Renewal of seals and bearings in bottom part.
Phase	Light phase: the lighter liquid separated, e.g. oil. Heavy phase: the heavier liquid separated, e.g. water.
Purification	Liquid/liquid/solids separation with the intention of separating two intermixed and mutually insoluble liquid phases of different densities. Solids having a higher density than the liquids can be removed at the same time. The lighter liquid phase, which is the major part of the mixture, shall be purified as far as possible.
Sediment (sludge)	Solids separated from a liquid
Sludge discharge	Ejection of sludge from the separator bowl.
Throughput	The feed of process liquid to the separator per time unit. Expressed in m ³ /hour or litres/hour.
Viscosity	Fluid resistance against movement. Normally expressed in centistoke (cSt = mm ² /s), at a specified temperature.
Water seal	Water in the solids space of the separator bowl to prevent the light phase (oil) from leaving the bowl through the heavy phase (water) outlet, in purifier mode.

5 *Service instructions*

5.1 Periodic maintenance

5.1.1 Introduction

Periodic, preventive maintenance reduces the risk of unexpected stoppages and breakdowns. Maintenance logs are shown on the following pages in order to facilitate periodic maintenance.



Disintegration hazards

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

5.1.2 Maintenance intervals

The following directions for periodic maintenance give a brief description of which parts to clean, check and renew at different maintenance intervals.

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

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

Oil change interval is 1500 hours. If the total number of operating hours is less than 1500 hours change oil at least once every year.

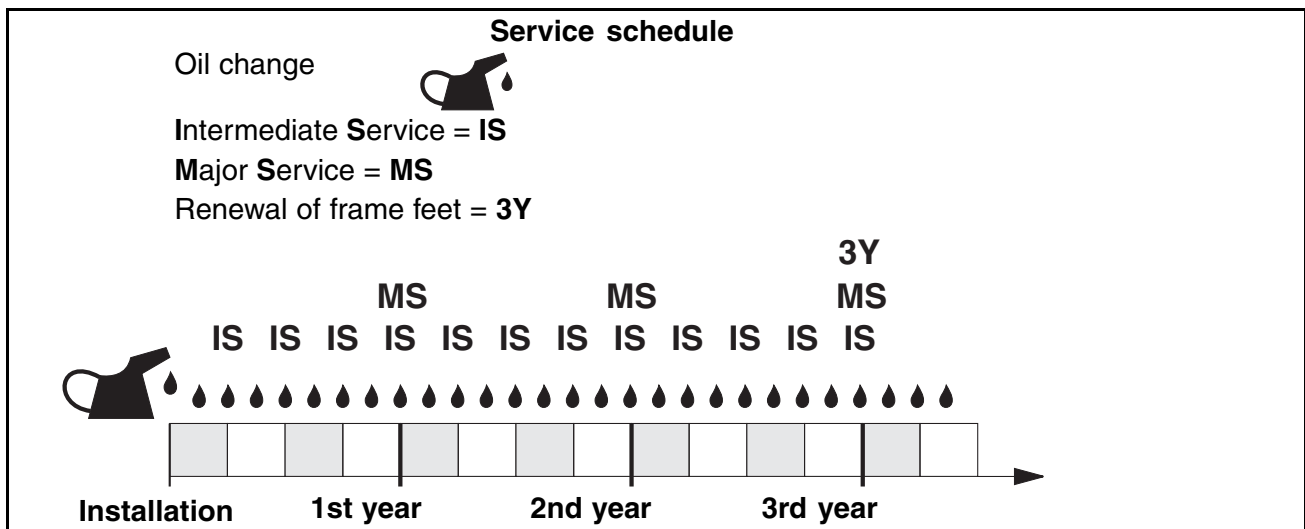
Time of operation between oil changes can be extended from the normal 1500 hours to 2000 hours if a synthetic oil of group D is used.

In seasonal operation change the oil before a new period.

IS - Intermediate Service consists of an overhaul of the separator bowl, inlet and outlet every 3 months or 2000 operating hours. Seals in bowl and gaskets in the inlet/outlet device and operating device are renewed.

MS - Major Service consists of an overhaul of the complete separator every 12 months or 8000 operating hours. An Intermediate Service is performed, and the flat belt, friction elements, seals and bearings in the bottom part are renewed.

3-year service consists of service of the coupling bearings, service of frame intermediate part and renewal of frame feet. The rubber feet get harder with increased use and age.



Other

Check and prelubricate spindle bearings of separators which have been out of service for 6 months or longer. Also see [5.11.2 Before shut-downs on page 73](#).

NOTE

Do not interchange bowl parts!
 To prevent mixing of parts, e.g. in an installation comprising several machines of the same type, the major bowl parts carry the machine manufacturing number or its last three digits.

5.1.3 Maintenance procedure

At each intermediate and major service, take a copy of the service log and use it for notations during the service. An intermediate and major service should be carried out in the following manner:

1. Dismantle the parts as mentioned in the service log and described in [6 Dismantling & Assembly on page 75](#). Place the separator parts on clean, soft surfaces such as pallets.
2. Inspect and clean the dismantled separator parts according to the service log.
3. Fit all the parts delivered in the service kit while assembling the separator as described in [6 Dismantling & Assembly on page 75](#). The assembly instructions have references to check points which should be carried out during the assembly.

5.1.4 Service kits

Special service kits are available for Intermediate Service (IS), Major Service (MS) and 3-year service (3-YSK).

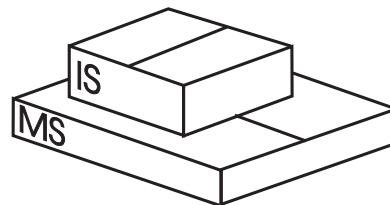
For other services the spare parts have to be ordered separately.

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

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

NOTE

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



Spare parts kits are available for Intermediate Service and Major Service

5.2 Maintenance Logs

5.2.1 Daily checks

The following steps should be carried out daily.

Main component and activity	Part	Page	Notes
Inlet and outlet			
Check for leakage	Connecting housing		
Separator bowl			
Check for vibration and noise			
Belt transmission			
Check for vibration and noise			
Oil sump			
Check	Oil level		
Electrical motor			
Check for vibration, heat and noise			
See manufacturer's instructions			

5.2.2 Oil change - monthly

The oil change and check of belt transmission should be carried out every 1500 hours of operation.

When using a group D oil, time of operation between oil changes can be extended from the normal 1500 hours to 2000 hours.

When the separator is run for short periods, the lubricating oil must be changed every 12 months even if the total number of operating hours is less than 1500 hours (less than 2000 hours if a group D oil is used).

See chapter [5.9 Lubricants on page 59](#) for further information on oil brands etc.

Main component and activity	Part	Page	Notes
Bowl spindle and transmission			
Check	Belt tension	122	
Change	Oil in oil sump	57	

5.2.3 Intermediate Service (IS)

Name of plant:

Local identification:

Separator:

Manufacture No./Year:

Total running hours:

Product No:

Date:

Signature:

Renew all parts included in the Intermediate Service kit (IS) and do the following activities.

Main component and activity	Part	Page	Notes
Inlet and outlet, frame Clean and inspect	Threads of inlet pipe	45	
	Paring disc	45	
	Housing and frame hood	-	
Separator bowl Clean and inspect	Bowl hood	42	
	Top disc		
	Bowl discs	56	
	Distributor		
	Sliding bowl bottom	42	
	Discharge mechanism	42	
	Threads on bowl hood and bowl body	46	
	Bowl spindle cone and bowl body nave	45	
	Corrosion	38	
	Cracks	41	
	Erosion	40	
	Galling of guide surface	46	
Disc stack pressure	48		
Power transmission Check Change	Belt and belt tension	122	
	Oil in oil sump	57	
Electrical motor Lubrication (if nipples are fitted)	See sign on motor		
Signs and labels on separator Check attachment and legibility	Safety label on hood Other plates and labels	154	

5.2.4 Major service (MS)

Name of plant:

Local identification:

Separator:

Manufacture No./Year:

Total running hours:

Product No:

Date:

Signature:

Renew all parts included in the Intermediate and Major Service kits and do the following activities.

Main component and activity	Part	Page	Notes
Inlet and outlet, frame Clean and inspect	Threads of inlet pipe	45	
	Paring disc	45	
	Housing and frame hood	-	
Separator bowl Clean and inspect Check	Bowl hood	42	
	Top disc		
	Bowl discs	56	
	Distributor		
	Nozzles in bowl body		
	Sliding bowl bottom	42	
	Discharge mechanism	42	
	Threads on bowl hood and bowl body	46	
	Bowl spindle cone and bowl body nave	45	
	Corrosion	38	
	Cracks	41	
	Erosion	40	
	Galling of guide surface	46	
Height of paring disc	49		
Disc stack pressure	48		

Main component and activity	Part	Page	Notes
Vertical driving device			
Clean and inspect	Oil mist fan	102	
	Oil pump	102	
	Water tank	128	
	Pump sleeve		
	Bowl spindle	97	
	Ball bearing housing indentations	97	
Check	Radial wobble of bowl spindle	50	
Oil sump			
Clean	Oil sump	57	
Change	Oil	57	
Clean and inspect	Oil filling device	127	
Friction coupling			
Clean and inspect	Friction coupling	114	
Electrical motor			
Replace	Bearings*		
Signs and labels on separator			
Check attachment and legibility	Safety label on hood	154	
	Other signs and labels	-	

* See manufacturer's instructions.

5.3 Check points at Intermediate Service

5.3.1 Corrosion

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



Disintegration hazard

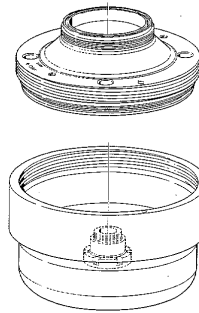
Inspect regularly for corrosion damage. Inspect frequently if the process liquid is corrosive.

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

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

Non-stainless steel and cast iron parts

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

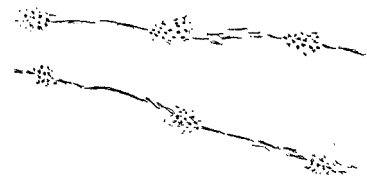


G0172111

Main bowl parts to check for corrosion

Stainless steel

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



Example of chloride corrosion in stainless steel

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

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

1. Inspect closely for all types of damage by corrosion and record these observations carefully.
2. Polish dark-coloured spots and other corrosion marks with a fine grain emery cloth. This may prevent further damage.



Disintegration hazard

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

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

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



Polish corrosion marks to prevent further damage

Other metal parts

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

5.3.2 Erosion

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



Disintegration hazard

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

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

Erosion is characterized by:

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

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

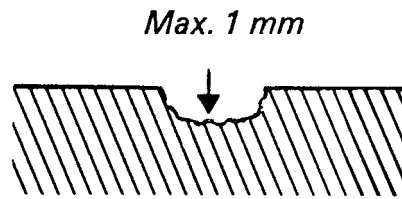


Disintegration hazard

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

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

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



G0205221

Max. permitted erosion

5.3.3 Cracks

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

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

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



Disintegration hazard

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

Always replace a part if cracks are present.

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

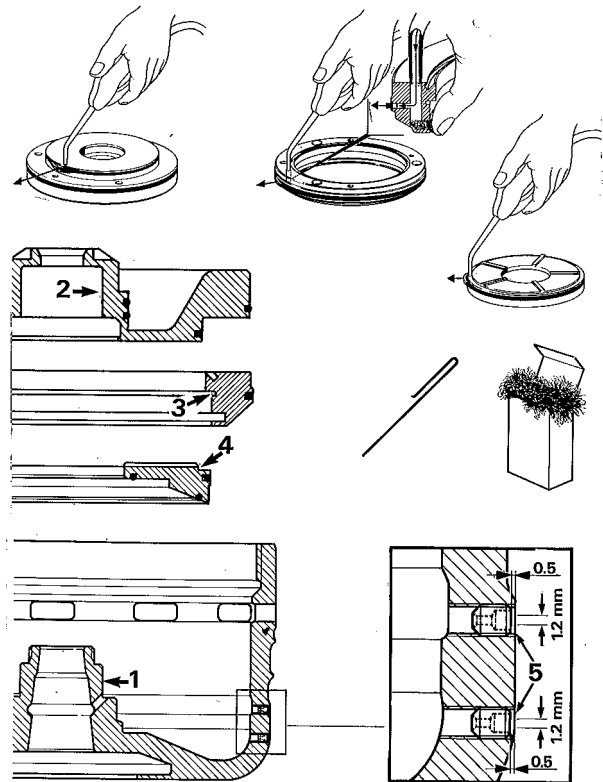
Always contact your Alfa Laval representative if you suspect that the largest depth of the damage exceeds 1,0 mm. Do not continue to use the separator until it has been inspected and cleared for operation by Alfa Laval.

5.3.4 Discharge mechanism

Dirt and lime deposits in the sludge discharge mechanism can cause discharge malfunction or no discharge.

- Thoroughly clean and inspect the parts. Pay special attention to important surfaces (1, 2, 3 and 4). If necessary, polish with steel wool.
- Clean nozzles (5) using soft iron wire or similar. Note that lime deposits can with advantage be dissolved in a 10% acetic acid solution.

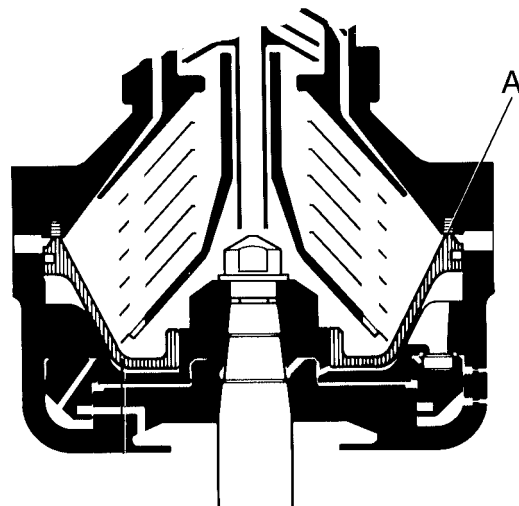
Use Loctite 242 on the threads if the nozzles have been removed or replaced.



G0121511

5.3.5 Bowl hood and sliding bowl bottom

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



G0071031

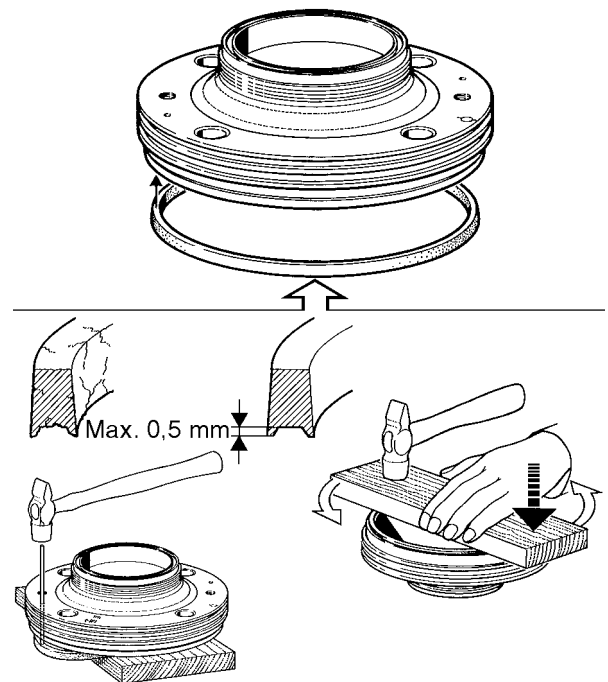
A Sealing surface in the bowl between bowl hood and sliding bowl bottom.

Fit a new bowl hood seal ring at each Intermediate Service (IS) if the old ring is damaged or indented more than 0,5 mm. Fit a new ring as follows: Press the ring into the groove with a straight board (1" x 4"), placed across the ring.

NOTE

If a new ring is too narrow, put it into hot water, 70 - 80 °C for about 5 minutes.

If it is too wide it will recover after drying at 80 - 90 °C for about 24 hours.

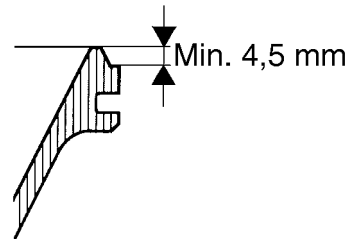
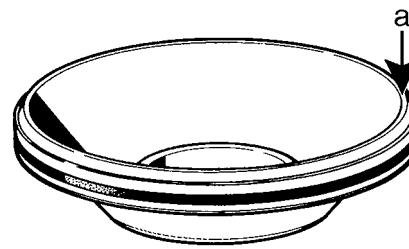


G0071121

Exchange of seal ring in bowl hood.

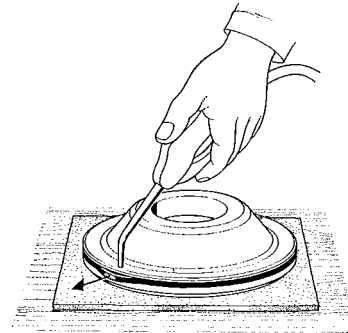
Check the sealing edge (a) of the sliding bowl bottom.

If damaged through corrosion or erosion or in other ways it can be rectified by turning in a lathe. Minimum permissible height of sealing edge: 4,5 mm.



G0071221

Sealing edge on sliding bowl bottom



G0071231

Removal of seal ring on sliding bowl bottom.

5.3.6 Spindle top cone and bowl body nave

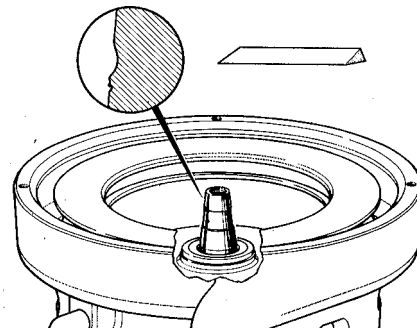
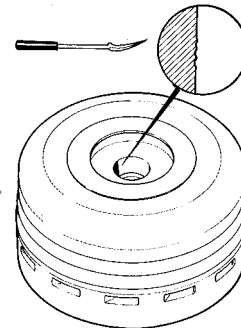
Impact marks on the spindle cone or in the bowl body nave may cause the separator to vibrate while running.

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

- Remove any impact marks using a scraper and/or a whetstone. Rust can be removed by using a fine-grain emery cloth (e.g. No. 320). Finish with polishing paper (e.g. No. 600).

NOTE

Always use a scraper with great care. The conicity must not be marred.



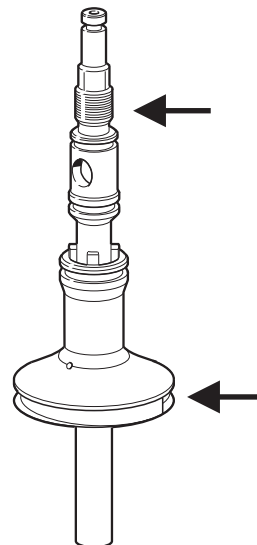
G0071611

Use whetstone or scraper with great care

5.3.7 Threads of inlet pipe, paring disc

Damage to threads or a broken paring disc can prevent correct tightening of the inlet pipe and cause the paring disc to scrape against the top disc, even though the height adjustment of the paring disc has been made correctly.

- Examine the threads for damage and rectify if required.
- Examine the paring disc for damage and to see if the disc walls have parted. If they have, the inlet pipe has to be replaced with a new one.



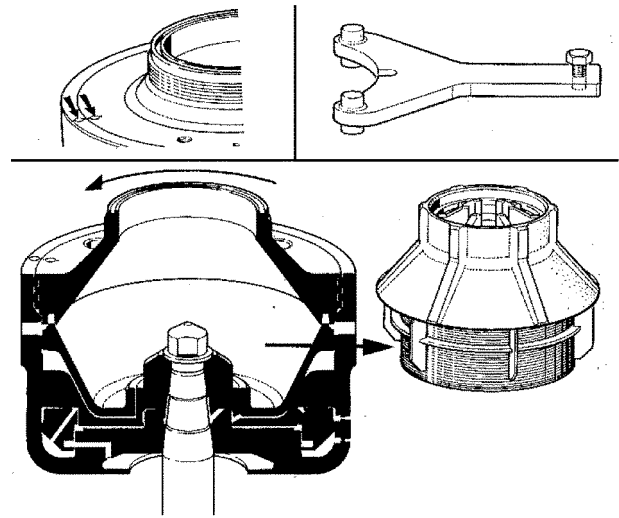
G0113031

5.3.8 Threads on bowl hood and bowl body

Excessive wear or impact marks on threads and guide surfaces of the bowl hood or bowl body can cause seizure damage.

Examine the thread condition by tightening the bowl hood after removing the disc stack and top disc from the bowl.

When the bowl is new the alignment marks on the bowl hood and the bowl body should be aligned. If not, contact an Alfa Laval representative.



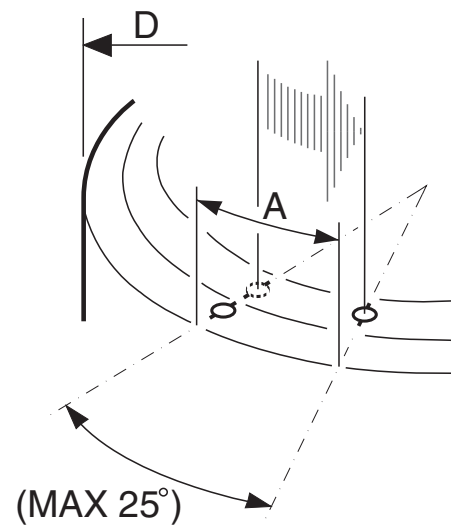
G0071311

Wear

If thread wear is observed, mark the bowl body at the new position by punching a new alignment mark. If the mark on the bowl hood passes the mark on the bowl body by more than 25x, (A in the illustration) an Alfa Laval representative should be contacted immediately.

The measure A in millimeters (mm) is obtained by calculating bowl outside diameter D times 0,2.

If the marks are illegible, an Alfa Laval representative should be contacted for determination and punching of new alignment marks.



G0578111



Disintegration hazards

Wear on threads must not exceed safety limit. f mark on bowl hood must not pass f mark on bowl body by more than 25°.

Damage

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

Examine for burrs and protrusions caused by impact.

Clean the threads, contact and guide surfaces with a suitable degreasing agent.

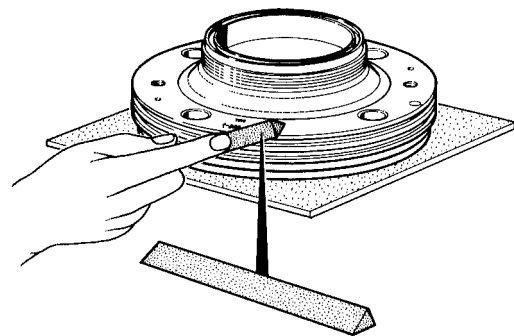
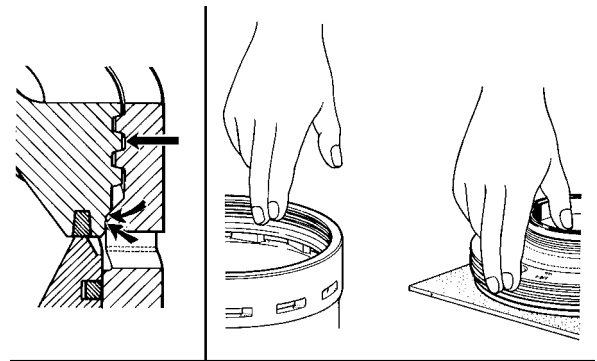


Cut hazard

The threads have sharp edges which can cause cuts.

If damage is found, rectify by using a whetstone or fine emery cloth. Recommended grain size: 240.

If the damage is bad, use a fine single-cut file, followed by a whetstone. After rectifying, the threads have to be primed with Molykote 1000.



G0071511

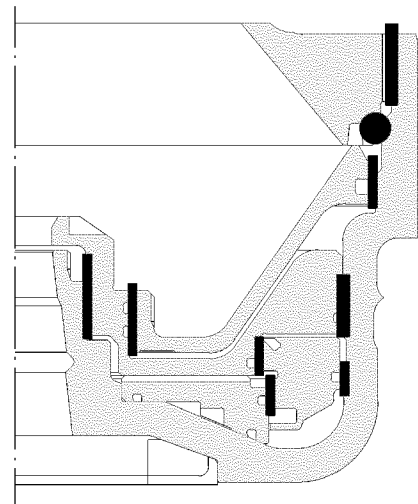
Contact surfaces to inspect on the bowl

5.3.9 Priming of bowl parts

The instruction refers to contact surfaces (dark shaded) of both matching parts.

Before assembly:

1. These surfaces should be sprayed with Molykote D321R after a careful cleaning.
2. Air cure for 15 minutes.
3. Polish to an even, homogenous surface.
4. Spray a second time.
5. Air cure for 15 minutes.
6. Polish to a shiny surface, the surface should look like well polished leather when properly done.
7. Finish the treatment by lubricating the surfaces with lubricating paste see [5.9.2 Recommended lubricants on page 60](#).



G0887731

5.3.10 Disc stack pressure

The bowl hood exerts a pressure on the disc stack clamping it in place.

NOTE

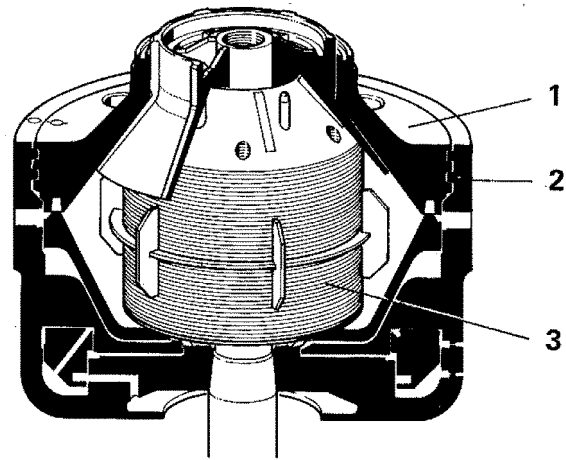
Insufficient pressure in the disc stack may affect the bowl balance, which in turn will cause abnormal vibration of the separator and shorten the life of ball bearings.

1. Place the bowl hood* on the top of the disc stack and tighten it by hand. The assembly mark on the bowl hood should now be positioned at the angle a (see illustration), $30^\circ - 60^\circ$ ahead of the corresponding mark on the bowl body.
* Also see [5.3.8 Threads on bowl hood and bowl body](#) on page 46.
2. If the bowl hood can be tightened by hand without resistance until the marks are in line with each other, an extra disc must be added to the top of the disc stack beneath the top disc

If one or more discs have been added re-check the disc stack pressure by repeating the procedure above.

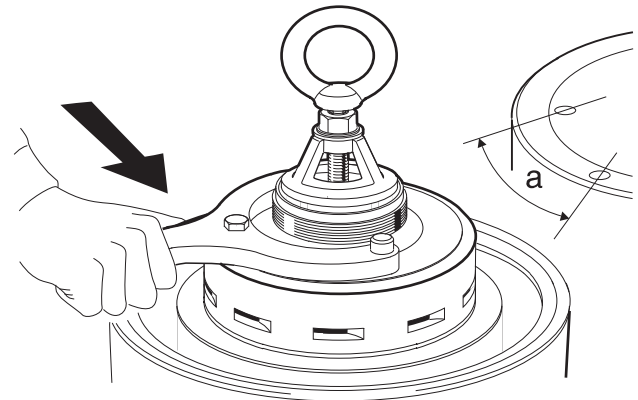
NOTE

The top disc can stick inside the bowl hood and fall when the hood is lifted.



G0071911

1. Bowl hood
2. Bowl body
3. Disc stack
 - below wing insert: 32
 - above wing insert: at least 31



G0357651

a Angle $30^\circ - 60^\circ$ between assembly marks before final tightening

5.4 Check points at Major Service

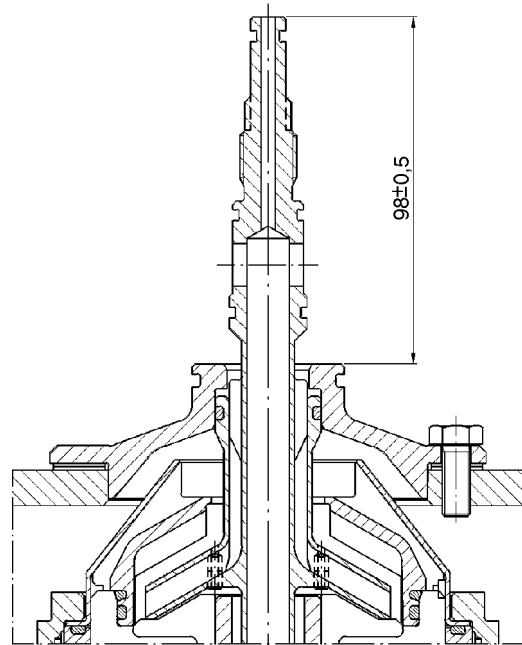
5.4.1 Paring disc height adjustment

The height of the paring disc above the frame hood must be measured if the bowl spindle has been dismantled or if the bowl has been replaced with a new one.

NOTE

Incorrect height position can cause the paring disc (14) to scrape against the paring chamber cover.

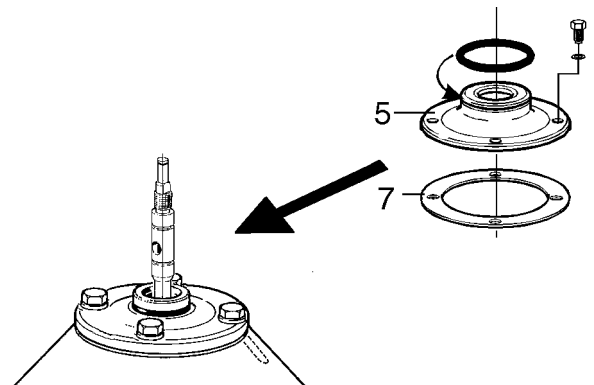
Pay attention to scraping noise at start-up after service.



G0883911

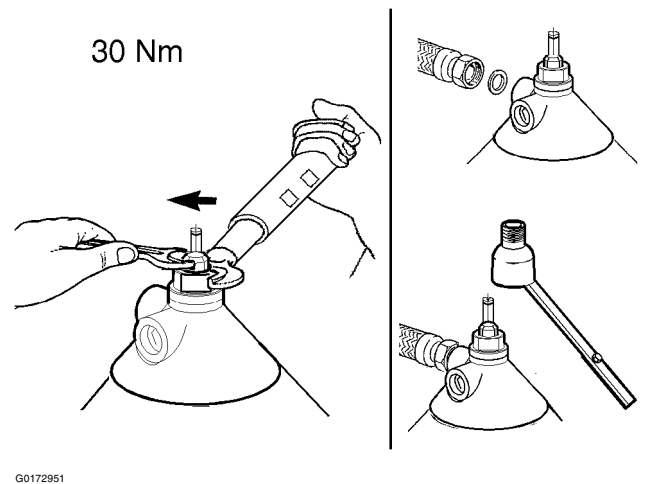
1. Assemble the bowl and frame hood as described in [6.1.2 Inlet/outlet and bowl - assembly on page 87](#).
2. Measure the distance according to the illustration above. Adjust the distance by adding or removing height adjusting rings (7).
3. Fit the support ring (5) and the inlet/outlet housing. Tighten the nut with 30 Nm.

Left-hand thread!



G00729A1

4. Rotate the bowl spindle by hand by means of the flat belt. If it does not rotate freely or if a scraping noise is heard, incorrect height adjustment or incorrect fitting of the inlet pipe can be the cause. Remove the parts and readjust.
5. Finally, fit the safety device.



5.4.2 Radial wobble of bowl spindle

The bowl spindle wobble must be measured if the bowl spindle has been dismantled or if rough bowl run (vibration) occurs.

NOTE

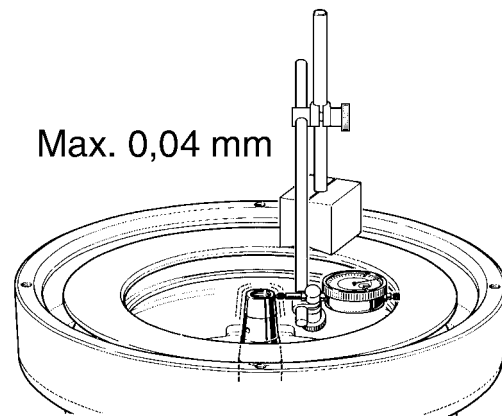
Spindle wobble will cause rough bowl run. This leads to vibration and reduces lifetime of ball bearings.

Check the wobble before removing the bowl spindle.

If the bowl spindle has been dismantled check the wobble before installing the bowl.

1. Fit a dial indicator in a support and fasten it in position as illustrated.
2. Remove the water tank from the frame bottom part for access to the flat belt. Use the flat belt to turn the spindle.
3. Permissible radial wobble: max. 0,04 mm. If the spindle wobble is more than the maximum permitted value, contact Alfa Laval representatives.
4. Finally fit the water tank to the frame bottom part.

Incorrect belt tension causes displacement of the vertical line of the spindle centre, but does not affect the wobble of the spindle.



5.5 3-year service

Exchange of frame feet

See [6.8.1 Mounting of new frame feet on page 130](#).

Friction coupling

Exchange of ball bearings, see [6.3 Friction coupling on page 114](#).

Frame intermediate part

Replace O-ring and gasket, see [6.2.2 Bowl spindle and frame - assembly on page 105](#).

5.6 Lifting instructions

1. Remove the inlet/outlet housings, the frame hood and the bowl according to the instructions in [6.1.1 Inlet/outlet and bowl - dismantling on page 82](#).

NOTE

Make sure to remove the cap nut fixing the bowl to the bowl spindle.

Before lifting the bowl, check that the bowl hood has been screwed home into the bowl body. Less than 2 mm of bowl hood threading must remain above the bowl body edge.

When lifting the bowl, use the compression tool fastened on the distributor.

2. Disconnect the motor cables.
3. Tighten the frame hood.
4. Fit the lifting eyes. The two eyebolts must be fitted in the holes nearest to the electric motor.
5. Use two endless slings to lift the separator. Length of each sling: minimum 1,5 metres. Thread the slings through the lifting eyes and fit them to the hook of the hoist.
6. Unscrew the foundation bolts.
7. When lifting and moving the separator, obey normal safety precautions for lifting large heavy objects.

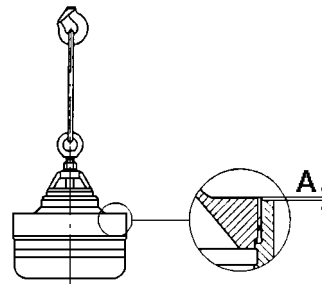
Do not lift the separator unless the bowl has been removed.

8. Remove the lifting eyes afterwards.



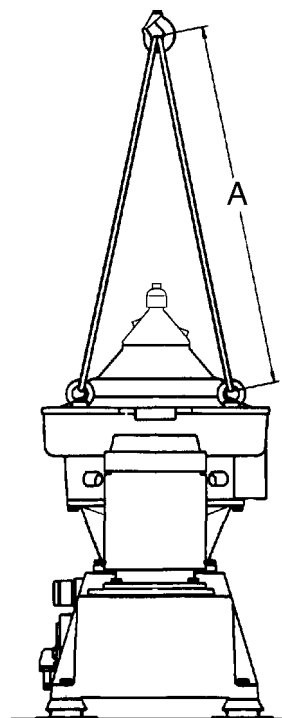
Crush hazards

Use only the two special lifting eyes (M12) for lifting the machine. They are to be screwed into the special threaded holes. Other holes are not dimensioned for lifting the machine. A falling separator can cause accidents resulting in serious injury and damage.



G0507121

$A < 2 \text{ mm}$



G0820621

A Minimum 750 mm distance between lifting eye and hook. Use a lifting hook with catch.

NOTE

Separator without bowl: Use lifting slings for WLL 300 kg.

Bowl: Use lifting slings for WLL 100 kg

5.7 Cleaning

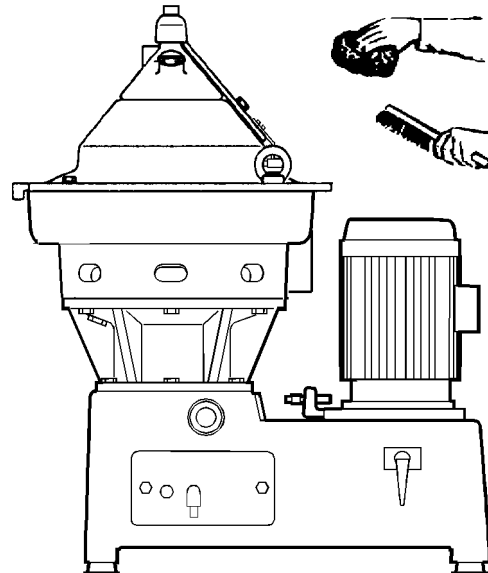
External cleaning

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

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

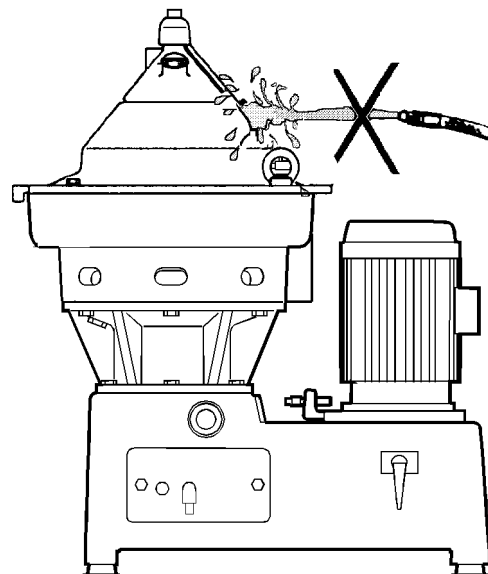
- Many operators believe that these motors are sealed, and normally they are not.
- A water jet played on these motors will produce an internal vacuum, which will suck the water between the metal-to-metal contact surfaces into the windings, and this water cannot escape.
- Water directed on a hot motor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

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



G0615361

Use a brush and a sponge or cloth when cleaning.



G0613661

Never wash down a separator with a direct water stream or spray.

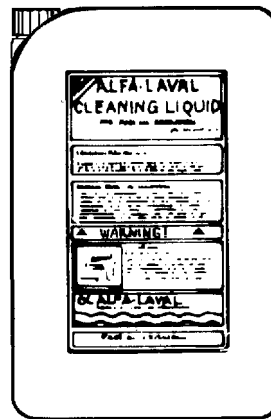
5.7.1 Cleaning agents

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

For separator bowl, inlet and outlet

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

- For cleaning of lube oil separators the most important function of the cleaning agent is to be a good solvent for the gypsum in the sludge. It should also act as a dispersant and emulsifier for oil. It is recommended to use Alfa Laval cleaning liquid for lube oil separators which has the above mentioned qualities. Note that carbon steel parts can be damaged by the cleaning agent if submerged for a long time.
- Fuel oil sludge mainly consists of complex organic substances such as asphaltenes. The most important property of a cleaning liquid for the removal of fuel oil sludge is the ability to dissolve these asphaltenes.



Alfa Laval cleaning liquid for lube oil and fuel oil separators.



Skin irritation hazard

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

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

For operating mechanism

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

For parts of the driving devices

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

Oiling (protect surfaces against corrosion)

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

5.7.2 Cleaning of bowl discs

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



Cut hazard

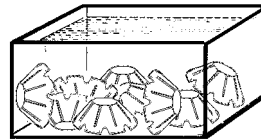
Sharp edges on the separator discs may cause cuts.



Mechanical cleaning is likely to scratch the disc surfaces causing deposits to form quicker and adhere more firmly.

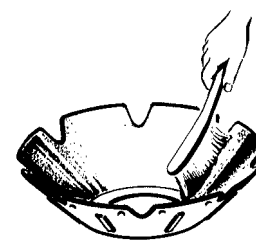
A gentle chemical cleaning is therefore preferable to mechanical cleaning.

1. Remove the bowl discs from the distributor and lay them down, **one by one**, in the cleaning agent.
2. Let the discs remain in the cleaning agent until the deposits have been dissolved. This will normally take between two and four hours.
3. Finally clean the discs with a **soft** brush.



g0065831

Put the discs one by one into the cleaning agent



g0065841

Clean the discs with a soft brush

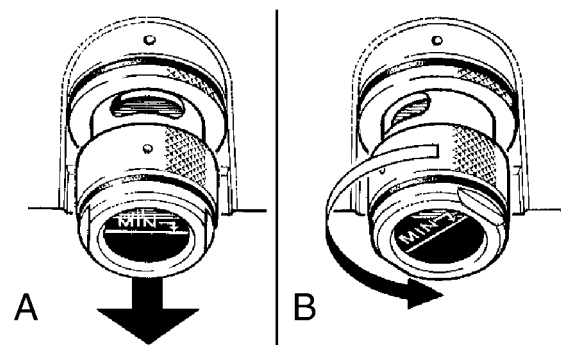
5.8 Oil change

5.8.1 Oil change procedure

NOTE

Before adding or renewing lubricating oil in the oil sump, the information concerning different oil groups, handling of oils, oil change intervals etc. given in chapter 5.9 Lubricants on page 59 must be well known.

1. Place a collecting vessel under the drain hole.
2. Pull out (A) the oil filling device and turn it half a turn (B).



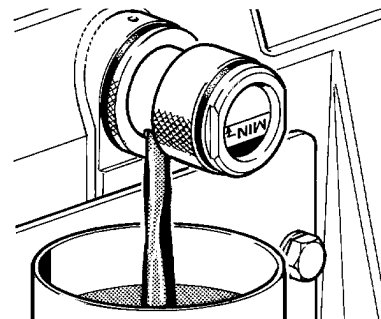
G0068911

3. Collect the oil in the vessel.



Burn hazards

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

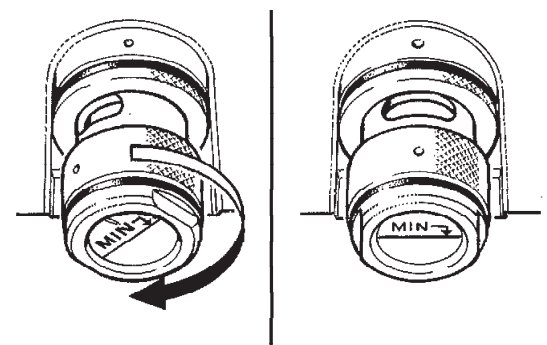


G0173811

4. Turn the oil filling device back to its normal position (A), the drain hole pointing upwards.

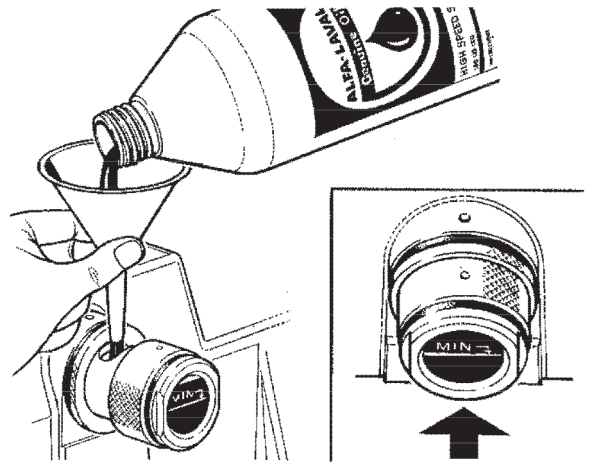
NOTE

When changing from one group of oil to another, the frame housing and the spindle parts must be thoroughly cleaned before the new oil is filled.



G0068911

5. Fill the oil sump in the frame housing with new oil. The oil level should be slightly above middle of the sight glass. Information on volume see [7.3 Technical Data on page 133](#).
6. Push in the oil filling device.



G0069211

5.9 Lubricants

5.9.1 Lubrication chart, general

Alfa Laval ref. 553216-01 Rev. 8

Lubricating points	Type of lubricant	Interval
The oil bath. Bowl spindle ball bearings are lubricated by oil splash from the oil bath.	Lubricating oil as specified in 5.9.3 Recommended lubricating oils on page 63 . See 7.3 Technical Data on page 133	Oil Change: 1. Continuous operation: 2000h 2. Seasonal operation: Before every operating period. 3. Short periods operation: 12 months even if the total number of operating hours is less than stated above.
Bowl spindle taper.	Lubricating oil (only a few drops for rust protection).	At assembly
Bowl: Sliding contact surfaces, thread of lock nut and cap nut.	Pastes as specified in 5.9.2 Recommended lubricants on page 60 .	At assembly
Rubber seal rings.	Grease as specified in 5.9.2 Recommended lubricants on page 60 .	At assembly
Friction coupling ball bearings. Not valid for rigid coupling.	The bearings are packed with grease and sealed and need no extra lubrication.	-
Electric motor	Follow manufacturer's instructions.	Follow manufacturer's instructions.
Threads	Lubricating oil, if not otherwise stated.	At assembly

NOTE

If not otherwise specified, follow the suppliers instructions about applying, handling and storing of lubricants.

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



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

5.9.2 Recommended lubricants

Alfa Laval ref. 553217-01 Rev. 11

NOTE

The data in below tables is based on supplier information in regards to lubrication properties. Trade names and designations might vary from country to country, contact your local supplier for more information.

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

Pastes:

Manufacturer	Designation	Alfa Laval No
Dow Corning	Molykote 1000 (Paste)	537086-02 (1000 g)
	Molykote 1000 (Paste)	537086-03 (100 g)
	Molykote G-rapid plus (Paste)	537086-04 (50 g)
Fuchs Lubritech	Gleitmo 705	
	Gleitmo 805K	
Klüber	Wolfracoat C (Paste)	
Rocol	Dry Moly Paste MT-LM	

Bonded coatings:

Manufacturer	Designation	Alfa Laval No
Fuchs Lubritech	Gleitmo 900 (Varnish or spray)	
Dow Corning	Molykote D321R (Spray)	535586-01(375 g)

Silicone grease for rubber rings:

Manufacturer	Designation	Hygienic comment	Alfa Laval No
Dow Corning	(Molykote) 111 (Compound)	Conform to the FDA regulations (21 CFR 178.3570) for occasional food contact. Certified: National Water Council UK and WRC, UK. Certified: food industry as per Chemical Testing Laboratory Dr. Böhm, Munich.	539474-02 (100 g) 539474-03 (25 g)
	Molykote G-5032	NSF Registered H1 (3 June 2005)	569415-01 (50 g)
Bremer & Leguil, Fuchs Lubritech	Chemplex 750	DVGW approved according to the German KTW-recommendations for drinking water.	
	Geralyn SG MD 2	NSF Registered H1 (30 March 2007)	
Klüber	Unisilikon L 250 L	Complies with German Environmental Agency on hygiene requirements for tap water. Certified by DVGW-KTW, WRC, AS4020, ACS.	
	Paraliq GTE 703	NSF Registered H1 (25 Feb 2004) Complies with LMBG and the European standard EN 1672, part 2.	
Bel-Ray	No-Tox Silicone Valve Seal	NSF Registered H1 (19 June 2002)	
MMCC	ALCO 220	NSF Registered H1 (25 March 2002)	
Rocol	Foodlube Hi-Temp	NSF Registered H1 (18 April 2001)	

Greases for ball and roller bearings:**NOTE**

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

Manufacturer	Designation	Hygienic comment
BP	Energrease MP-MG2 Energrease LS2 Energrease LS-EP2	
Castrol	APS 2 Spheerol EPL 2	
Chevron	Chevron Dura-Lith Grease EP2 Texaco Multifak AFB 2	
Dow Corning	Molykote G-0101 Molykote Multilub	
ExxonMobil	Beacon EP2	
	Unirex N2 Mobilith SHC 460 Mobilux EP2	
Fuchs Lubritech	Lagermeister EP2	
Q8/Kuwait Petroleum	Rembrandt EP2	
Shell	Alvania EP 2 Albida EP2	
SKF	LGEP 2 LGMT 2 LGFB 2	NSF Registered H1 (14 Sept 2005)
Total	Multis EP2	
BP	Energrease MP-MG2 Energrease LS2 Energrease LS-EP2	

5.9.3 Recommended lubricating oils

Alfa Laval ref. 553219-09 Rev. 1

Type of frame: **D/D and P/P** with motor < 7,5 kW.

Two different groups of lubricating oils are approved. They are designated as Alfa Laval lubricating oil groups A and D. The numerical value after the letter states the viscosity grade.

The numerical value after the letter states the viscosity grade.

The corresponding commercial oil brands are found in chapter [5.9.4 Recommended oil brands on page 64](#) and [5.9.5 Recommended oil brands on page 66](#).

Ambient temperature (°C)	Alfa Laval lubricating oil group	Time in operation Oil change interval
Between +5 and +45 ^{*)}	A/150	1 500 h
Between +2 and +65	D/220	2 000 h

Note:

- 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.

5.9.4 Recommended oil brands

Alfa Laval ref. 553218-04 Rev. 6

Paraffinic mineral lubricating oil category (ISO-L-) HM 150 . Viscosity grade (ISO 3448/3104) VG 150. The oil shall follow the requirements in one of the standards below.

Standard	Designation
ISO 11158, (ISO 6743/4)	ISO-L-HM or HV 150
ISO 12925-1, (ISO 6743/6)	ISO-L-CKC or CKE 150
DIN 51524 part 2 or 3 (German standard)	DIN 51524 - HLP or HVLP 150
DIN 51517 part 3	DIN 51517 - CLP 150

Alfa Laval lubrication oil group A	
Viscosity grade (ISO 3448/3104)	VG 150
Viscosity index (ISO 2909)	VI >95
Manufacturer	Designation
Alfa Laval	546098-81 4 litres 546098-83 1 litre
BP	Bartran 150 Bartran HV 150 Energol SHF-HV 150
Castrol	Alpha ZN 150 Hyspin AWH(-M) 150 Hyspin AWS 150
Chevron	Meropa 150 Rando HD 150 Paper Machine oil XL 150
ExxonMobil	Mobil DTE PM 150 Mobil DTE 10 excel 150 Mobil Vacuoline 528 (ISO VG 150) Nuto H 150 Mobilgear 600 XP 150
Q8/Kuwait Petroleum	Haydn 150
Shell	Morlina 150 Morlina S2 B 150
Statoil	LubeWay XA 150
Total	Azolla ZS 150 Lubmarine Visga 150

Paraffinic mineral lubricating oil category HM 150 for hygienic applications. Conform to U.S. Food and Drug Administration (FDA) requirements of lubricants with incidental food contact, Title CFR 21 178.3570, 178.3620 and/or those generally regarded as safe (US 21 CFR 182).

Lubrication oils for food and hygienic applications	
Viscosity grade (ISO 3448/3104)	VG 150
Viscosity index (ISO 2909)	VI >95
Manufacturer	Designation
Bel-Ray	Bel-Ray No-Tox Gear Oil 85 Bel-Ray No-Tox Anti-Wear 40
ExxonMobil	Mobil DTE FM 150 (Mineral/PAO)
Fiske Brothers	Lubriplate FMO-AW 900
Total	(Keystone) Nevastane EP 150

The hygienic oil on the list is in the online “NSF White Book™ Listing” at the time of the revision of this document. For more information about the NSF registration and up to date H1 registration, see www.nsf.org (http://www.nsf.org/business/nonfood_compounds/)

5.9.5 Recommended oil brands

Alfa Laval ref. 553218-08 Rev. 6

Synthetic lubricating oil, category PAO (ISO-L-) CKE 220 . Viscosity grade (ISO 3448/3104) VG 220.

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

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

Alfa Laval lubrication oil group D	
Manufacturer	Designation
Alfa Laval	542690-80 20 litres 542690-81 4 litre
BP	Enersyn HTX 220 Enersyn EP-XF 220
Castrol	Alphasyn EP 220 Alphasyn HG 220 Optigear Synthetic A 220
Chevron	(Texaco/Caltex) Pinnacle EP 220 Tegra Synthetic Gear Lubricant 220 Pinnacle Marine Gear 220
ExxonMobil	Mobil SHC 630
Q8/Kuwait Petroleum	Schumann 220
Shell	Shell Morlina S4 B 220 Omala RL 220
Statoil	Mereta 220
Total	Carter SH 220 Elf Epona SA 220

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

**Synthetic lubricating oil, category PAO
(ISO-L-) CKE 220 for hygienic applications.**

Conform to U.S. Food and Drug Administration (FDA) requirements of lubricants with incidental food contact, Title CRF 21 178.3570, 178.3620 and/or those generally regarded as safe (US 21 CRF 182).

Lubrication oils for food and hygienic applications	
Manufacturer	Designation
Shell	Cassida fluid GL 220

The hygienic oil on the list is in the online “NSF White Book™ Listing” at the time of the revision of this document. For more information about the NSF registration and up to date H1 registration, see www.nsf.org (http://www.nsf.org/business/nonfood_compounds/).

5.10 Vibration

5.10.1 Vibration analysis

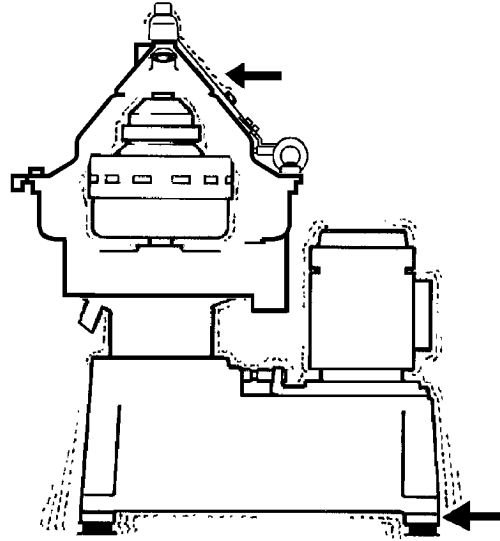
A separator normally vibrates and produces a different sound when passing through its critical speeds during run-up and run-down.

It also vibrates and sounds to some extent when running. It is good practice to be acquainted with these normal conditions.

Excessive vibrations and noise indicate that something is wrong. Stop the separator and identify the cause.

Use vibration analysis equipment to periodically check and record the level of vibration.

The level of vibration of the separator should not exceed 9 mm/s.



G0075251



Disintegration hazards

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

The cause of the vibration must be identified and corrected before the separator is restarted.

Excessive vibration can be due to incorrect assembly or poor cleaning of the bowl.

5.10.2 Vibration switch (optional)

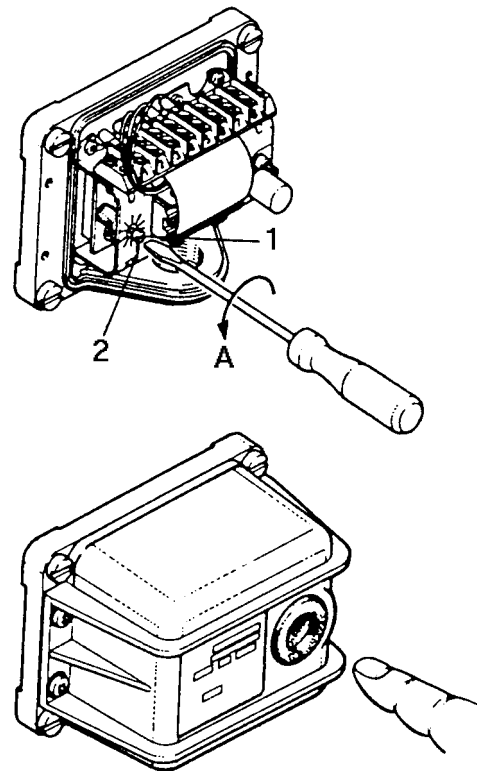
Adjustment of setpoint

The vibration switch is adjusted with the separator in operation. The cover must be removed to gain access to the setpoint adjusting screw (1).

1. Back-off the setpoint adjusting screw counter-clockwise (A) two or three turns. Press the reset button. If the armature does not remain in the reset position, turn the adjusting screw another turn or two until the armature stays in position when the reset button is pressed.
2. Now turn the adjusting screw slowly clockwise until the armature rocks. Mark this position with a line immediately in front-of the adjusting screw pointer (2).
3. Back-off the adjusting screw counter-clockwise a three-quarter turn. Press the reset button. If the armature now rocks, turn the adjusting screw counter-clockwise another quarter turn and so on until the armature remains in the reset position. Refit the cap and fasten with the screws.

NOTE

Further adjustment may become necessary if alarm occurs due to vibration from surrounding equipment.



G0546821

Setpoint adjustment

1. Adjusting screw
2. Pointer
- A. Direction of increased checkpoint (admit higher vibration)

5.11 General directions

5.11.1 Ball and roller bearings

Specially designed bearings for the bowl spindle

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

Only Alfa Laval genuine spare parts should be used.

A bearing that in appearance looks equivalent to the correct may be considerably different in various respects: inside clearances, design and tolerances of the cage and races as well as material and heat treatment.

NOTE

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

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

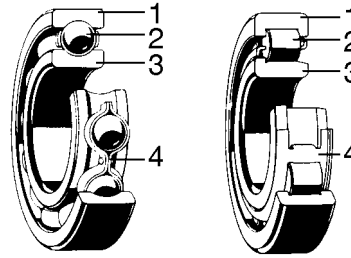
Dismantling

Remove the bearing from its seat by using a puller. If possible, let the puller engage the inner ring, then remove the bearing with a steady force until the bearing bore completely clears the entire length of the cylindrical seat.

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

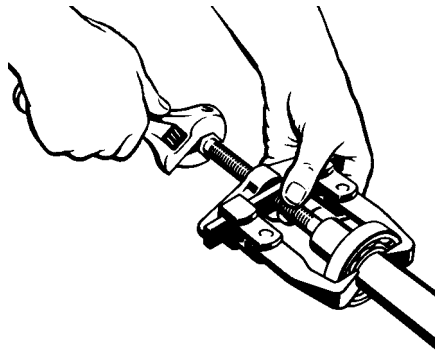
NOTE

Do not hit with a hammer directly on the bearing.



G0587321

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



G0587411

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

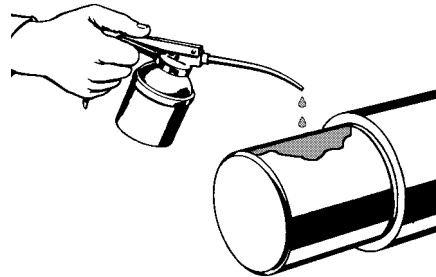
Cleaning and inspection

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

Assembly

- Leave new bearings in original wrapping until ready to fit. The anti-rust agent protecting a new bearing should not be removed before use.
- Use the greatest cleanliness when handling the bearings.

To facilitate assembly and also reduce the risk of damage, first clean and then lightly smear the bearing seating on shaft (spindle) or alternatively in housing, with a thin oil.



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Clean and smear the bearing seating before assembly.

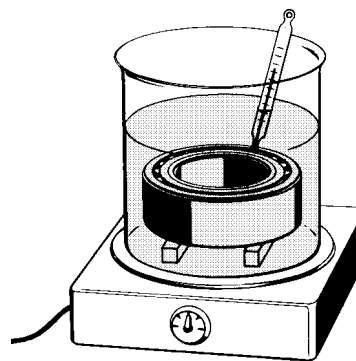
- When assembling ball bearings, the bearings must be heated in oil to maximum 125 °C.

NOTE

Heat the bearing in a clean container with a cover.

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

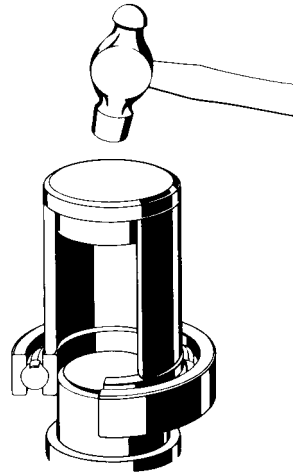
The bearing must be well covered by the oil and not be in direct contact with the sides or the bottom of the container. Place the bearing on some kind of support or suspended in the oil bath.



G0587611

The bearing must not be in direct contact with the container.

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

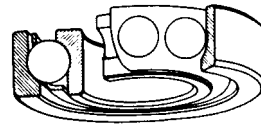


G0587711

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

Angular contact ball bearings

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



G0587211

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

5.11.2 Before shut-downs

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

- Remove the bowl, according to instructions in chapter 6 [Dismantling & Assembly on page 75](#)
- Protect parts in contact with process liquid from corrosion by applying a thin layer of oil.
- Remove the O-rings.

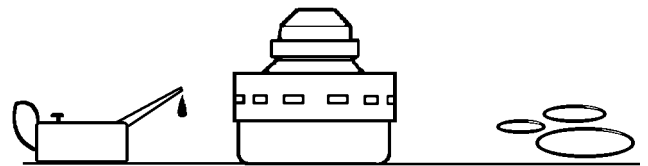
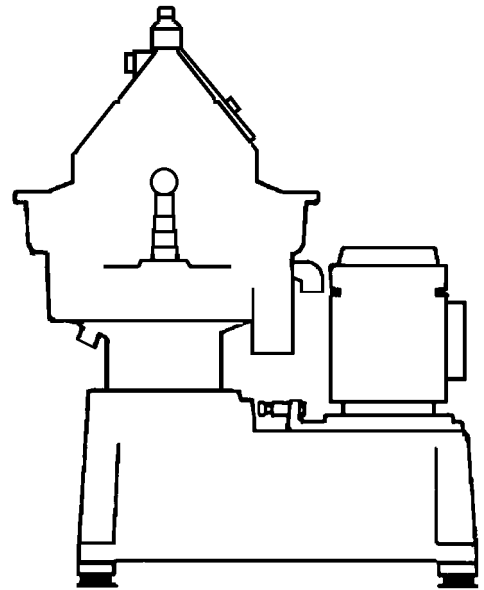
Protect cleaned carbon steel parts against corrosion by oiling. Separator parts that are not assembled after cleaning must be wiped and protected against dust and dirt.

NOTE

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

Vibration in foundations can be transmitted to the bowl and produce one-sided loading of the bearings.

The resultant indentations in the ball bearing races can cause premature bearing failure.



G0466851

Remove the bowl if the separator is left at standstill for more than one week.

6 Dismantling & Assembly

References to check points

In the text you will find references to the check point instructions in chapter 5 [Service instructions on page 31](#). The references appear in the text as in the following example:

Check point 5.3.10 Disc stack pressure on page 48. In this example, look up check point Disc stack pressure for further instructions.



Switch off and lock power supply before starting any dismantling work.

Tools

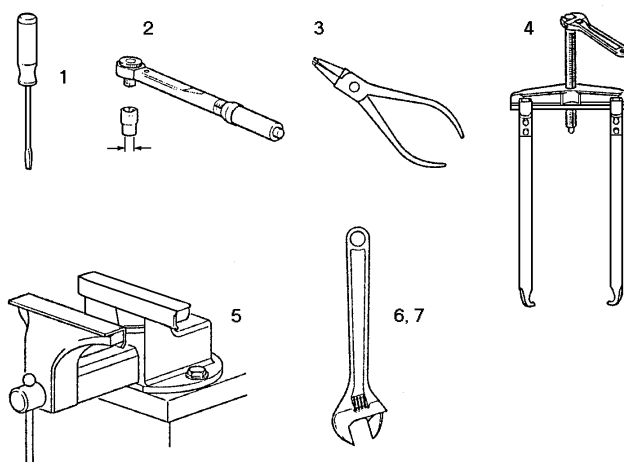
Special tools from the tool kit must be used for dismantling and assembly. The special tools are specified in the Spare Parts Catalogue.

Additional tools needed for dismantling but not included in the tool kit are shown here.

For bowl and bowl spindle

1. Screwdriver
2. Torque wrench (50 Nm) with socket 16 mm
3. Pliers for internal snap ring
4. Ball bearing puller
5. Screw vice with copper liners
6. Adjustable wrench, length approx. 400 mm
7. Adjustable wrench or spanner, width of jaws 24 mm

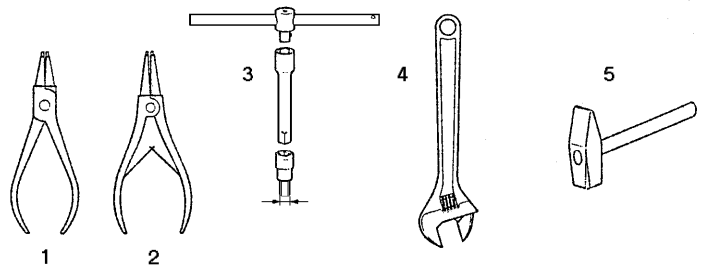
Two lifting slings, working load limit (WLL): >300 kg are also needed.



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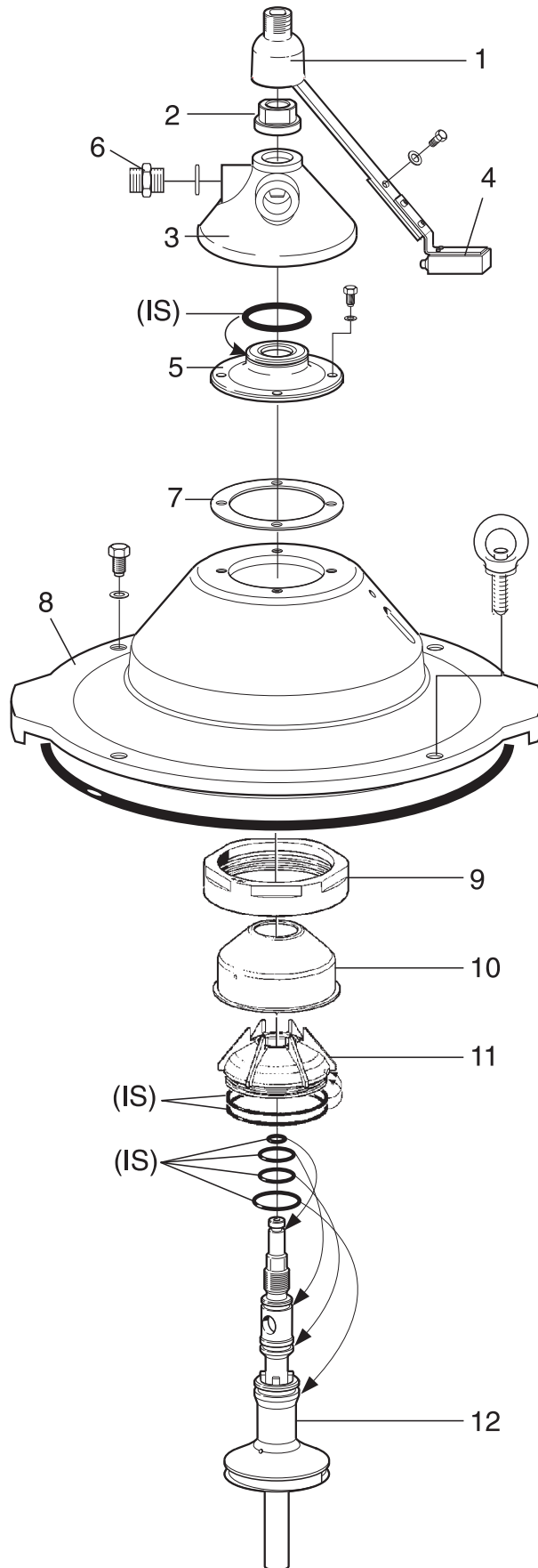
For friction coupling and flat belt

1. Pliers for internal snap ring
2. Pliers for external snap ring
3. T-handle, extension rod and socket 16 mm
4. Adjustable wrench or spanner, width of jaws 36 mm
5. Hammer



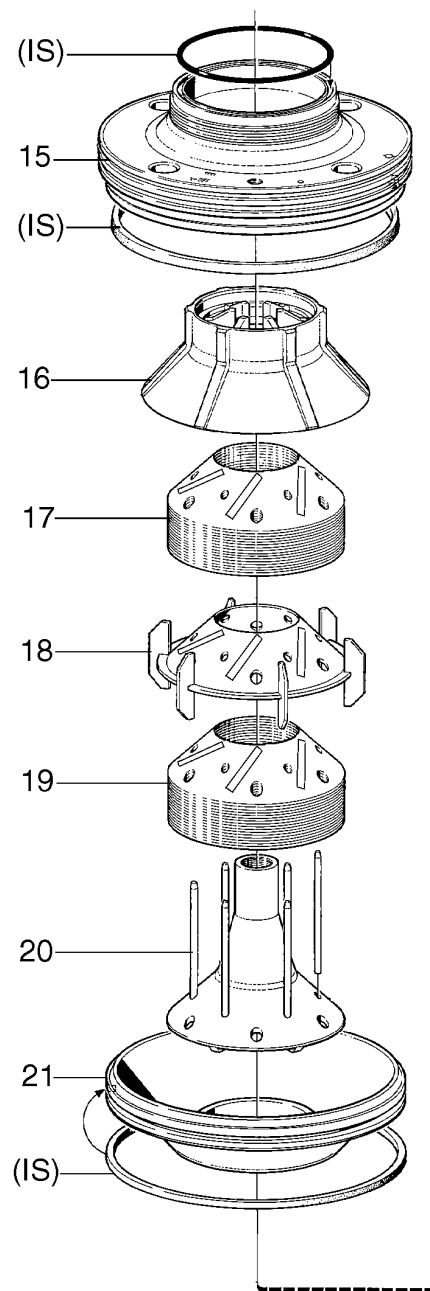
G0278921

6.1 Inlet/outlet and bowl



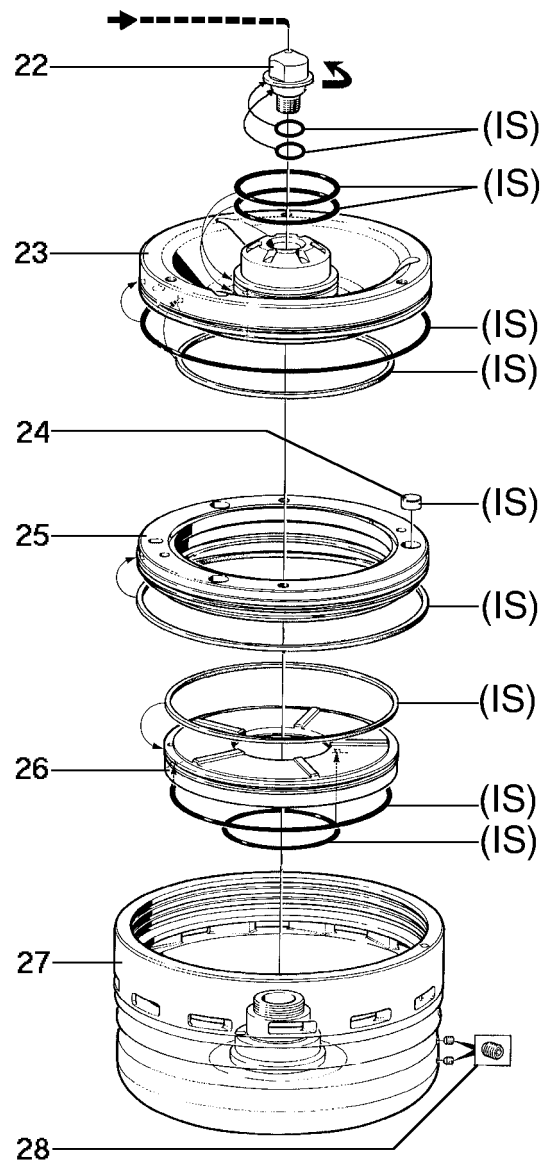
G0073761

1. *Safety device*
 2. *Nut*
 3. *Inlet/outlet housing*
 4. *Interlocking switch (optional)*
 5. *Support ring*
The support ring is removed from the frame hood top, at paring disc adjustment (Major Service)
 6. *Insert*
 7. *Height adjusting ring*
 8. *Frame hood*
 9. *Lock ring*
 10. *Gravity disc/Clarifier disc*
 11. *Paring chamber cover*
 12. *Inlet pipe with paring disc*
- IS. Intermediate service kit*
MS. Major service kit



G0887751

- 15. Bowl hood
- 16. Top disc
- 17. Bowl discs
- 18. Wing insert
- 19. Bowl discs
- 20. Distributor
- 21. Sliding bowl bottom
- IS. Intermediate service kit
- MS. Major service kit



G0074251

- 22. Cap nut
- 23. Upper distributing ring
- 24. Valve plug
- 25. Operating slide
- 26. Lower distributing ring
- 27. Bowl body
- 28. Nozzle
- IS. Intermediate service kit

6.1.1 Inlet/outlet and bowl - dismantling

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

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



Entrapment hazard

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

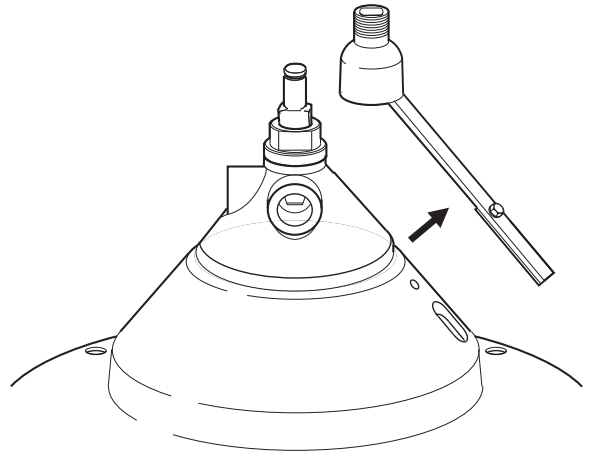
1. Remove safety device and look through the slot in the frame hood to see if the bowl still rotates.



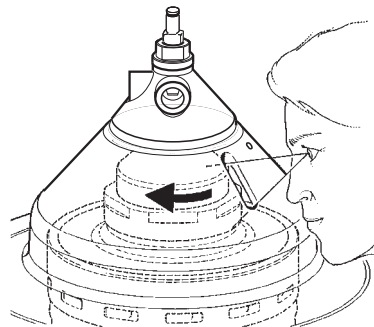
Entrapment hazard

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

The bowl parts can remain very hot for a considerable time after the bowl has come to a standstill.



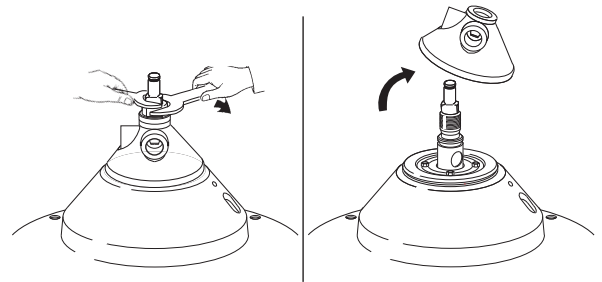
G0819751



G0467361

2. Unscrew nut clockwise and lift off inlet- outlet housing together with the connecting hoses. When removing the connecting hoses, do not drop the washer.

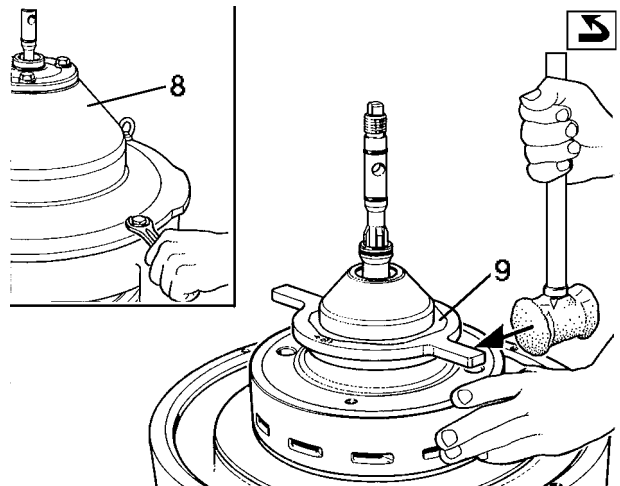
Left-hand thread!



G0821531

3. Remove the bolts and lift off frame hood (8).
4. Unscrew lock ring (9) clockwise by using the special tool; spanner for lock ring.

Left-hand thread!

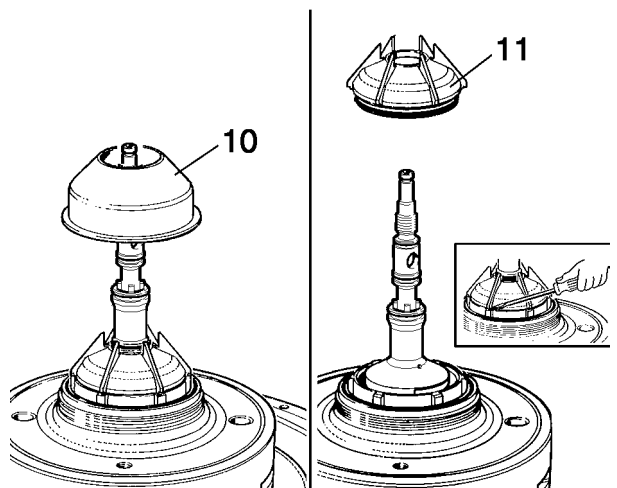


G0070021

5. Lift off gravity disc (clarifier disc) (10).
6. Carefully prise loose paring chamber cover (11) by using a screwdriver. Lift off the paring chamber cover.

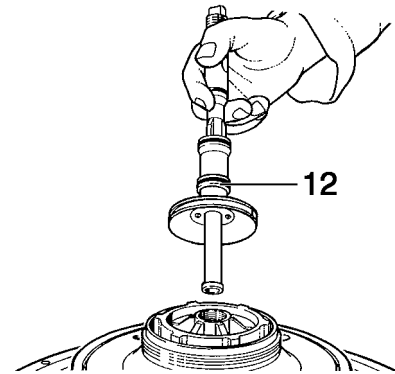
NOTE

If the gravity disc has to be replaced owing to changed operating conditions, see [8.3.3 Gravity disc nomogram](#) on page 171.



G0070141

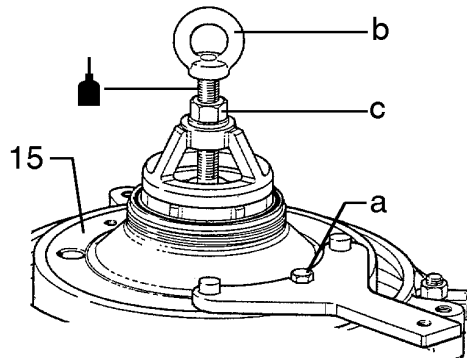
7. Lift out inlet pipe (14) with the paring disc.



G0070231

8. Preparations for unscrewing of bowl hood (15):

- Fit the spanner to the bowl hood and secure it with the bolt (a).
- Fit the compression tool and screw down the central screw (b) until it stops
- Compress the disc stack by tightening the nut (c) firmly.



G0167121

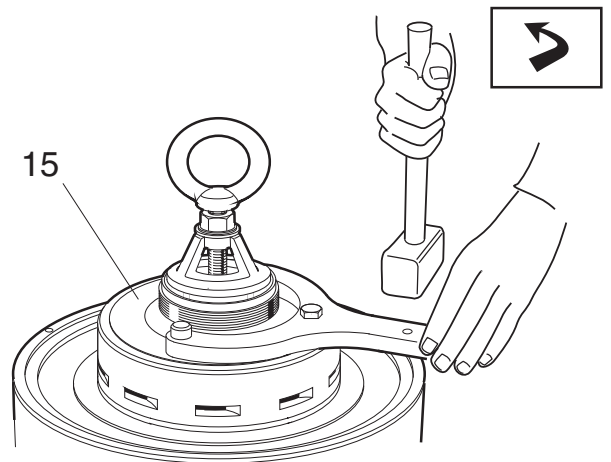
NOTE

Use the compression tool as instructed. Use of substitute tools can damage the equipment.

9. Unscrew bowl hood (15) clockwise by using a tin hammer.

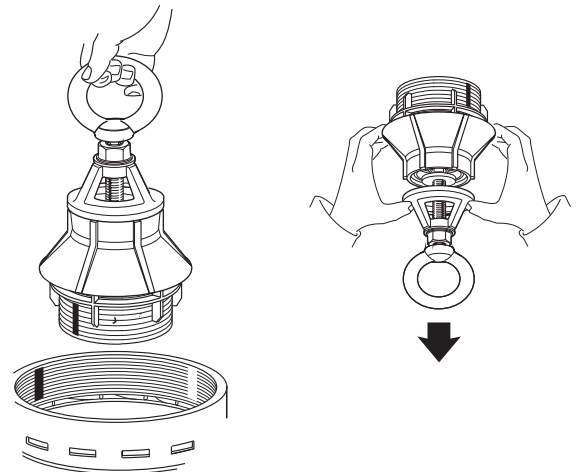
Left-hand thread!

10. Lift off the bowl hood with the spanner still attached.



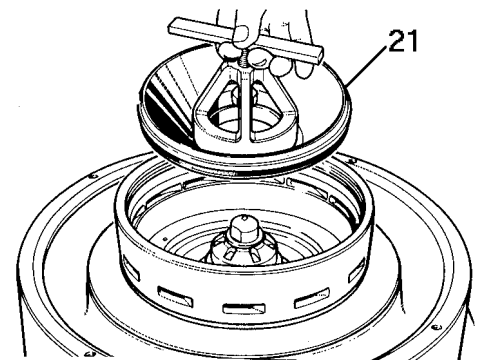
G0357411

11. Lift out the top disc, the bowl discs with wing insert and the distributor. Screw the nut of the compression tool up against the eye bolt, turn the unit with the tool still attached upside down and hit it against a firm base. This will facilitate loosening of the top disc.



G0357521

12. Lift out sliding bowl bottom (21) using the special tool. Ease the sliding bowl bottom off with the central screw of the tool. If necessary, knock on the handle.



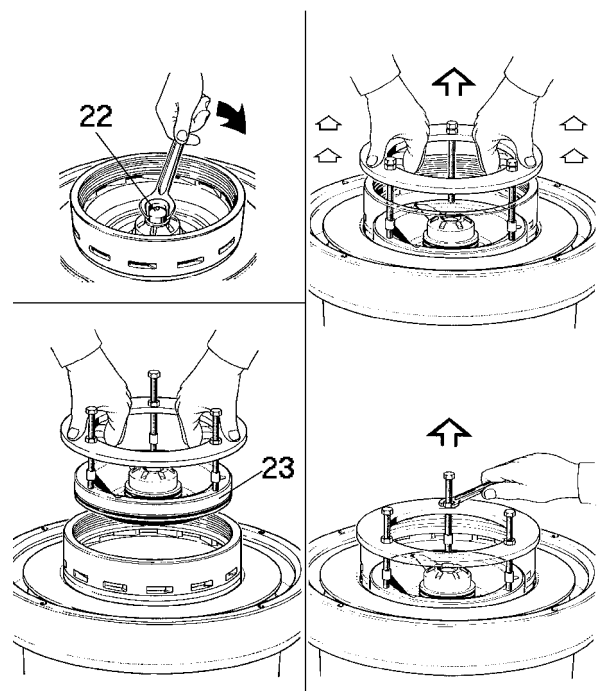
G0072031

13. Unscrew cap nut (22).

Left-hand thread!

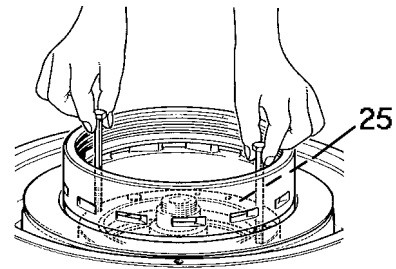
14. Remove upper distributing ring (23) using the special tool. Detach the distributing ring either:

- by jerking, or
- by tightening the nuts equally



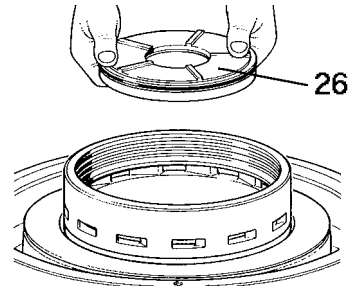
G0070631

15. Lift out operating slide (25) using the special tool: lifting bolts for operating slide.



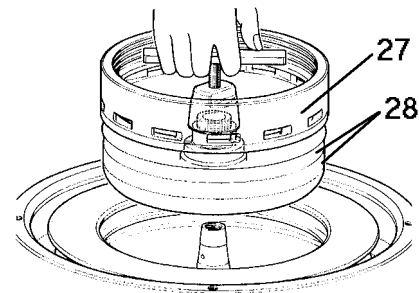
G0070721

16. Lift out lower distributing ring (26).



G0070821

17. Lift out bowl body (27) using the special tool.
 18. Ease the bowl body off with the central screw of the tool. If necessary, knock on the handle.
 19. Soak and clean all parts thoroughly in suitable cleaning agent, see [5.7 Cleaning on page 53](#).
 20. Clean nozzles (28) in bowl body (27) using soft iron wire of maximum 1,2 mm diameter, see [5.3.4 Discharge mechanism on page 42](#).



G0070922

NOTE

Dirt and lime deposits in the sludge discharge mechanism can cause discharge malfunction or failing discharge.

21. Remove O-rings and replace them with spares from the intermediate service kit (IS).

6.1.2 Inlet/outlet and bowl - assembly

**NOTE**

Be sure bowl parts are not interchanged.

Out of balance vibration will reduce ball bearing life.

Make sure that the following check points are carried out before and during assembly of the separator bowl.

Check point

Corrosion

[5.3.1 Corrosion on page 38](#)

[5.3.3 Cracks on page 41](#)

[5.3.4 Discharge mechanism on page 42](#)

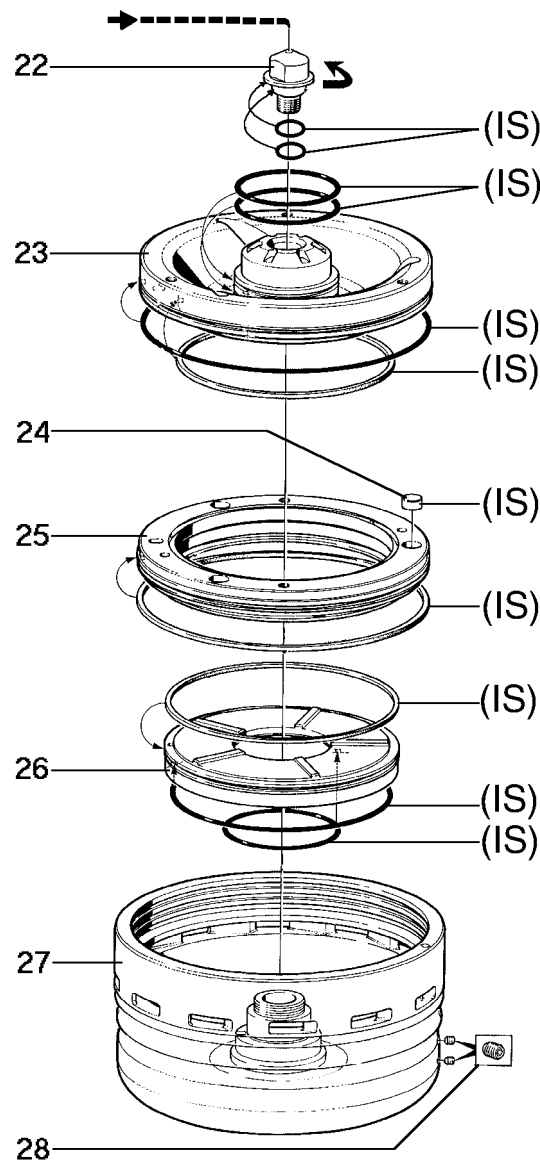
[5.3.6 Spindle top cone and bowl body nave on page 45](#)

[5.3.7 Threads of inlet pipe, paring disc on page 45](#)

[5.3.8 Threads on bowl hood and bowl body on page 46](#)

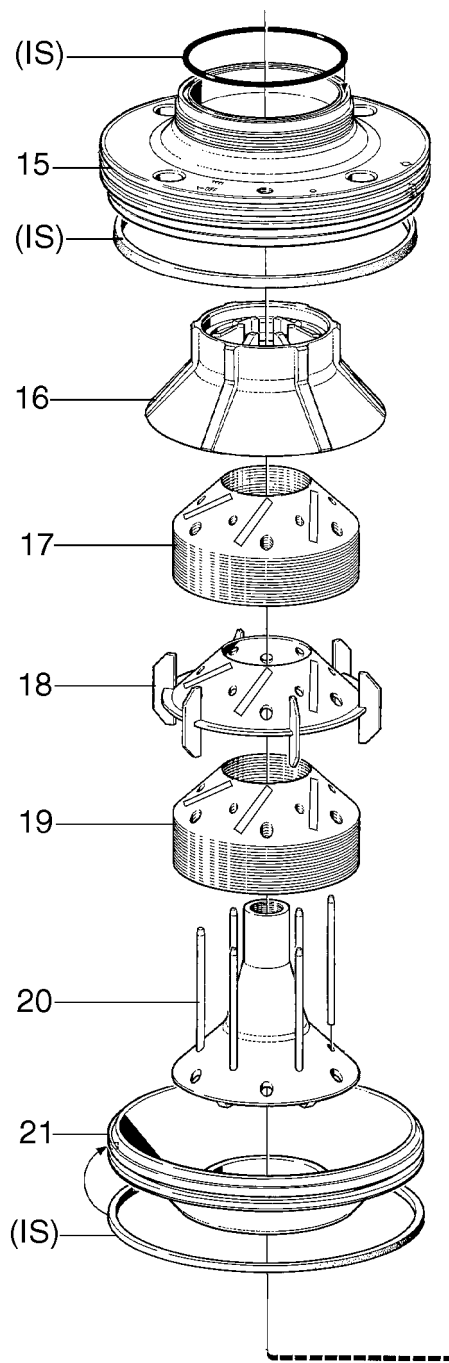
[5.3.10 Disc stack pressure on page 48](#)

[5.4.1 Paring disc height adjustment on page 49](#)



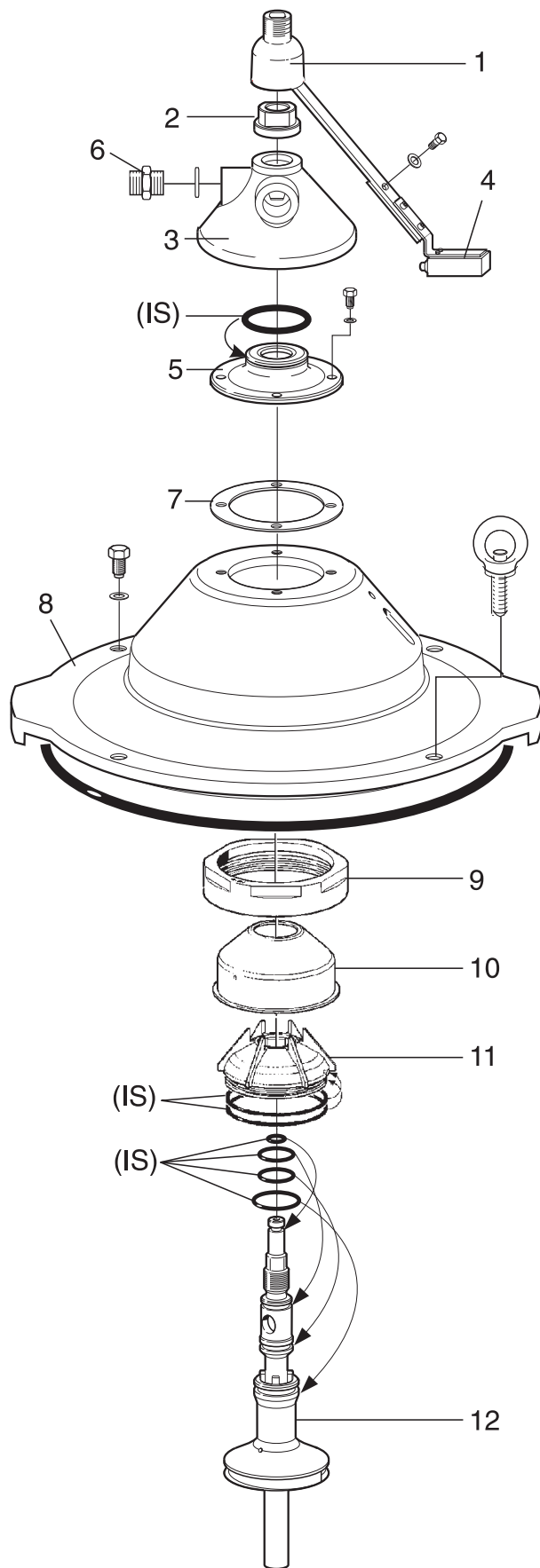
G0074251

- 22. Cap nut
- 23. Upper distributing ring
- 24. Valve plug
- 25. Operating slide
- 26. Lower distributing ring
- 27. Bowl body
- 28. Nozzle



G0887751

- 15. Bowl hood
- 16. Top disc
- 17. Bowl discs
- 18. Wing insert
- 19. Bowl discs
- 20. Distributor
- 21. Sliding bowl bottom



G0073761

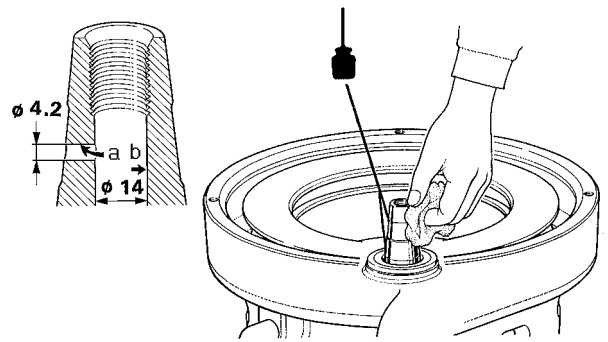
1. *Safety device*
2. *Nut*
3. *Inlet/outlet housing*
4. *Interlocking switch (optional)*
5. *Support ring*
The support ring is removed from the frame hood top, at paring disc adjustment (Major Service)
6. *Insert*
7. *Height adjusting ring*
8. *Frame hood*
9. *Lock ring*
10. *Gravity disc/Clarifier disc*
11. *Paring chamber cover*
12. *Inlet pipe with paring disc*
- IS. *Intermediate service kit*
- MS. *Major service kit*

1. Clean the hollow part (b) of the spindle top and the radial hole (a). Wipe clean the spindle top and nave bore in the bowl body. Apply oil to the tapered end of the spindle, smear the oil over the surface and wipe off surplus with a clean cloth.
2. Clean the nozzles in the bowl body, see [5.3.4 Discharge mechanism on page 42](#).

Check point

[5.3.6 Spindle top cone and bowl body nave on page 45](#) and [5.3.9 Priming of bowl parts on page 47](#).

3. Fit the bowl body (27) on the spindle. Avoid damaging the spindle cone.
 - Attach the special lifting tool to the bowl body nave.
 - Screw down the central screw of the tool, then lower the bowl body until the screw rests on the spindle top.
 - Screw up the central screw and the bowl body will sink down on the spindle cone.



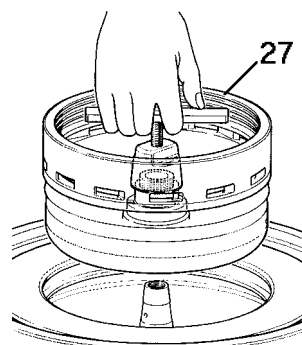
G0071721

4. Place the lower distributing ring (26) in the bowl body.

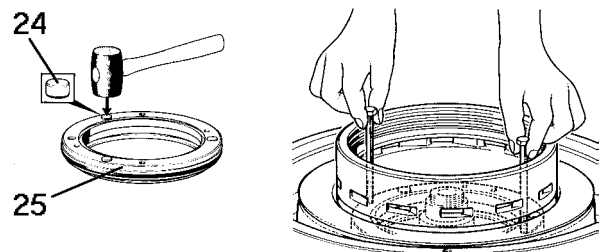
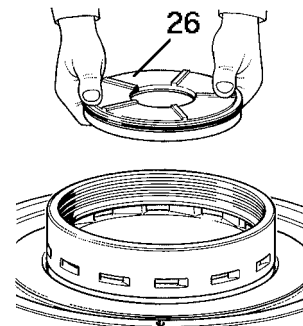
Using the lifting bolts fit the operating slide (25).

Make sure that the seal rings lie concentrically in their grooves.

If replacing valve plugs (24), use a rubber mallet.



G0071831



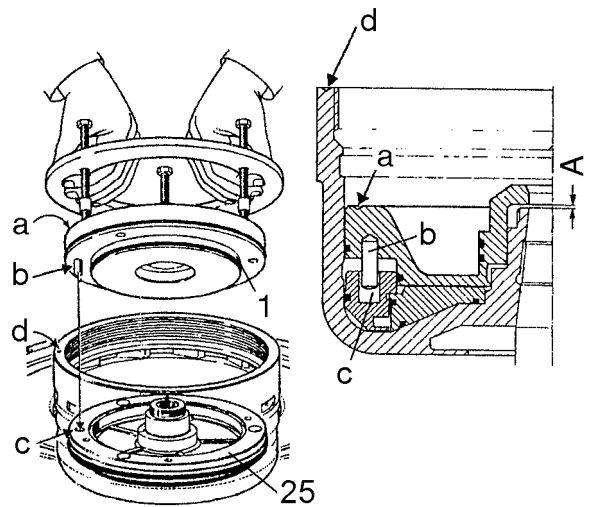
G0071841

- Fit the upper distributing ring so that drill mark (a) is in line with hole (c) on the distributing ring. When the distributing ring is in correct position the guide pin (b) will enter hole (c).

NOTE

The two guide pin (b) in the distributing ring have to be fitted properly in the hole (c).

Check the distance "A". If the play is larger than 2 mm the guide pins have not entered the hole properly.

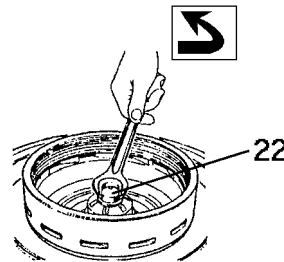


G0378031

- a. Drill mark
- b. Guide pin
- c. Guide pin

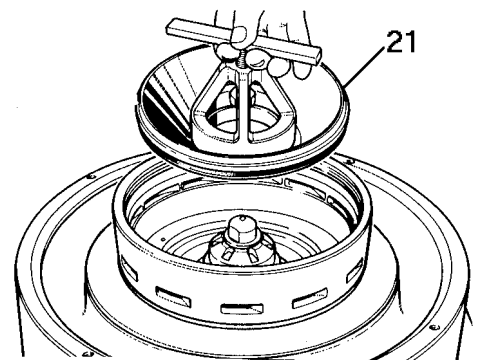
- Screw cap nut (22) counter-clockwise onto the spindle. Tighten firmly.

Left-hand thread!



G0378111

- Fit sliding bowl bottom (21). Make sure that the square seal ring lies concentrically in its groove. Press the sliding bowl bottom down on the upper distributing ring.



G0072031

8. Check point

Before assembling the bowl discs, check the threads of the bowl hood and bowl body, see [5.3.8 Threads on bowl hood and bowl body on page 46](#).

9. Assemble the bowl discs with wing insert and top disc on the distributor. Note the angular positioning (six options). Ensure that the pins in the distributor fit properly into the holes of the top disc.
10. Preparations for lifting in the disc stack
 - Fit the compression tool and screw down the central screw until it stops
 - Tighten the compression nut by hand
11. Fit the disc stack assembly in the bowl body. Make sure that the cuts in the wings on the underside of the distributor fit properly in the corresponding lugs of the bowl.
12. Fit bowl hood (15):
 - Apply a thin layer of Molykote Paste 1000 to threads and on contact and locating surfaces.
 - Fit the spanner for the bowl hood and secure it with the bolt (a).
 - Screw on the bowl hood by hand.

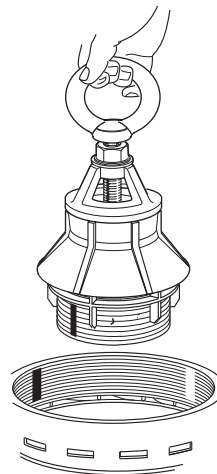
Left-hand thread!

13. Fit the compressing tool and screw down the central screw (b) until it stops. Compress the disc stack by tightening the nut (a) firmly.

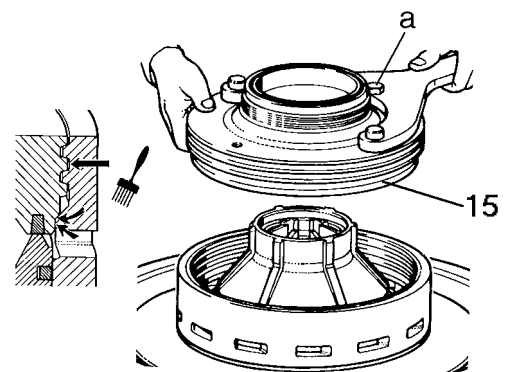
NOTE

Use the compression tool as instructed. Use of substitute tools can damage the equipment.

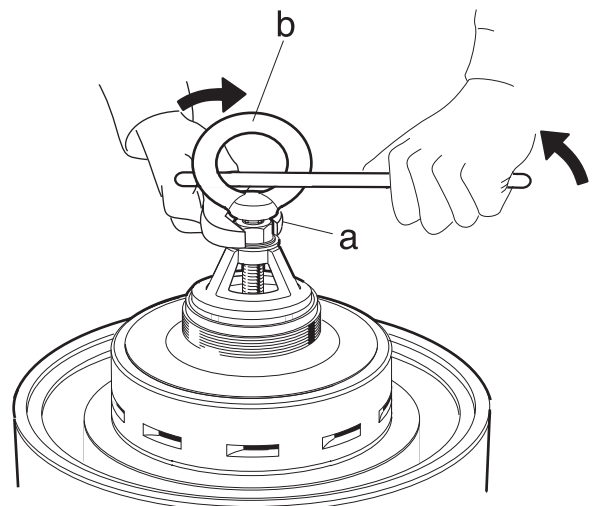
Check point [5.3.10 Disc stack pressure on page 48](#).



G0357561



G0072231



G0072361

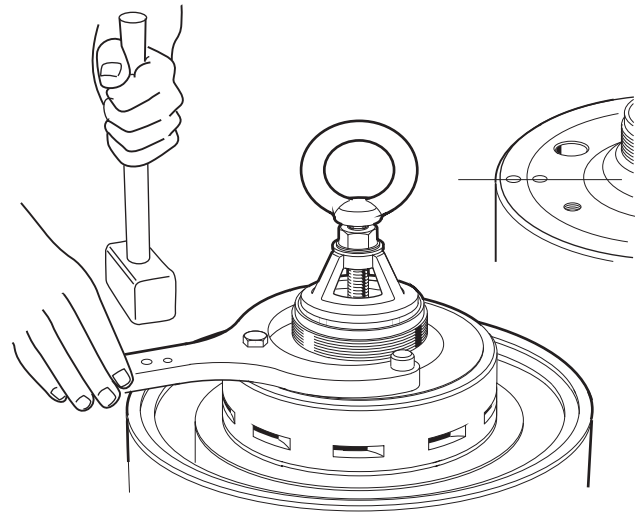
14. Attach the spanner and tighten the bowl hood by using a tin hammer. Strike the spanner handle until the bowl hood lies tightly against the bowl body. In a new bowl, the assembly marks now will be in line with each other.



Disintegration hazard

The assembly mark on the bowl hood must never pass the mark on the bowl body by more than 25°.

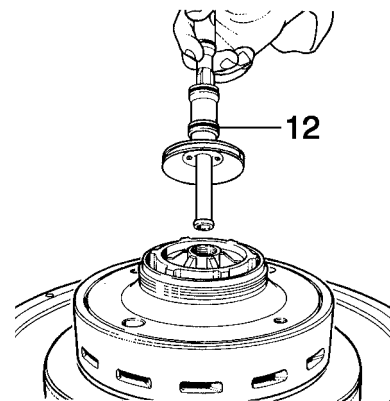
Also see [5.3.8 Threads on bowl hood and bowl body on page 46](#).



G0357711

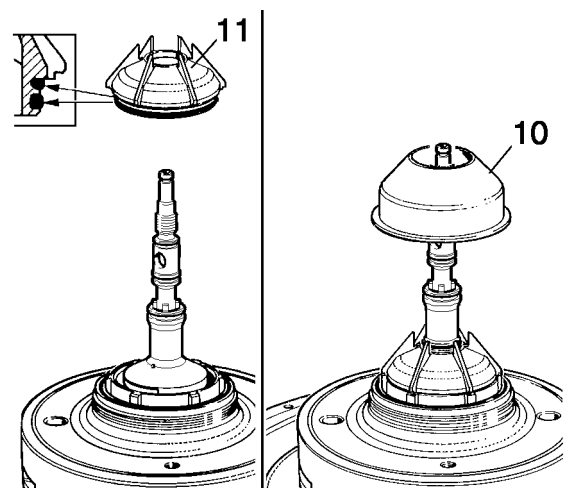
15. Place inlet pipe (12) in the bowl.

Check point [5.3.7 Threads of inlet pipe, paring disc on page 45](#).



G0072731

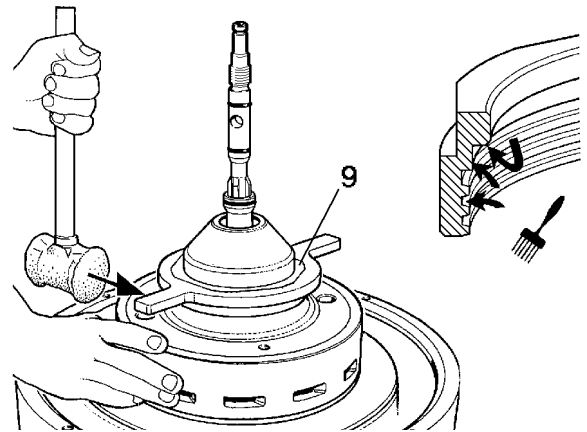
16. Fit paring chamber cover (11) by pressing it down gently.
17. Assemble gravity disc/ clarifier disc (10).



G0073351

18. Fit lock ring (9). Apply a thin layer of Molykote Paste 1000 to the threads and on contact and locating surfaces.

Left-hand thread!

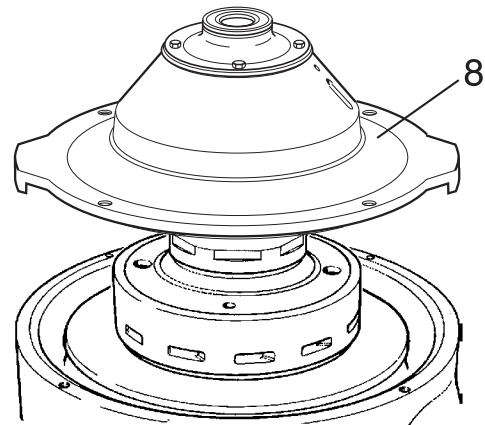


G0074331

19. Fit frame hood (8). The two eye-bolts must be fitted in the holes nearest to the electric motor.

In case of Major Service remove the connecting housing and fit a new O-ring on the insert (2).

Check point 5.4.1 Paring disc height adjustment on page 49. To be performed at Major Service and if the bowl spindle has been dismantled.



G0073581

20. Fit inlet/outlet housing. Tighten nut.

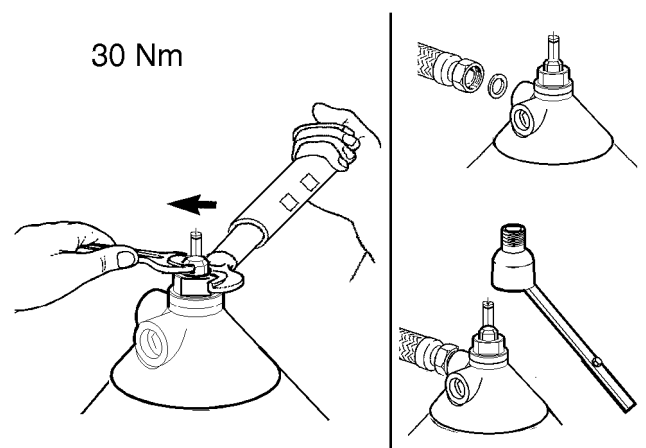
Left-hand thread!

21. Then rotate the bowl by means of the flat belt. If the bowl does not rotate freely or a scraping noise is heard, incorrect bowl assembly or incorrect height adjustment of the paring disc can be the cause.

NOTE

To avoid damage on the inlet pipe the tightening torque must not exceed 30 Nm.

22. Make sure that the gasket on the safety device is in position. If not, glue with Loctite 407. Fit and secure safety device.
23. Fit the connecting hoses if they have been removed. Make sure to fit their gasket rings.
24. Fit the water tank on the frame bottom part if it has been removed.



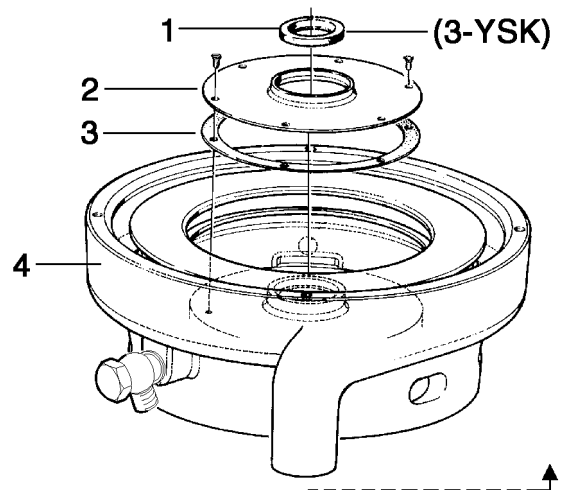
G0172951

6.2 Bowl spindle and frame

6.2.1 Bowl spindle and frame - dismantling

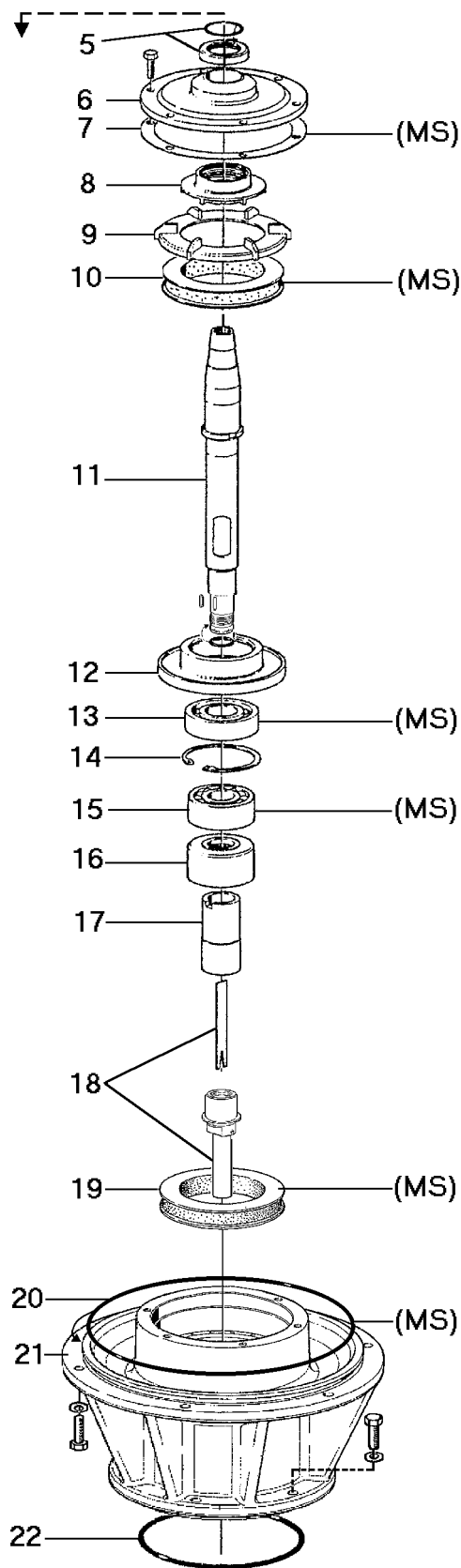
Before dismantling the bowl spindle, the inlet and outlet housing, frame hood and bowl as well as the flat belt must be removed.

Before dismantling, in the case of Major Service, or if the separator vibrates while running, see **Check point 5.4.2 Radial wobble of bowl spindle** on page 50.



G01132b1

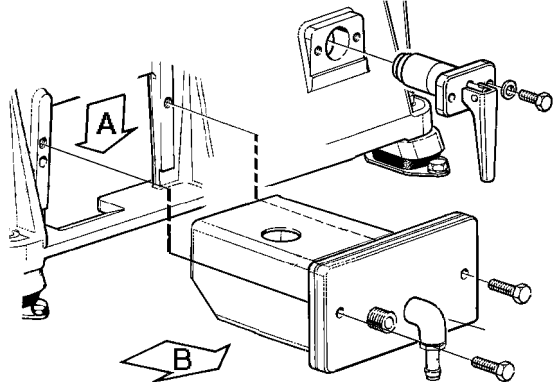
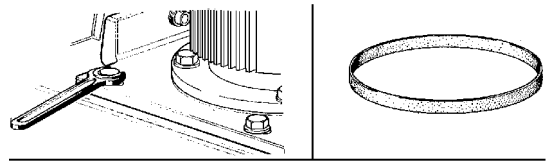
1. Lip seal ring
 2. Screen
 3. Gasket
 4. Frame, top part
- 3-YSK. Parts to be renewed at Three year service



G01131A1

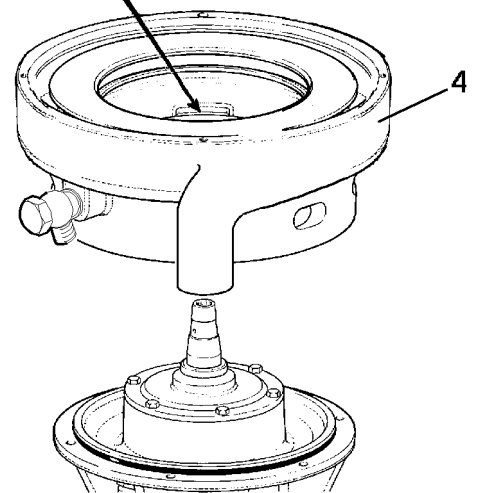
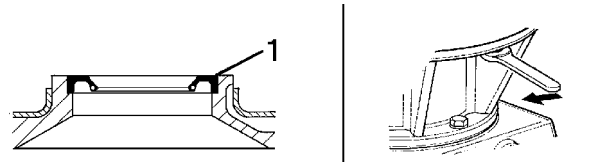
5. *Deflector ring*
 6. *Top bearing cover*
 7. *Gasket*
 8. *Fan*
 9. *Buffer holder*
 10. *Rubber buffer*
 11. *Bowl spindle*
 12. *Ball bearing holder*
 13. *Ball bearing*
 14. *Snap ring*
 15. *Ball bearing*
 16. *Oil pump*
 17. *Belt pulley*
 18. *Pump sleeve*
 19. *Rubber buffer*
 20. *O-ring*
 21. *Frame, intermediate*
 22. *O-ring*
- MS.Parts to be renewed at Major Service*

1. Loosen but do not remove the motor adapter screws.
2. Remove the water tank.
3. Remove the brake.
4. Remove the flat belt.



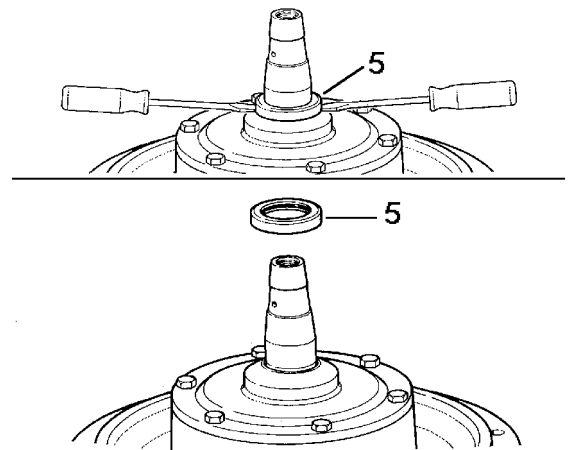
G01133E1

5. Remove the screws and lift off frame top part (4). Lip seal ring (1) must be removed in the case of 3-year service, or if found damaged.



G01134E1

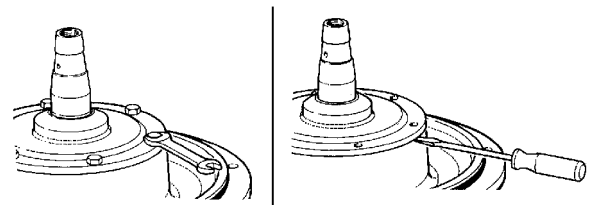
6. Clean the bowl spindle cone in place and remove deflector ring (5).



G0113521

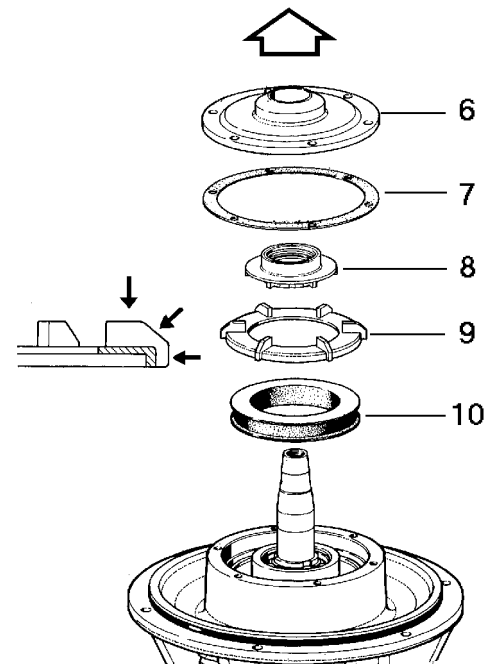
7. Remove, in the following sequence:

- Top bearing cover (6)
- Gasket (7)
- Fan (8)
- Buffer holder (9)
- Rubber buffer (10).



NOTE

Be very careful not to damage the wings of the buffer holder.

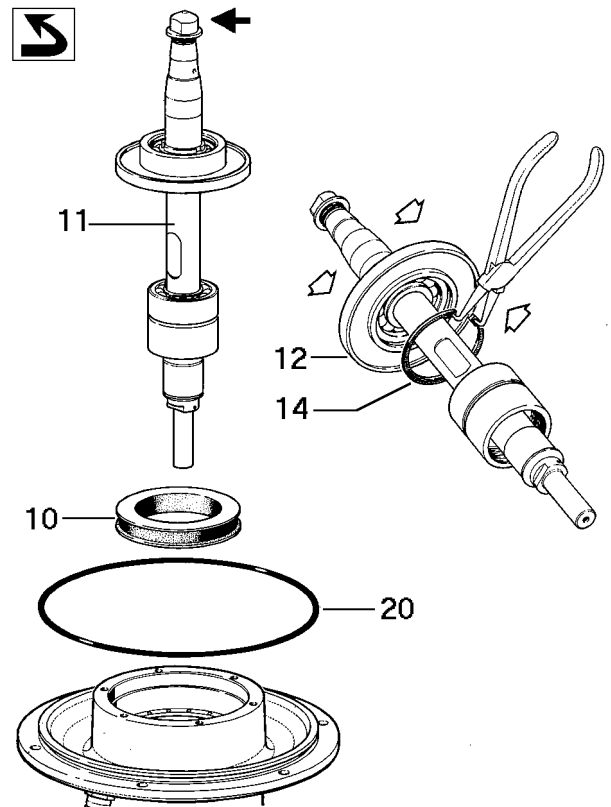


G0113621

8. Screw the cap nut counter-clockwise (left-hand thread) onto the spindle top to protect the top and bore.

Lift out spindle assembly (11), rubber buffer (10) and O-ring (20).

Remove snap ring (14) by using a pair of pliers and pull off ball bearing holder (12).



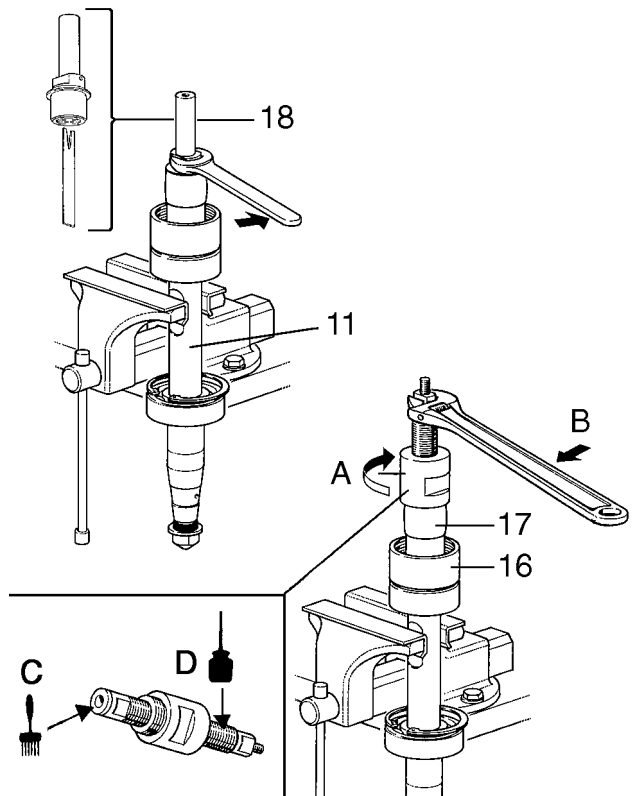
G0076132

9. Clamp the bowl spindle (11) in a screw vice. Remove the pump sleeve (18). When turning the spindle upside down there is a risk that the vane in the pump sleeve can slide down partly or entirely into the spindle. Therefore, after unscrewing the sleeve, check that the vane has not been damaged.
10. Remove the belt pulley (17). If the pulley has stuck proceed with point 10.
11. Lubricate the mounting/dismantling tool.

Fit the mounting/dismantling tool and screw it down as far as it will go (A).

Use a long spanner (450 - 650 mm) to press the belt pulley off the spindle (B).

Remove the oil pump (16) by hand, do not loose the flat key.



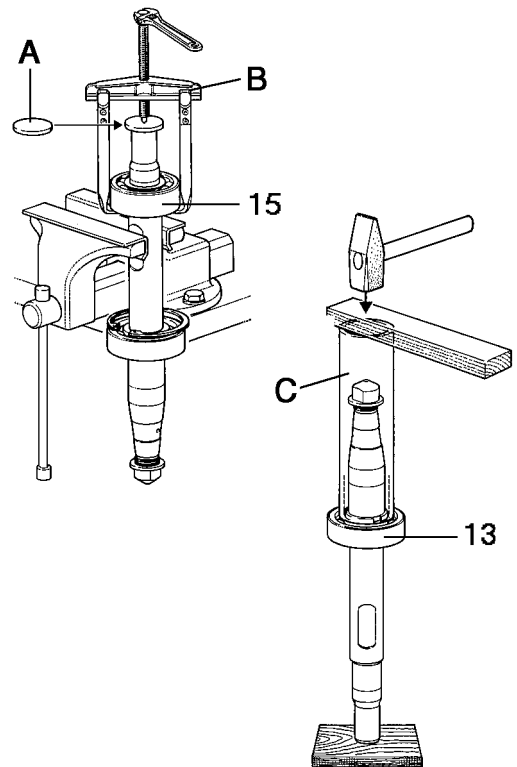
G0076271

C. Molykote 1000 paste
D. Oil

12. Pull off ball bearing (15) using a puller (B) and thrust washer (A). Pull off bearing (13) using the special mounting tool (C) and a hammer.

NOTE

Always discard a used bearing.

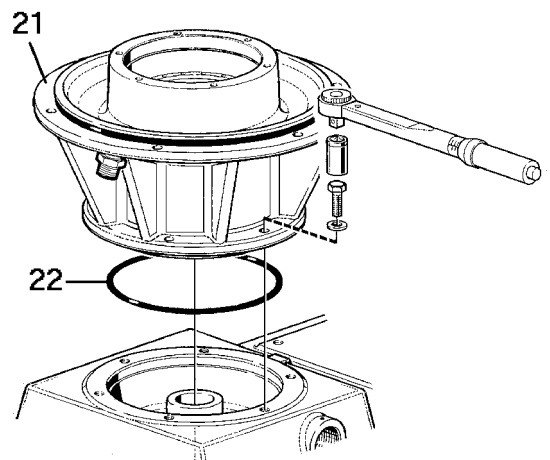


G0076351

13. Loosen the screws and lift off the frame intermediate part (21).

14. **In case of 3-year-service**

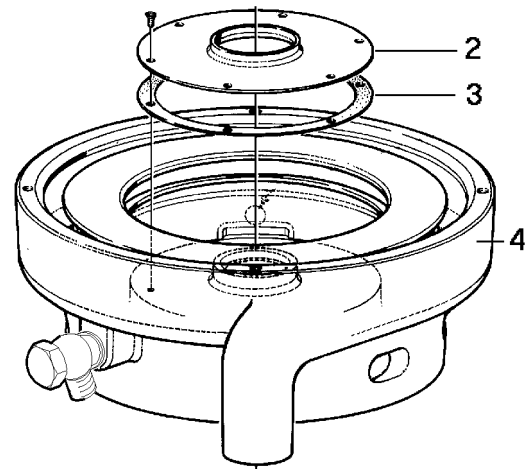
Discard the O-ring (22). This O-ring is not included in any service kit, but must be ordered separately.



G0093791

15. Remove the screen (2) from the frame top part (4). Discard the gasket (3). This gasket is not included in any service kit, but must be ordered separately.
16. Clean the oil sump.
17. Clean all dismantled parts thoroughly in a degreasing agent and check for damage and corrosion.

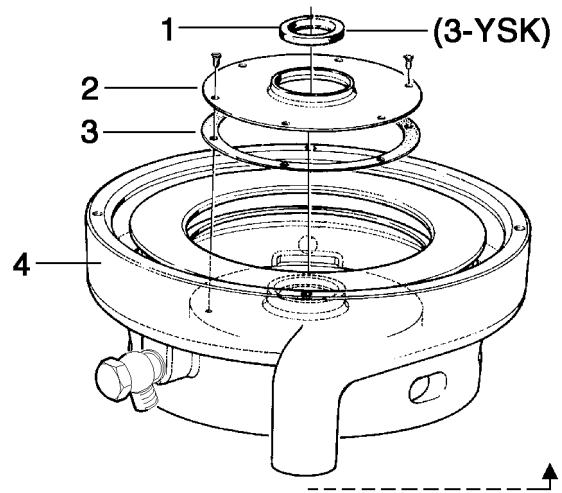
Replace all parts supplied in the spare parts kits.



G0113771

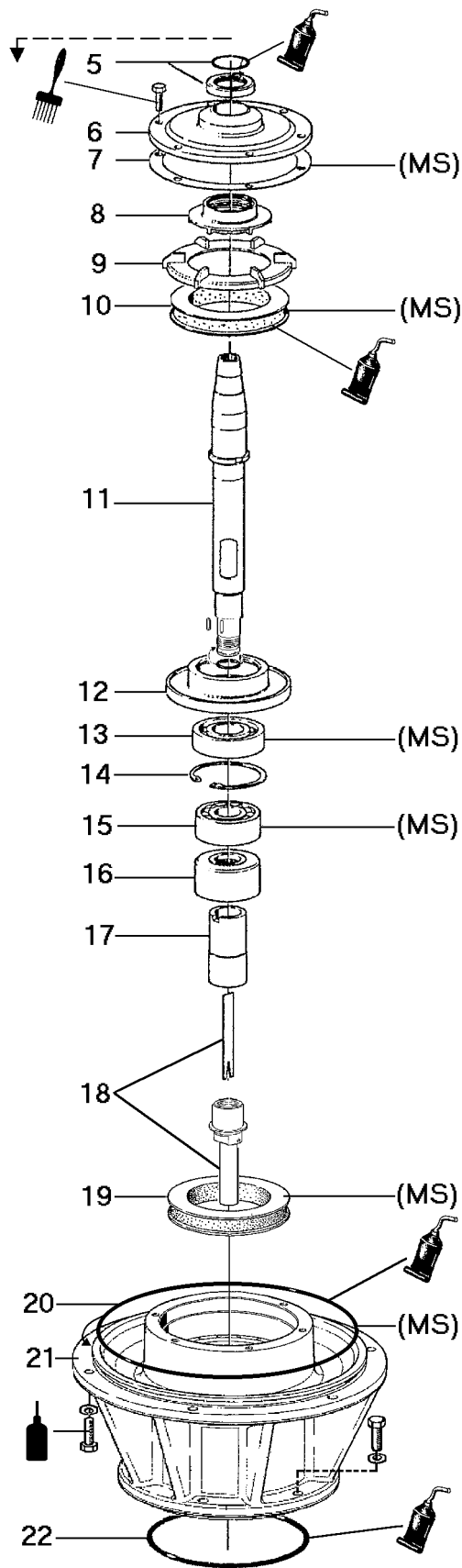
6.2.2 Bowl spindle and frame - assembly

The bowl spindle and frame is assembled in reverse sequence to dismantling.



G01132b1

1. Lip seal ring
 2. Screen
 3. Gasket
 4. Frame, top part
- 3-YSK .Parts to be renewed at Three year service

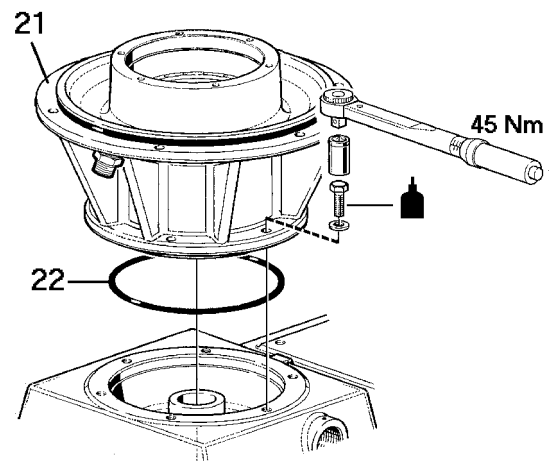


G01131b1

5. *Deflector ring*
 6. *Top bearing cover*
 7. *Gasket*
 8. *Fan*
 9. *Buffer holder*
 10. *Rubber buffer*
 11. *Bowl spindle*
 12. *Ball bearing holder*
 13. *Ball bearing*
 14. *Snap ring*
 15. *Ball bearing*
 16. *Oil pump*
 17. *Belt pulley*
 18. *Pump sleeve*
 19. *Rubber buffer*
 20. *O-ring*
 21. *Frame, intermediate*
 22. *O-ring*
- MS.Parts to be renewed at Major Service*
- A. *Molykote 1000 paste (thin layer to be rubbed into surface)*
 - B. *Silicone grease (thin layer)*
 - C. *Loctite 242*
- MS.Major service kit*

1. **In case of 3-year-service.**

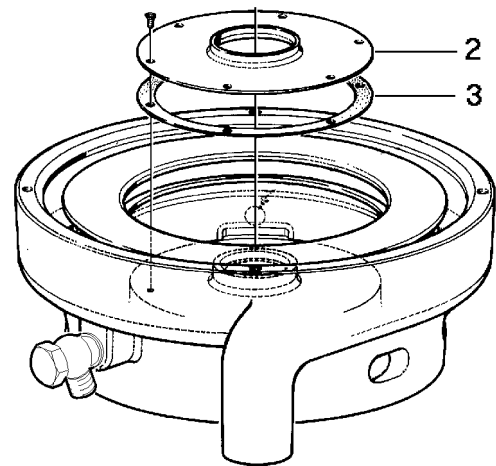
Fit a new O-ring (22) and assemble the frame intermediate part (21). Use a torque wrench and tighten the screws lightly crosswise at first. Then tighten all around to 45 Nm. Secure the screws with Loctite 242.



G0093781

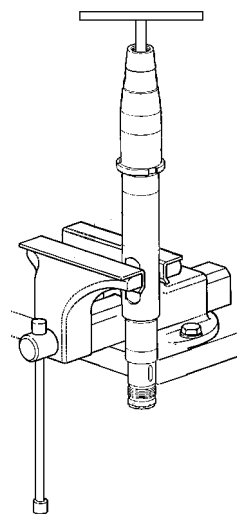
2. Fit a new gasket (3).

Fit the screen (2).



G0113761

3. Clear the spindle bore from dirt and lime deposits with the special reamer



G0076341

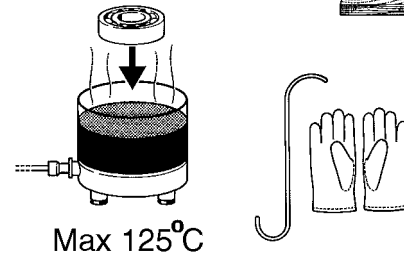
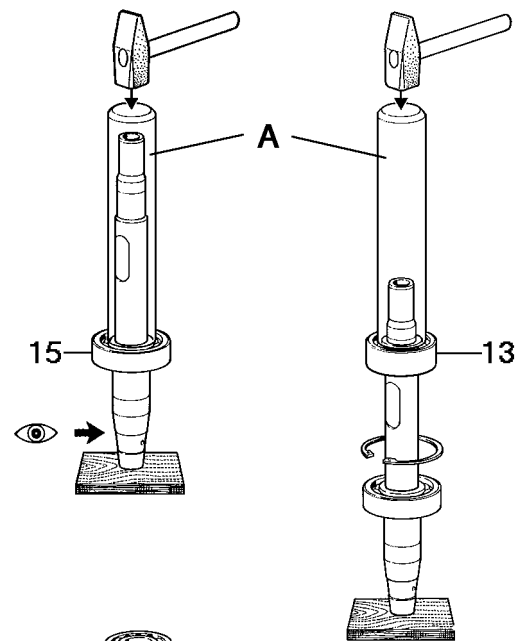
4. Inspect the tapered end and the hollow part of the bowl spindle for wear and clean if necessary. Assemble ball bearings (13 and 15).

Heat the new ball bearings in oil to maximum 125 °C. Use the special mounting tool (A) from the tool kit.

NOTE

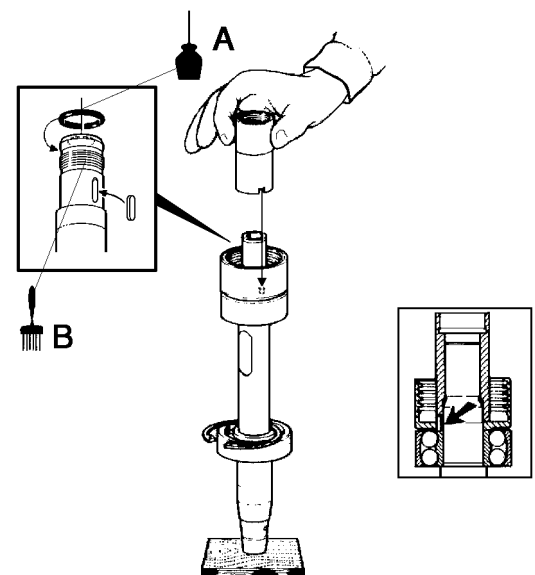
Always fit new bearings.

If in doubt how to install roller bearings in a correct way, please see the detailed description in 5.11.1 Ball and roller bearings on page 70.



G0113851

5. Fit oil pump, flat key and belt pulley. Make sure that the recess in the belt pulley fits over the guide pin in the oil pump.

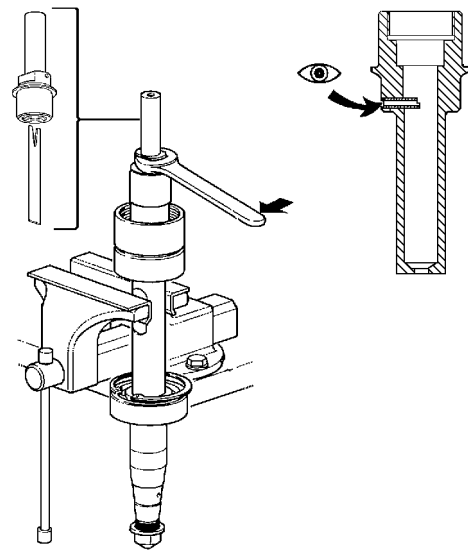


G0113961

A. Oil

B. Molykote 1000 paste (Thin layer to be rubbed into surface)

6. Check that the radial hole (\varnothing 1 mm) in the pump sleeve is clean, and fit the pump.

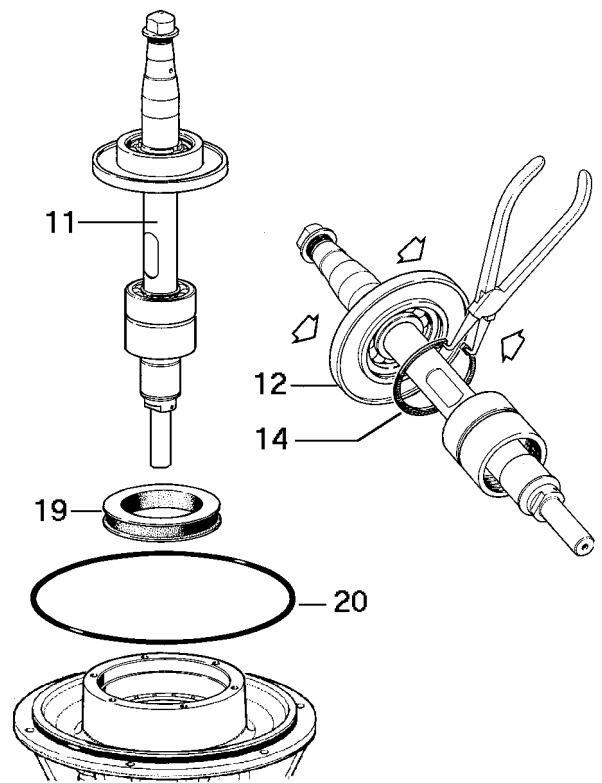


G0114341

7. Fit ball bearing holder (12) and secure it with snap ring (14).

Fit O-ring (20) and rubber buffer (19).

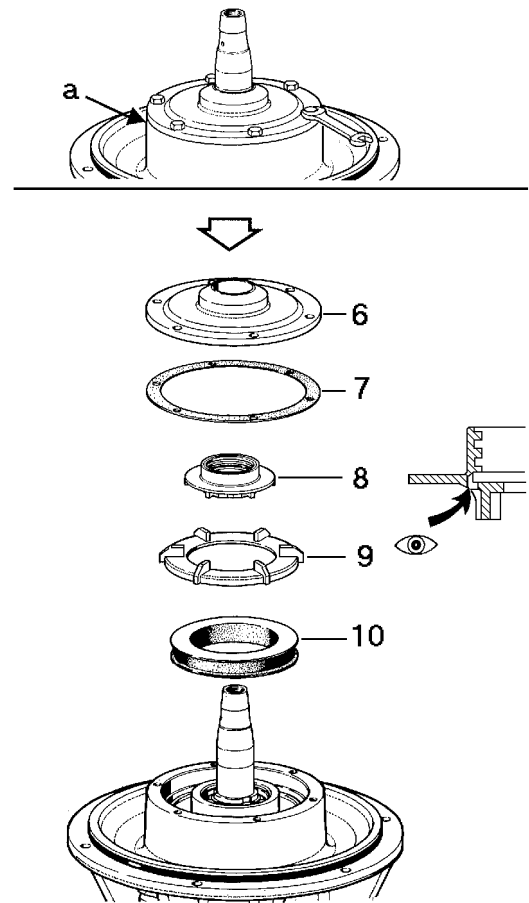
Lower spindle assembly (11) carefully into the separator intermediate frame.



G0076122

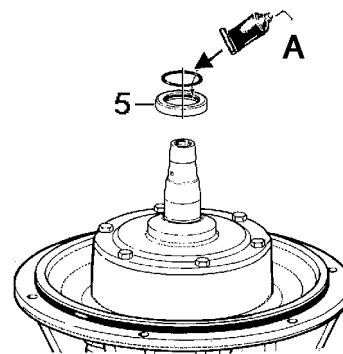
8. Assemble, in the following sequence:

- Rubber buffer (10)
 - Buffer holder (9)
 - Fan (8)
 - Gasket (7)
 - Top bearing cover (6)
- Make sure that the \varnothing 3 mm hole in fan (8) is clean and the lugs in the fan enter the recesses in the bowl spindle.
- Before tightening, make sure that there is some play (a) between top bearing cover (6) and the frame. The play will disappear when the screws are tightened.
- Tighten the screws sequentially (not crosswise) in order to successively compress the rubber buffers.



G0114421

9. Push down deflector ring (5) till it stops.



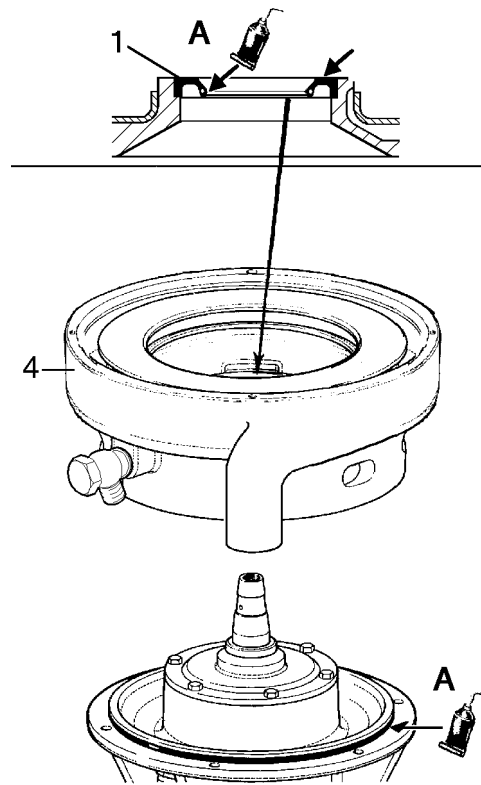
G0114541

A. Silicone grease (thin layer)

10. Assemble frame top part (4). If lip seal ring (1) has been removed, fit a new one before the frame top part is put in place.

Make sure the lip seal is turned the correct way. See illustration.

When frame top part (4) is assembled there shall be a small gap between the bowl spindle and the lip seal (1).



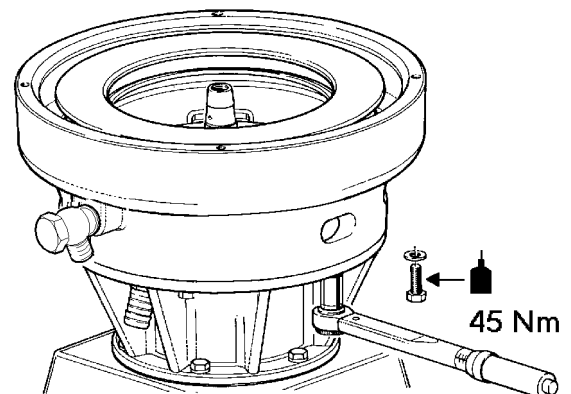
G0114681

A. Silicone grease (thin layer)

11. Tighten the screws of the top frame using a torque wrench (width across flats 16 mm).

Tighten the screws slightly crosswise at first. Then tighten all around to 45 Nm.

Secure the screws with Loctite 242.



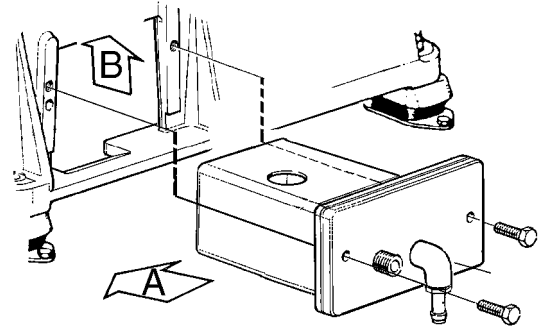
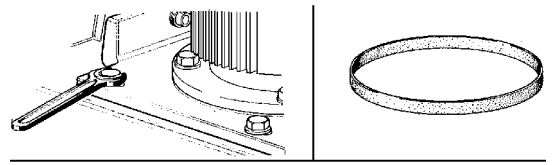
G0114751

12. Fit and adjust the flat belt, see [6.4 Flat belt and tightener on page 122](#).

Check point

[5.4.2 Radial wobble of bowl spindle on page 50](#)

13. Fit the water tank and tighten the screws.



G01133A1

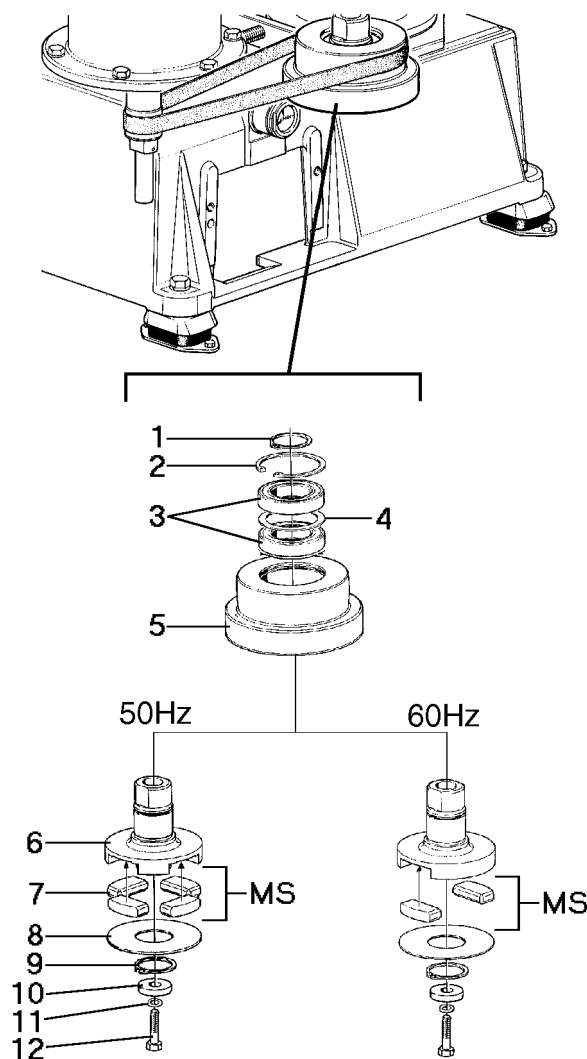
6.3 Friction coupling

If the separator does not attain full speed within about 2 minutes, the friction elements or the coupling may be worn or greasy. The friction elements must then be replaced with new ones or be thoroughly cleaned from grease.



Entrapment hazards

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



G0372121

1. Snap ring
2. Snap ring
3. Ball bearings
4. Washer
5. Belt pulley
6. Coupling hub
7. Friction element
8. Cover
9. Snap ring
10. Washer
11. Spring washer
12. Screw

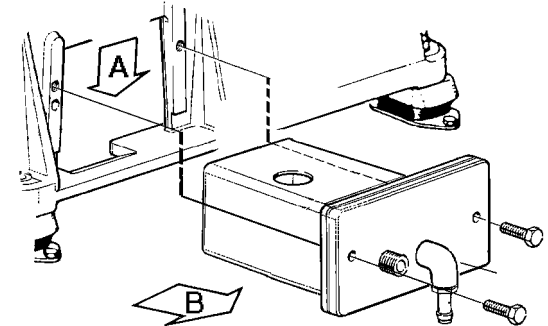
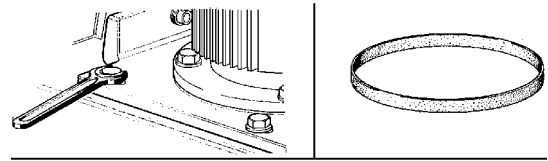
MS. Set of friction elements included in the Major service Kit for 50 Hz or 60 Hz

6.3.1 Friction coupling - dismantling

1. Check that the belt tightener is in backward position.
2. Remove the motor adapter screws.
3. Remove the water tank and the flat belt.

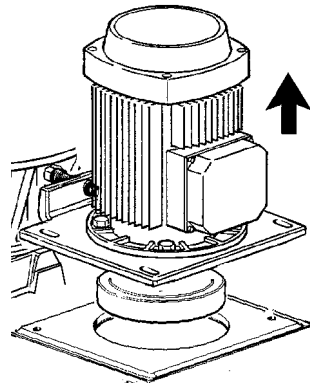
Note that the tank must be lowered past spindle end (A) before it can be withdrawn (B).

4. Remove the flat belt.



G0113391

5. Remove the electric motor complete with the friction coupling and motor adapter. Weight of motor including adapter and friction coupling is not more than 35 kg.

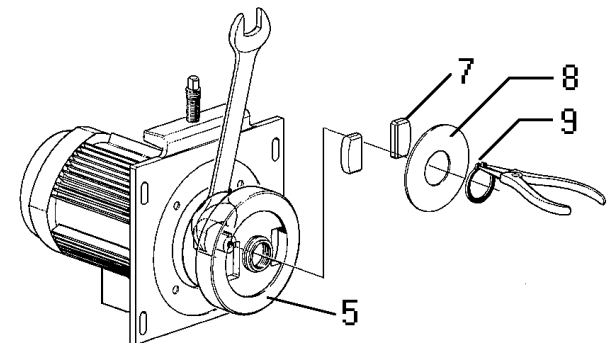


G0077331

6. Remove snap ring (9), cover (8) and friction elements (7).

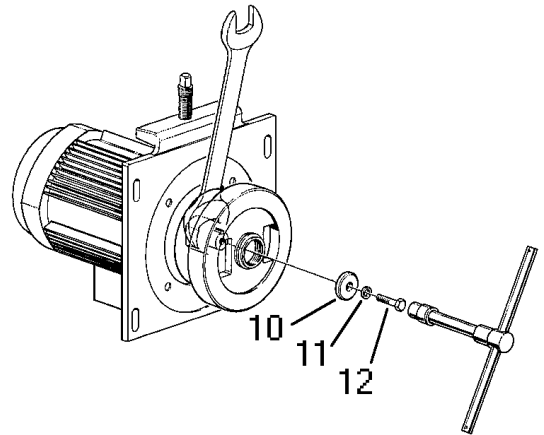
If the friction elements are worn, fit new ones. Replace all friction elements even if only one is worn.

If the friction elements are only greasy: Clean the friction elements and the inside of belt pulley (5) with a degreasing agent.



G0170841

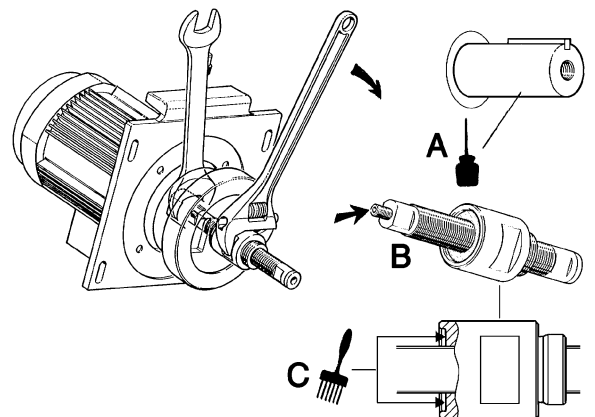
- Remove the screw (12), spring washer (11) and washer (10) from the friction coupling.



G0170921

Complete dismantling of the friction coupling

- Lubricate and fit the special mounting and dismantling tool. Ease off the coupling.



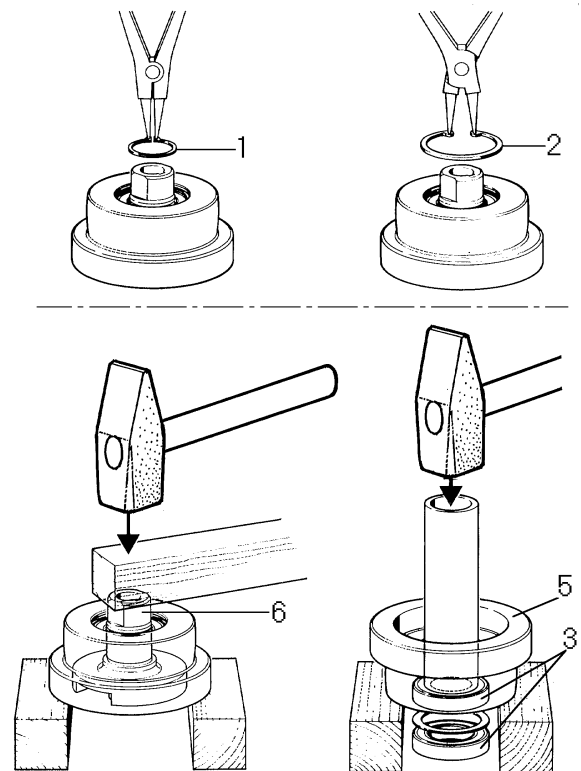
G0171051

- A. Oil
- B. Mounting tool
- C. Molykote 1000 Paste (thin layer to be rubbed into surface)

2. Remove snap rings (1 and 2) and drive off coupling hub (6). Turn the coupling, i.e. belt pulley (5) with bearings (3), the other way round and drive off the ball bearings and washer by using a tube.
3. Clean all parts in a degreasing agent and replace parts supplied in the spare parts kits.

NOTE

Always discard a used bearing.



G0171131

6.3.2 Friction coupling - assembly

Before the friction coupling is assembled, examine all parts thoroughly for wear and corrosion.

1. Assemble the new ball bearings in belt pulley (5) by using a tube and a hammer.

Apply Loctite 641 on the outer surfaces of ball bearings (3).

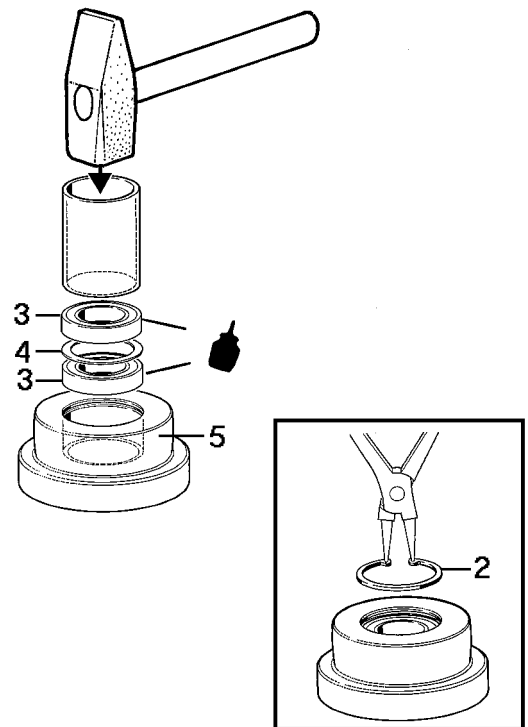
Knock down the bearings carefully (do not forget washer 4) by using the tube which must rest on the outer race of the bearing.

The new bearings must not be heated as they are packed with grease and sealed with plastic membranes.

After the assembly of the bearings, fit snap ring (2).

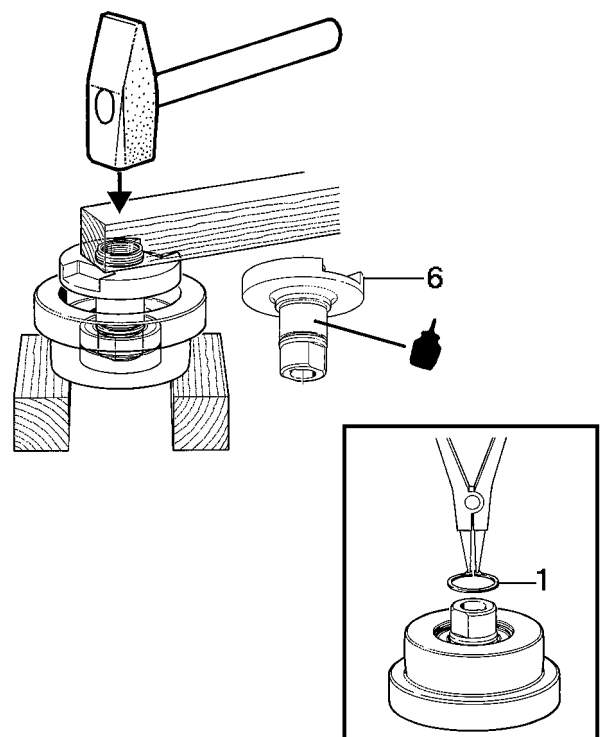
NOTE

Do not refit used bearings.



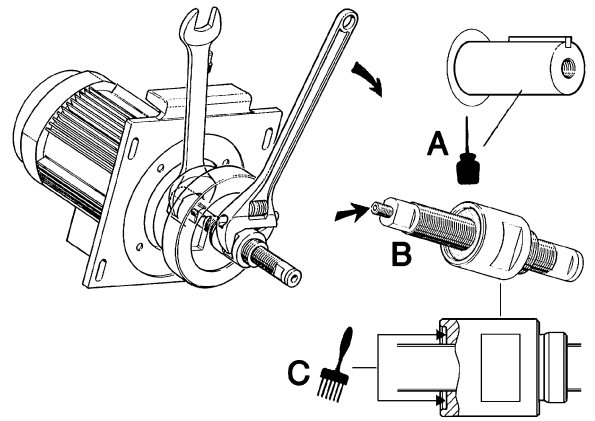
G0171231

2. Apply Loctite 641 on the coupling hub (6) and knock it down into the belt pulley by using a hammer.
3. Fit snap ring (1).



G0171321

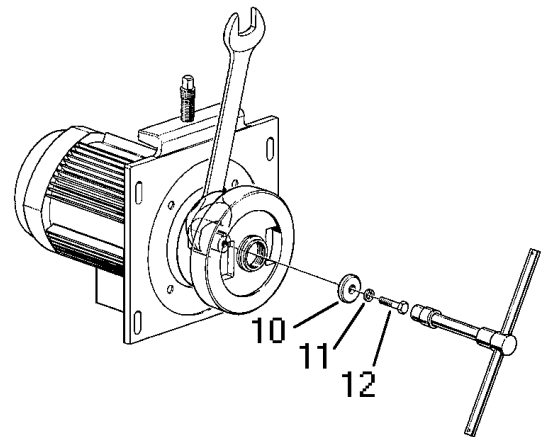
4. Wipe clean the motor shaft and apply a thin oil film on it. Fit the special mounting and dismantling tool to the motor shaft (by means of the small screw on one end of the tool) and press the friction coupling onto the shaft.



G0171051

- A. Oil
- B. Mounting tool
- Molykote 1000 Paste (thin layer to be rubbed into surface)

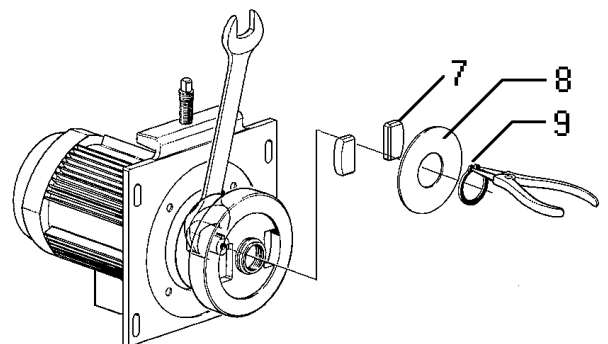
5. Fit the screw (12) with the washer (11) and spring washer (10) to secure the friction coupling.



G0170921

Assembly of friction elements

1. Fit new friction elements (7), cover (8) and snap ring (9).
 - A coupling with two friction elements is used for 60 Hz installations.
 - A coupling with four friction elements is used for 50 Hz installations.

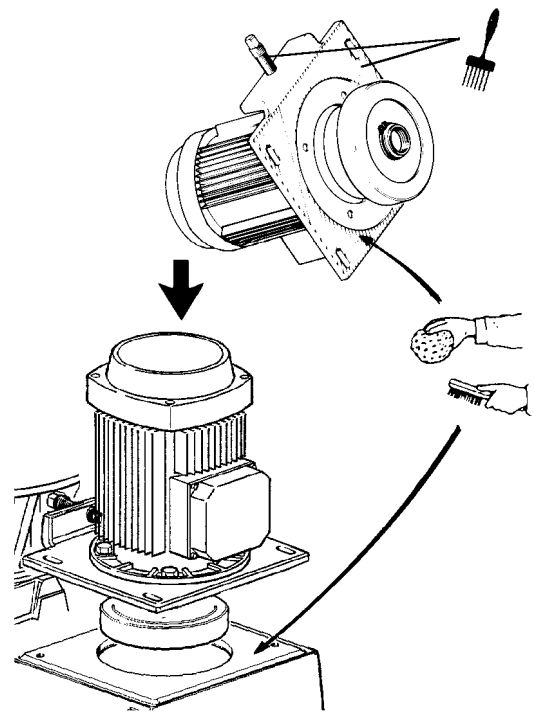


G0170831

2. Degrease and clean the contact surfaces of frame and motor adapter. Lubricate the contact surfaces with Molykote 1000 paste. Then fit the electric motor with adapter and friction coupling in position. Also lubricate the threads of the belt tightener with Molykote 1000 paste or similar.
3. Fit and tighten the flat belt, see [6.4 Flat belt and tightener on page 122](#).
4. Install the water tank and the cover.

NOTE

The belt must be re-tightened before starting the separator, see next page.



G0077341

6.4 Flat belt and tightener

The flat belt must be removed before dismantling of the bowl spindle or the friction coupling. The procedure is the same when replacing the belt at a Major Service. A new belt must be re-tightened twice:

- 30 minutes after the belt has been installed. The separator must not be started until the re-tightening has been done.
- after approximately 24 hours of operation.

NOTE

Do not start the separator unless the flat belt has been re-tightened after 30 minutes. If started, the belt may slip and be damaged.

6.4.1 Belt replacement and tightening

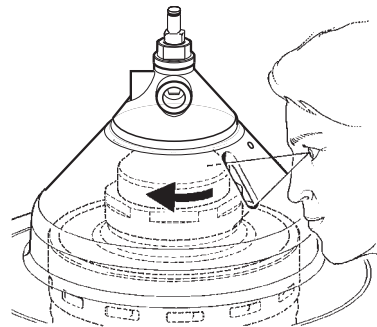
If only tightening of flat belt should be done, only steps 3 and 8-12 have to be performed.



Entrapment hazards

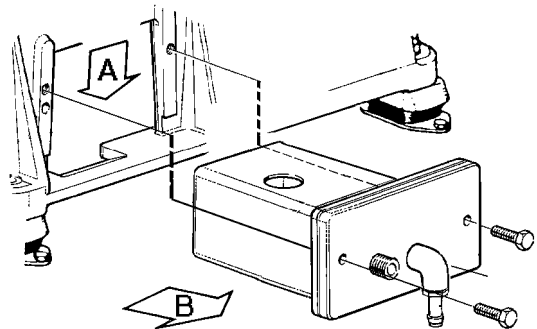
Make sure that rotating parts have come to a complete standstill before starting any dismantling work.

Look into the slot in the frame hood to see if separator parts are rotating or not.



G0467361

1. Remove the water tank and brake. Note that the tank must be lowered past spindle end (A) before it can be withdrawn (B).



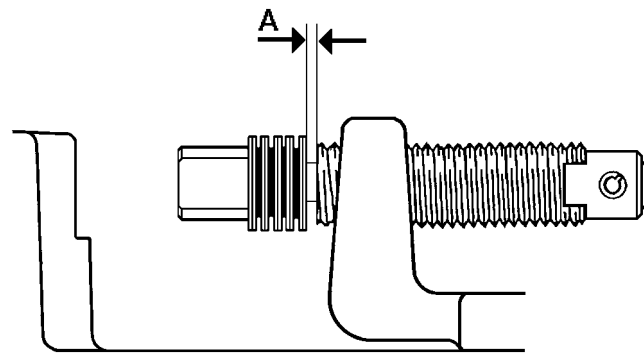
G0884721

2. Check that the belt tightener is in backward position.

NOTE

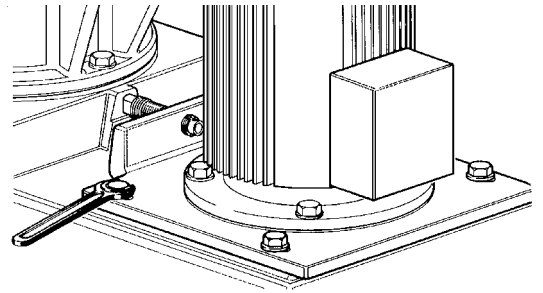
Pay attention to the air gap "A" between the cup springs and the threaded sleeve.

The distance "A" must not exceed 0,5 mm. Otherwise a correct belt tightening will be impossible.



G0473911

3. Loosen but do not remove the motor adapter screws.

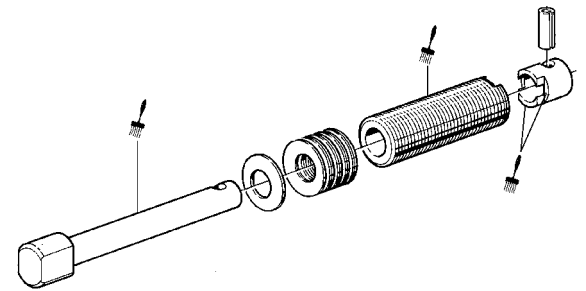


G0076622

4. Knock out the tubular spring pin and separate the parts, lubricate with Molykote 1000 paste and assemble the parts.

NOTE

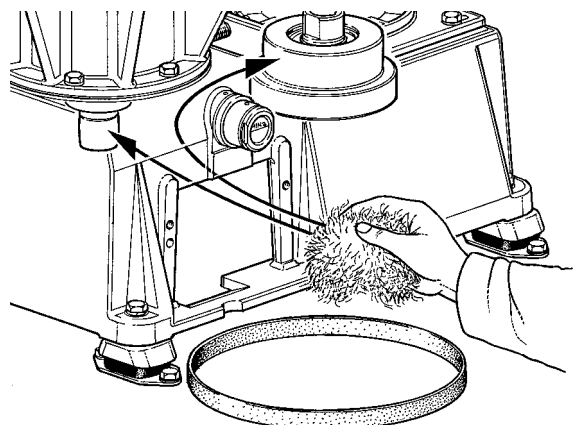
To guarantee a proper function of the belt tightener it is advisable to protect the surfaces.



G0885711

5. Remove the existing belt and clean the raceways of the bowl spindle and the friction coupling by using a degreasing agent. Wipe the raceways with a clean rag after cleaning.

Exercise the greatest possible cleanliness. There must be no dirt, oil or grease on the raceways.

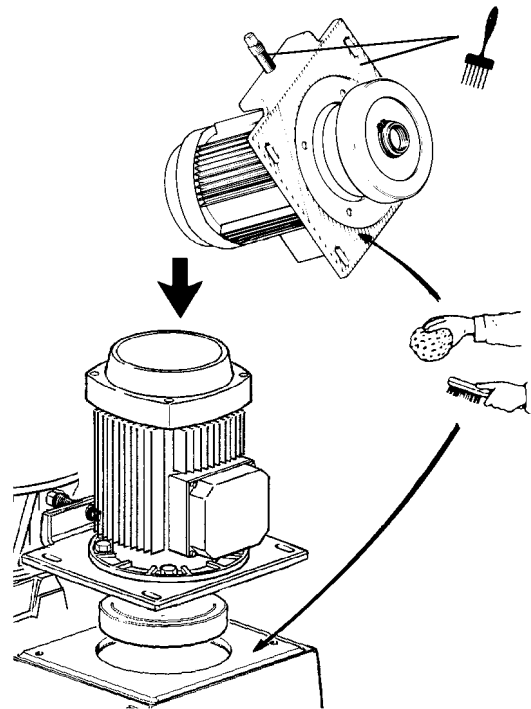


G0171531

6. Remove the motor adapter screws. Lift the motor together with adapter and friction coupling and check that there is a sufficient film of Molykote 1000 Paste, or an equivalent lubricating paste, between the adapter and the frame surface. Lower the motor after checking. Fit the motor adapter screws but do not tighten them.

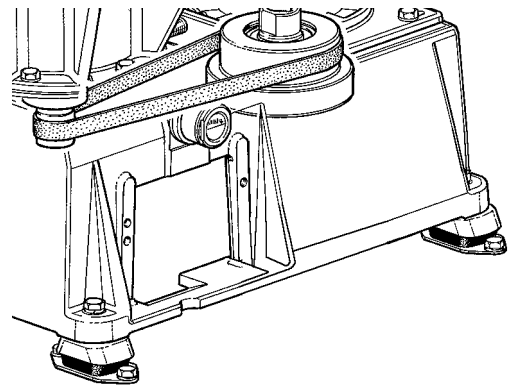
The weight of motor including adapter and friction coupling is not more than 35 kg.

The threads of the belt tightener should be lubricated with a thin layer of Molykote 1000 Paste. (to be rubbed into surface)



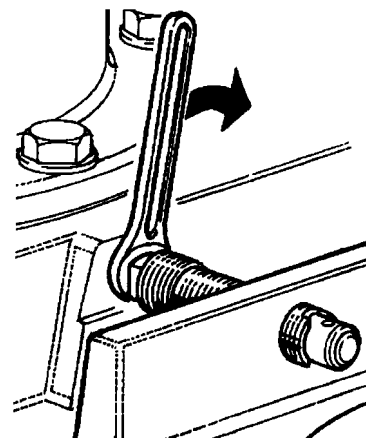
G0077341

7. Fit a new belt. Start on the motor side. Tighten the belt by moving the motor backwards by hand. Pull the belt around a few turns by hand.



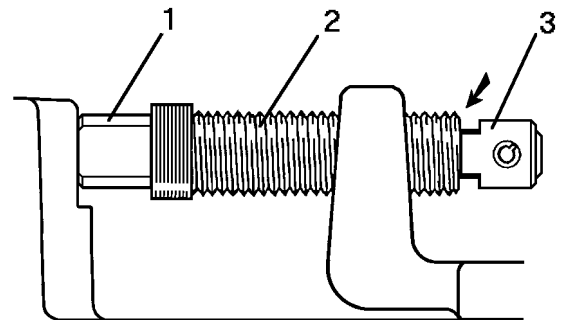
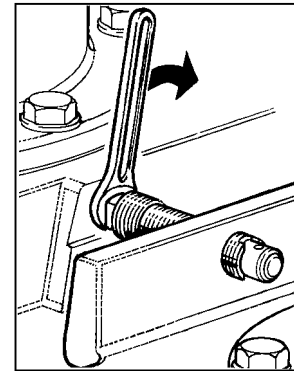
G0171661

8. Rotate the belt tightener by rotating the shaft until it makes contact with the frame pad.



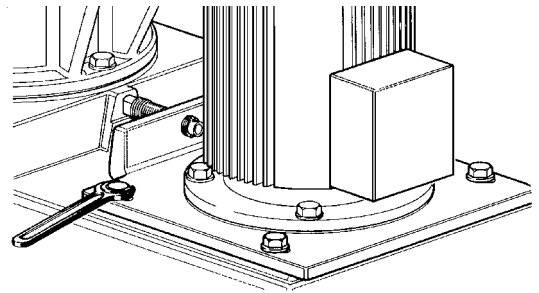
G0489821

9. Tighten the shaft (1) further until the threaded sleeve (2) and dog (3) are disengaged. "Shake" the motor by hand several times during this operation in order to overcome the friction between the motor adapter and the frame.



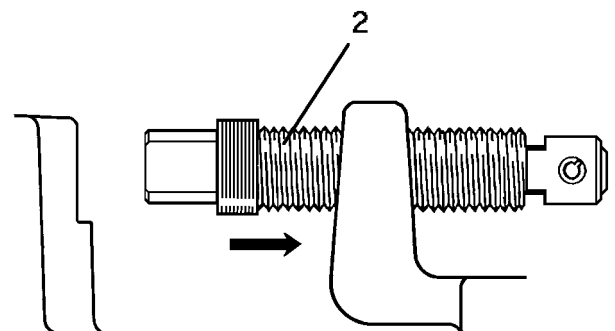
G0477111

10. Tighten the motor adapter screws.



G0076622

11. Loosen the belt tightener by rotating the threaded sleeve (2) backwards.

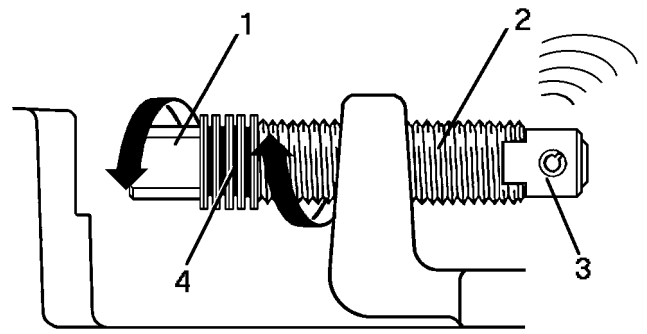


G0477211

12. Rotate the shaft (1) relative to the threaded sleeve (2) until the sleeve (2) and dog (3) are engaged again with a clicking sound.

NOTE

If the springs (4) are not decompressed they will lose their tension and correct tightening of belt will be impossible.

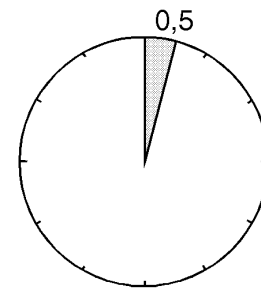


G0477311

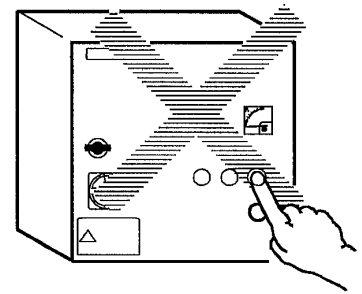
13. Let the belt stay in this position for at least 30 minutes without starting the separator. Then repeat steps 3 and 8-12 above. After this proceed to step 14.

NOTE

Do not start the separator unless the flat belt has been re-tightened after 30 minutes. If started, the belt may slip and be damaged.



G0474021



14. Fit the water tank and brake.
15. The separator may now be started.

NOTE

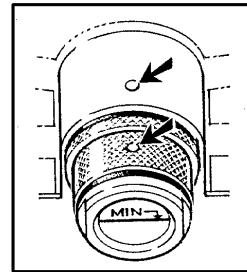
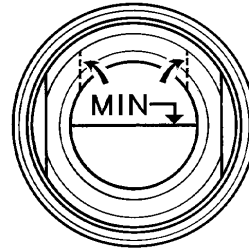
The belt must be re-tightened when the separator has been in operation approximately 24 hours after the belt change: Repeat steps 3 and 8-12.

6.5 Oil filling device

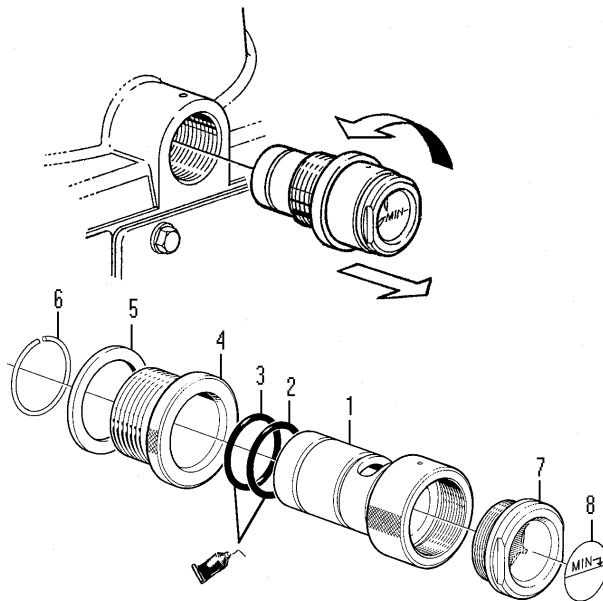
6.5.1 Dismantling/assembly

Drain off the oil, see [5.8 Oil change on page 57](#).

1. Unscrew nipple (4) and pull off the oil filling device. Then unbend the round safety wire (6) and pull off nipple (4).
2. If plate (8) is to be replaced, wipe the sight glass (7) with a degreasing agent.
3. Fit the new plate on the outside of the sight glass. The plate is self-adhesive.
4. Mark the position of the plate relative to the recess in sleeve (1).
5. Assemble the oil filling device and fit it into the frame. Note that the mark on sleeve (1) must be positioned opposite the mark on the frame. Fill the sump with new oil.



G0155811



G0155911

1. Sleeve for oil filling
2. O-ring, Silicone grease (thin layer)
3. O-ring, Silicone grease (thin layer)
4. Nipple
5. Sealing ring
6. Round safety wire
7. Sight glass
8. Plate

6.6 Water tank

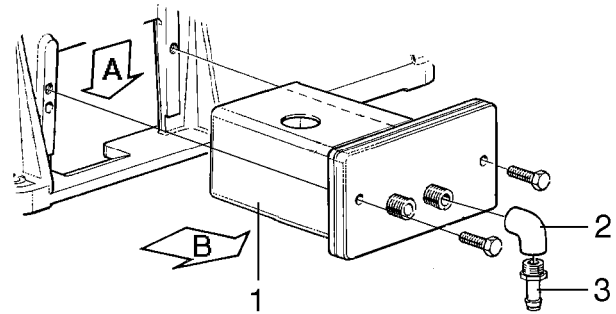
Remove the water tank (1).

Note that the tank must be lowered past the spindle end (A) before it can be withdrawn (B).

- Check the tank interior and clean out if necessary.
- Check that the pipes are not defective. Replace if necessary.

If the parts fitted on the tank have been removed, it is necessary to fit the parts properly together at assembly.

- Seal the water inlet pipe with Loctite 573.

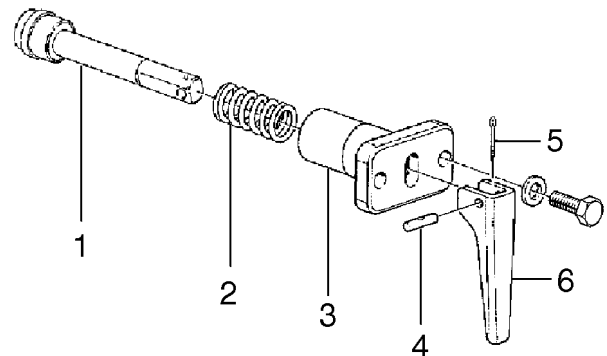


G0884711

1. Water container
2. Elbow
3. Pipe

6.7 Brake

6.7.1 Exploded view



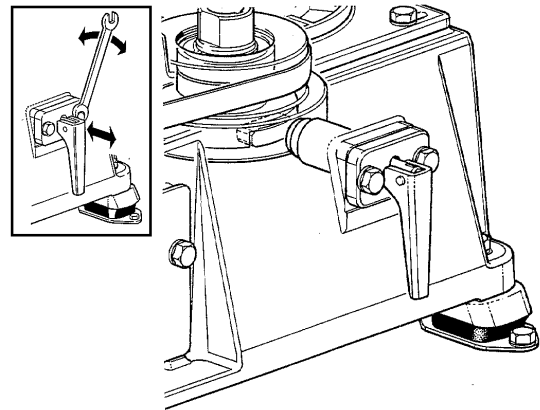
G0171731

1. Spindle with friction element
2. Spring
3. Bracket
4. Cylindrical pin with hole
5. Split pin
6. Brake handle

6.7.2 Checking of friction element

A worn or oily friction element will lengthen the stopping time. Remove bracket with the brake. Examine the friction element.

- If the friction element is worn; Fit a new complete spindle (includes friction element).
- If the friction element is oily; Clean the element and its surface in contact with the belt pulley with a suitable degreasing agent.

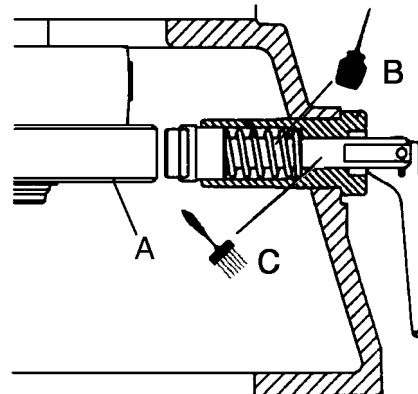


G0171821

Checking of bracket, spindle and spring

Rust can form on the brake parts and cause the brake to jam.

Remove rust from the spindle and the corresponding guide surface on the bracket. Rub the surface of the spindle with a thin layer of lubricating paste. Replace the spring with a new one if it has lost its stiffness. Oil the spring when assembling.



G0171941

- A. Coupling surface
 B. Oil
 C. Molykote 1000 Paste

Checking the brake

After the brake assembly has been fitted, release the brake and rotate the bowl slowly by hand. If a scraping noise is heard, the friction element is probably touching the coupling pulley surface (A). If so, it is necessary to adjust the position of the motor adapter and re-tighten the flat belt, see [6.4 Flat belt and tightener on page 122](#).

6.8 Frame feet

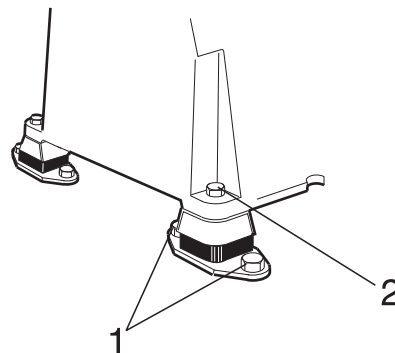
6.8.1 Mounting of new frame feet

When replacing the frame feet, the separator must be lifted.

Remove the bowl before lifting the separator.

Follow the Lifting instructions.

1. Loosen the foundation bolts and lift the separator.
2. Remove the existing frame feet.
3. Mount the new feet.
4. Place the separator in its original position and fasten the foundation bolts.
5. Remove the two lifting eye bolts.
6. Assemble the separator bowl, see [6.1.2 Inlet/outlet and bowl - assembly on page 87](#).



G0358351

1. *Foundation bolts*
2. *Bolt*

7 Technical Reference

7.1 Product description

Alfa Laval ref. 589967 Rev. 2

**NOTE**

The separator is a component operating in an integrated system including a monitoring system.

If the technical data in the system description does not agree with the technical data in this instruction manual, the data in the system description is the valid one.

Product specification: 881099-06-03/1
Commercial name: P 605
Application: Mineral oil
Technical Design: Purifier (clarifier as option).
Partial discharge
Machine bottom part for belt drive
Intended for marine and land applications.
Colour of finish painting of painted parts according to order.
Quality of painting according to specifications on drawings.
Sealings available in Nitrile.

Operational limits:

Max. Allowed speed 9510 r/minute
Discharge interval: 2 - 60 minutes
Feed temperature: 0 °C to + 100 °C
Maximum allowed density of operating liquid: 1000 kg/m³.
Ambient temperature: + 5 °C to + 55 °C
Not to be used for liquids with flashpoint below 60 °C.
Risk for corrosion and erosion have to be investigated in each case.

7.2 Directives & Standards

Alfa Laval ref. 591985 Rev. 1

Health and safety requirements:

2006/42/EC	Machinery Directive
2004/108/EC	Electromagnetic Compatibility
2006/95/EC	Low Voltage Directive

Standards:

EN 60204-1	Electrical equipment of machines, part 1
EN ISO 14121-1	Safety of machinery - Principles of risk assessment
EN ISO 12100-1,-2	Safety of machinery - Basic concepts, general principles for design
ISO 3744	Acoustic determination

7.3 Technical Data

Alfa Laval ref. 561687 Rev. 3

Maximum density	feed sediment	1100 kg/m ³ 2631 kg/m ³
Power consumption	idling running (at max. capacity) max. power consumption	0,8 kW 1,8 kW 2,8 kW (at starting-up)
Bowl speed synchronous	9512/9307	r/min. 50Hz/60Hz
Motor speed synchronous	3000/3600	r/min. 50Hz/60Hz
Gear ratio (pulleys)	130:41 (50 Hz) 106:41 (60 Hz)	
Starting time min./max. 50 Hz	2,4 - 3,2 minutes	
Starting time min./max. 60 Hz	3,3 / 4,0 minutes	
Stopping time	Running down without brake With brake	average 14 minutes min. 3, max. 4 minutes
Maximum running time without flow	Empty bowl/Filled bowl	180 minutes
Sludge volume total/efficient	0,6 / 0,2 litres	
Fixed discharge bowl volume	1,0 litres	
Discharge volume	1 litre (nominal) fixed	
Max. density of operating liquid	1000 kg/m ³	
Max. bowl inner diameter	198 mm	
Lubricating oil volume	0,5 litres	
Bowl liquid volume	1,5 litres	
Sound pressure level	69 dB(A)	
Vibration level	Separator in use	Max. 9 mm/sec
Weight	Separator without motor Motor Complete bowl	Net weight approx. 191 kg 16 kg 35 kg
Motor power	2,2 / 2,5 Kw	
Jp reduced to motor shaft, 50 Hz:	2,5 kg/m ³	
Jp reduced to motor shaft, 60 Hz:	1,7 kg/m ³	
Bowl material	AL 111 2377-02	stainless steel

NOTE

The separator is a component operating in an integrated system including a monitoring system. If the technical data in the system description does not agree with the technical data in this instruction manual, the data in the system description is the valid one.

7.4 Connection list

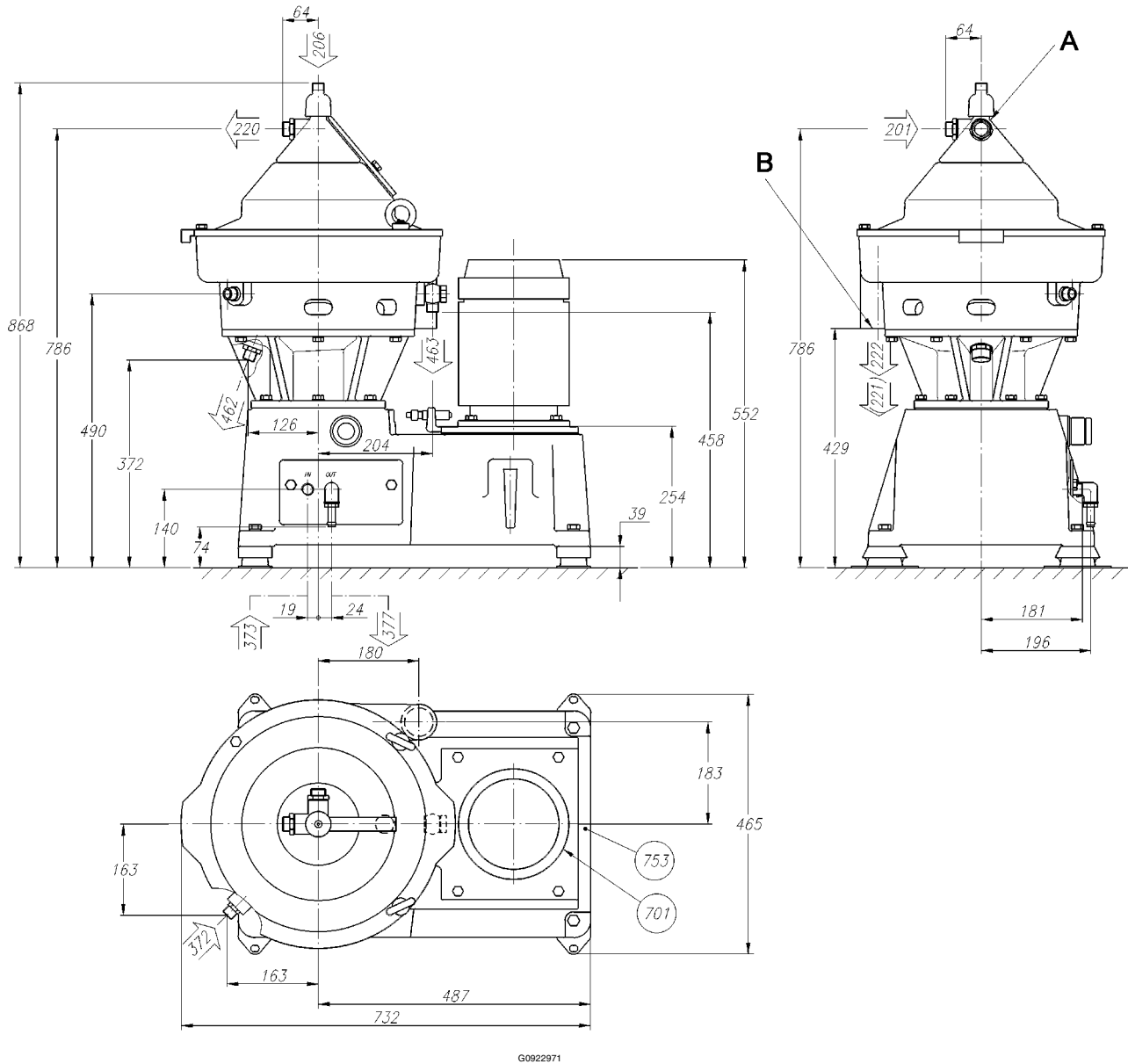
Alfa Laval ref. 561658 Rev. 1

Connection No.	Description	Requirements/limits
201	Inlet for process liquid - Flow - Pressure	See 7.11 Performance data, in- and outlet device on page 150 See 7.11 Performance data, in- and outlet device on page 150
206	Inlet for liquid seal and displacement liquid. - Quality requirements: - Flow, set value:	See 7.7 Water quality on page 145 8 litres/minute
220	Outlet for light phase, clarified liquid - Counter pressure - Capacity	See 7.11 Performance data, in- and outlet device on page 150 See 7.11 Performance data, in- and outlet device on page 150
(221)	Outlet for heavy phase	Should be possible to drain liquids by gravity.
222	Outlet for solid phase - Discharge volume:	See 7.3 Technical Data on page 133 . The outlet after the separator should be installed in such a way that you can not fill the frame top part with sludge. (Guidance of sludge pump or open outlet)
372	Inlet for discharge liquid. - Flow, set value: - Quality requirements:	18 litres/minute See 7.7 Water quality on page 145
373	Inlet for make-up liquid. - Flow, set value: - Quality requirements: - Consumption:	0,9 litres per minute See 7.7 Water quality on page 145 0,9 litres per discharge
377	Outlet for operating liquid.	Should be possible to drain liquids by gravity.
462	Drain of frame top part, lower	Should be possible to drain liquids by gravity.
463	Drain of frame top part, upper.	Should be possible to drain liquids by gravity.
701	Motor for separator - Allowed frequency variation (momentarily during 5 seconds)	± 5% ± 10%

Connection No.	Description	Requirements/limits
753	Unbalance sensors, vibration - Type: - Frequency range: - Vibration measurement range: - Internal impedance: - Reset coil voltage: - Reset coil power: - Switch rating, resistive load max.	Mechanical switch < 300 Hz < 4,5 g 4 k Ω \pm 5% 48 V DC Max. 14 W 2 A @ 24 V DC

7.5 Basic size drawing

Alfa Laval ref. 565297 Rev. 2

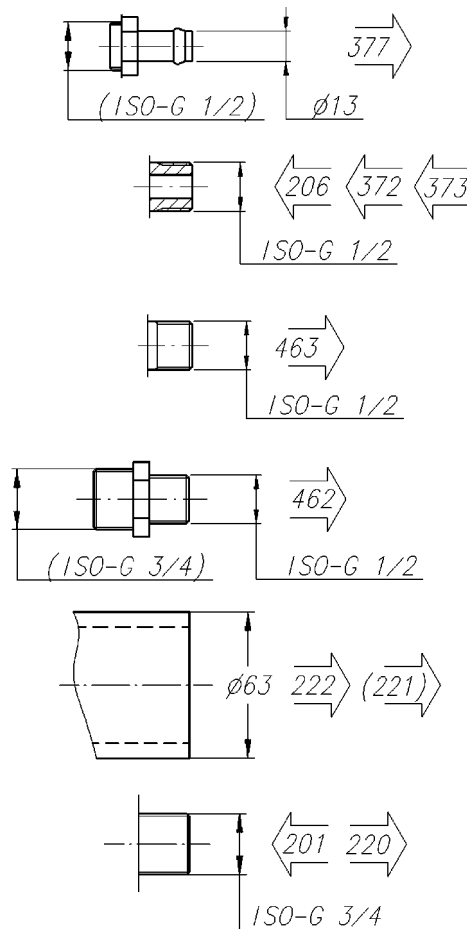


Connections 201 and 220 are turnable 90°.

- A. Maximum horizontal displacement during operation ± 20 mm.
- B. Maximum vertical displacement during operation ± 10 mm.

7.5.1 Dimensions of connections

Alfa Laval ref. 565297 Rev. 2



G0922961

All dimensions are nominal.

Reservation for individual deviations due to tolerance.

All connections to be installed non-loaded and flexible.

Data for connections see [7.4 Connection list on page 134](#).

7.6 Interface Description

Alfa Laval ref. 565810 Rev. 0

7.6.1 Scope

This document gives information, requirements, and recommendations about operational procedures and signal processing for safe and reliable operation of the separator. It is intended to be used for designing auxiliary equipment and control systems for the separator.

7.6.2 References

This Interface Description is one complementary document to the separator. Other such documents that contain necessary information and are referred to here are:

- Interconnection Diagram
- Connection List
- Technical Data
- Operating Water Interface

Standards referred to are:

- EN 418 Safety of machinery - Emergency stop equipment, functional aspects - Principles of design
- EN 1037 Safety of machinery - Prevention of unexpected start-up

7.6.3 Definitions

For the purpose of this document, the following definitions apply:

- Synchronous speed: The speed the machine will attain when it is driven by a three phase squirrel-cage induction motor and there is no slip in the motor and the drive system.
- Full speed: The synchronous speed minus normal slip.

7.6.4 Goal

To eliminate situations that can cause harm, i.e. injury, damage to health or property and unsatisfactory process result are e.g.:

Situation	Effect
Unbalance caused by uneven sediment accumulation in the bowl.	Too high stress on bowl and bearing system which might cause harm.
Too high bowl speed.	Too high stress on bowl which might cause harm.
Access to moving parts.	Can cause injury to person who accidentally touches these parts.
Insufficient cleaning of separator.	Unsatisfactory product quality.
Bowl leakage.	Product losses.

Information and instructions given in this document aim at preventing these situations.

Control and supervision can be more or less comprehensive depending on the type of used control equipment. When a simple control unit is used it would be impossible or too expensive to include many of the functions specified here while these functions could be included at nearly no extra cost when a more advanced control unit is used. For this reasons functions that are indispensable or needed for safety reasons to protect the machine and/or personnel are denoted with *shall* while other functions are denoted with *should*.

7.6.5 Description of separator modes

For control purposes the operation of the separator should be divided into different modes. The normally used modes are described below but other modes might exist. It is assumed that:

- The separator is correctly assembled.
- All connections are made according to Connection List, Interconnection Diagram and Interface Description.
- The separator control system is activated.

If above conditions are not fulfilled the separator is unready for operation.

Stand still means:

- The power to the separator motor is off
- The bowl is not rotating.

Starting means:

- The power to the separator motor is on.
- The bowl is rotating and accelerating.

Running means:

- The power to the separator motor is on.
- The bowl is rotating at full speed.
- *RUNNING* is a collective denomination for a number of sub modes which e.g. can be:
 - *STAND BY*: Separator is in a waiting mode and not producing.
 - *PRODUCTION*: Separator is fed with product and producing.
 - *CLEANING*: Separator is fed with cleaning liquids with the intention to clean the separator.

Stopping means:

- The power to the separator motor is off.
- The bowl is rotating and decelerating.
- *STOPPING* is a collective denomination for a number of sub modes which e.g. can be:
 - *NORMAL STOP*: A manually or automatically initiated stop.
 - *SAFETY STOP*: An automatically initiated stop at too high vibrations.
 - *EMERGENCY STOP*: A manually initiated stop at emergency situations. This stop will be in effect until it is manually reset.

7.6.6 Handling of connection interfaces

Electrical connections

701 Separator motor.

The separator is equipped with a 3-phase DOL (Direct On Line) started motor.

There shall be an emergency stop circuit designed according to EN 418 and a power isolation device according to EN 1037.

There shall be a start button close to the separator that shall be used for first start after assembly of the separator.

There should be a counter to count number of running hours.

There should be a current transformer to give an analogue signal to the control unit about the motor current.

753 Unbalance sensor .

For indication of any abnormal unbalance and to be able to perform appropriate countermeasures, the separator may be equipped with a vibration initiated mechanical switch on the separator frame.

The vibration monitor shall include a self-check function to be performed at least at initiation of *STARTING*.

If to high vibrations occur the separator shall be stopped the quickest way possible and it shall not be restarted until the reasons for the vibrations have been found and measures to remove them have been taken.

Signal processing in *STARTING*:

- If to high vibrations occur the separator shall be stopped automatically by *SAFETY STOP*.
- If the self-check system triggers, an alarm shall be given and an automatic stop by *NORMAL STOP* shall be initiated.

Signal processing in *RUNNING*:

- If to high vibrations occur the separator shall be stopped automatically by *SAFETY STOP*.
- If the self-check system triggers, an alarm shall be given.

Signal processing in *STOPPING*:

- If the self check system triggers, an alarm shall be given..

Signal processing in *NORMAL STOP*:

- If to high vibrations occur the system shall turn over automatically to *SAFETY STOP*.

Fluid connections

Complementary information is given in the document Connection List.

201 Inlet for process liquids (feed).

Processing in *STAND STILL*:

- Shall be closed.

Processing in *STARTING*:

- Should be closed. Bowl will be open and empty or closed and filled depending on if start is done from *STAND STILL* or *STOPPING*.

Processing in *RUNNING*:

- Could be closed or open.
- Shall be closed before a discharge. See [8.2.1 Operating water interface on page 168](#) or [8.3.1 Operating water interface on page 169](#).

Processing in *NORMAL STOP* or *EMERGENCY STOP*:

- Could be closed or open but the bowl should be filled unless the stop is initiated in *STARTING*.

Processing in *SAFETY STOP*:

- Could be closed or open but the bowl shall be filled unless the stop is initiated in *STARTING*.

206 Inlet to liquid seal.

Processing in *STAND STILL*:

- Shall be closed.

Processing in *STARTING*:

- Shall be closed.

Processing in *RUNNING*:

- Supplying a liquid seal prior to opening the feed: See Operating water interface.

- Displacing (the interface) before a discharge:
See [8.2.1 Operating water interface on page 168](#) or [8.3.1 Operating water interface on page 169](#).

220 and 221 Outlets

Processing in *STAND STILL*:

- Could be closed or open.

Processing in other modes

- Shall be open.

372 Inlet for discharge liquid.

Processing in *STAND STILL*:

- Shall be closed.

Signal processing in *STARTING*:

- Shall be closed.

Signal processing in *RUNNING*:

- A discharge is initiated according to procedure in “Operating Water Interface”.
- After a discharge has been triggered the motor current or bowl speed should be monitored to indicate if there comes a current peak or a sudden drop in speed. The absence of such a signal indicates that the discharge has failed and corrective action should be taken (e.g. trigger a new discharge). Absence of a discharge may result in problems due to solidification of the sediment. That the current returns to original value after discharge could also be supervised. If current is much higher after the discharge this might be an indication that the bowl has not closed properly after the discharge.
- For service purposes there should be a counter to count number of discharges.

373 Inlet for make-up liquid.

Processing in *STAND STILL*:

- Shall be closed.

Signal processing in *STARTING*:

- Shall be closed.

Signal processing in *RUNNING*:

- The separator bowl is closed according to procedure in “Operating Water Interface”.

- The separator bowl is closed in a discharge sequence according to procedure in “Operating Water Interface”.
- For service purposes there should be a counter to count number of discharges.

7.7 Water quality

Alfa Laval ref. 553406 Rev. 9

Operating water is used in the separator for several different functions: e.g. to operate the discharge mechanism, to lubricate and cool mechanical seals.

Poor quality of the operating water may with time cause erosion, corrosion and/or operating problem in the separator and must therefore be treated to meet certain demands.

The following requirements are of fundamental importance

1.1 Turbidity free water, solids content <0,001% by volume

Deposits must not be allowed to form in certain areas in the separator

1.2 Max. particle size 50 µm

2 Total hardness less than 180 mg CaCO₃ per litre, which corresponds to 10°dH or 12.5°E
Hard water may with time form deposits in the operating mechanism. The precipitation rate is accelerated with increased operating temperature and low discharge frequency. These effects become more severe the harder the water is.

3 Chloride content max 100 ppm NaCl (equivalent to 60 mg Cl/l)

Chloride ions contribute to corrosion on the separator surface in contact with the operating water, including the spindle. Corrosion is a process that is accelerated by increased separating temperature, low pH, and high chloride ion concentration. A chloride concentration above 60 mg/l is not recommended.

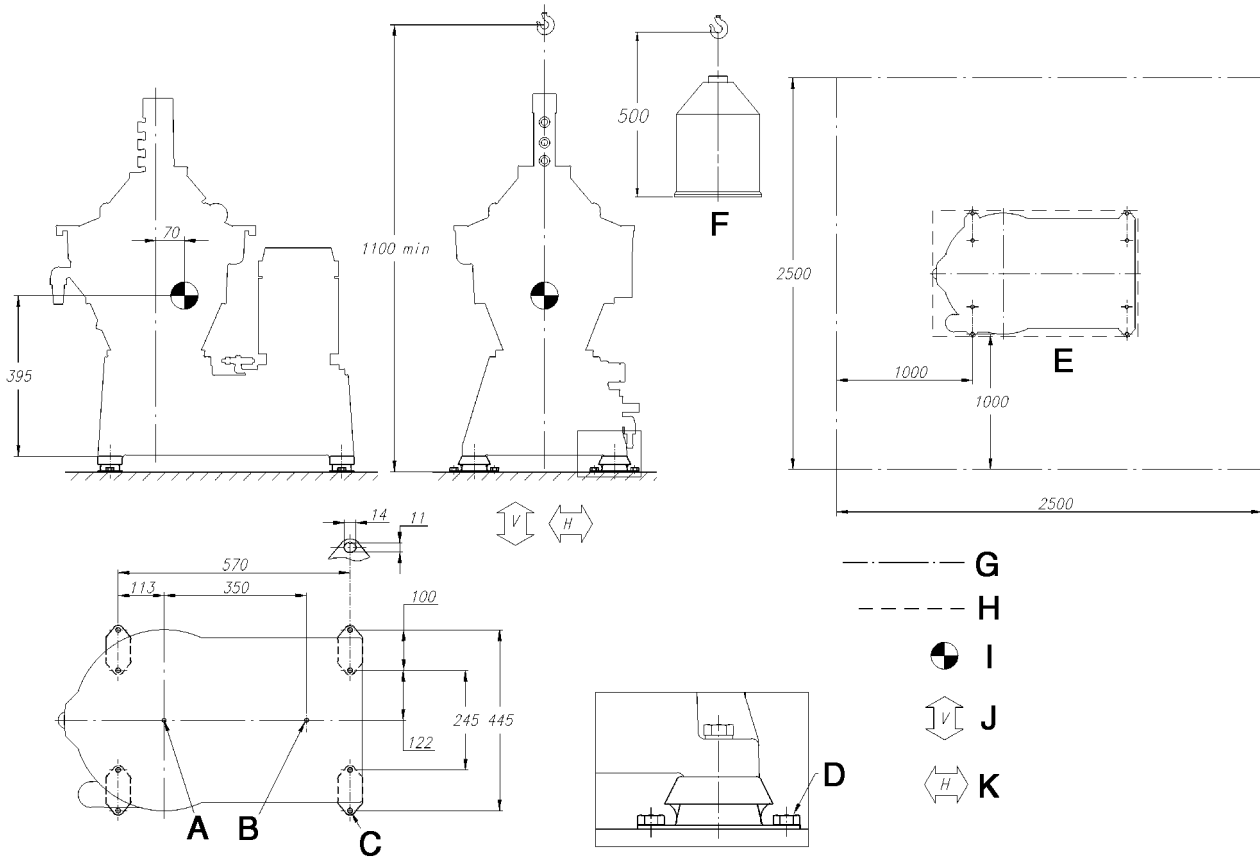
4 pH>6 Increased acidity (lower pH) increases the risk for corrosion; this is accelerated by increased temperature and high chloride ion content.

NOTE

Alfa Laval accepts no liability for consequences arising from unsatisfactory purified operating water supplied by the customer

7.8 Foundation drawing

Alfa Laval ref. 548711 Rev. 2



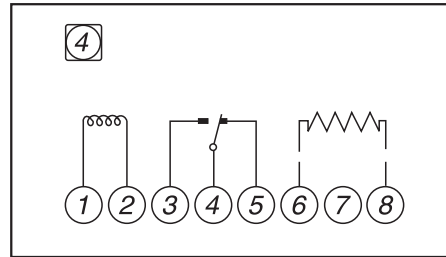
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- A. Centre of separator bowl.
- B. Center of motor
- C. 8 holes for foundation bolt
- D. Foundation bolt. Installation according to stated foundation force.
- E. Service side
- F. Max. height of largest component incl. lifting tool
- G. Recommended free floor space for unloading when doing service.
- H. No fixed installation within this area.
- I. Centre of gravity (complete machine).
- J. Vertical force not exceeding 5 kN/foot
- K. Horizontal force not exceeding 7 kN/foot.
- K. Total static load max. 4 kN

7.9 Interconnection diagram

Alfa Laval ref. 561723 Rev. 0

1	Reset Coil
2	
3	NO
4	Common
5	NC
6	Heater
7	
8	



753

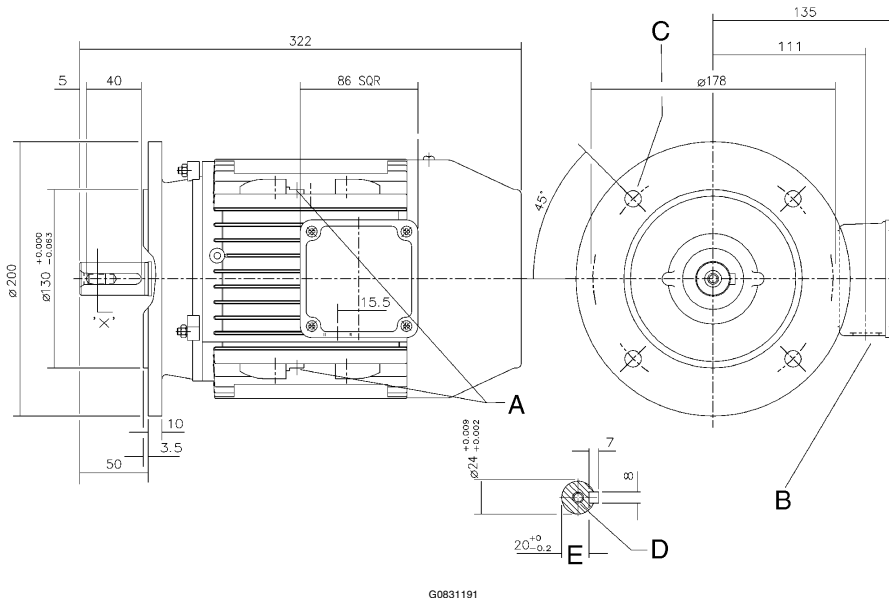
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Vibration sensor (mechanical switch)

7.10 Electric motor


7.10.1 Crompton Greaves

Alfa Laval ref. 585146 Rev. 3



- A. M5 external earth
- B. $\varnothing 20$ conduit entry
- C. 4 holes drilled $\varnothing 12$ on a 165 P.C.D. equi-spaced as shown.
- D. Hole tapped M8x19 deep. To DIN 332 form D
- E. View on "X"

Manufacturer:	Crompton Greaves Ltd.
Manuf. drawing:	Cat. Crompton Greaves Ltd TEFC, SCR
Standards:	IEC 34-series, 72, 79 and 85
Size:	IEC 90
Type:	GD 90
Weight:	16 kg
Poles:	2
Insulation class:	F
Bearings:	D-end 6205-ZZ N-end 6203-ZZ
Method of cooling:	IC 411 (IEC 34-6)
Spec:	Totally enclosed three-phase motor for marine service.

Type of mounting		Degree of protection
IEC 34-7		IEC 34-5
 G0541421	IM 3011	IP 55

The rotor balanced with half key, max vibration velocity 1,8 mm/s (rms)

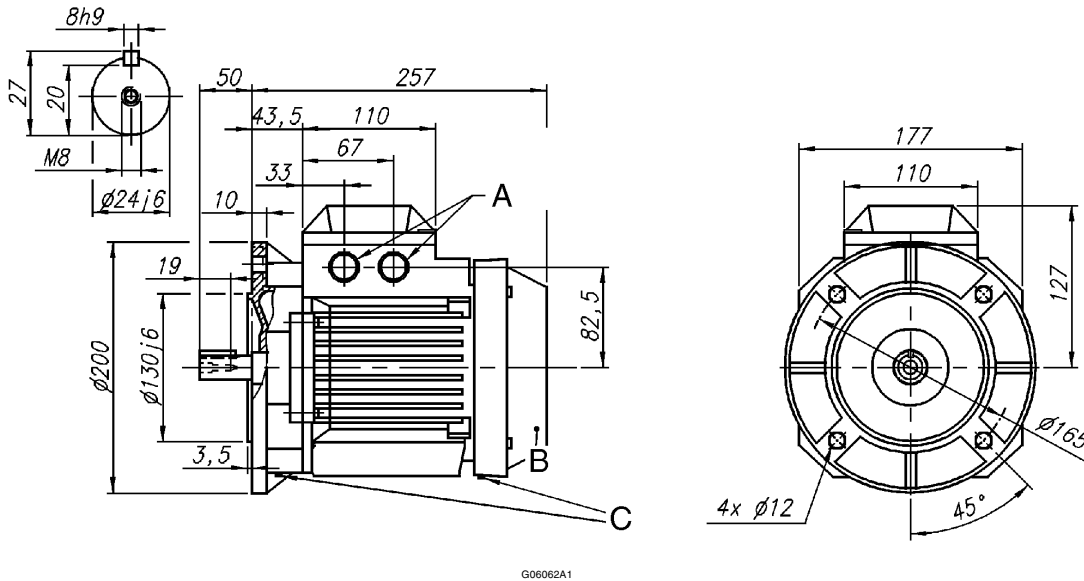
Max. vibration velocity 1,8 mm/s (rms) according to IEC 34-14.
The motor bearings are permanently lubricated.

NOTE

For complete information about motor variants, please contact your Alfa Laval representative.


7.10.2 ABB

Alfa Laval ref. 552807 Rev. 7



- A. Knock out openings for cable glands on both sides 2 x M25
- B. Sheet-steel fan hood
- C. Drain holes with closable plugs to be positioned at lowest point for IM 3011 mounting position.

Manufacturer: ABB Motors
Manuf. drawing: CAT. BA/Marine motors GB 98-05
Standards: IEC 34-series, 72, 79 and 85
Size: 90 L
Type: M2AMA 90L
Weight: 16 kg
Poles: 2
Insulation class: F
Bearings: D-end 6305-2Z/C3
 N-end 6204- 2Z/C3
Method of cooling: IC 411 (IEC 34-6)
Spec: Totally enclosed three-phase motor for marine service.

Type of mounting		Degree of protection
IEC 34-7		IEC 34-5
	IM 30011	IP 55

The rotor balanced with half key, max vibration velocity 1,8 mm/s (rms)
 Max. vibration velocity 1,8 mm/s (rms) according to IEC 34-14.
 The motor bearings are permanently lubricated.

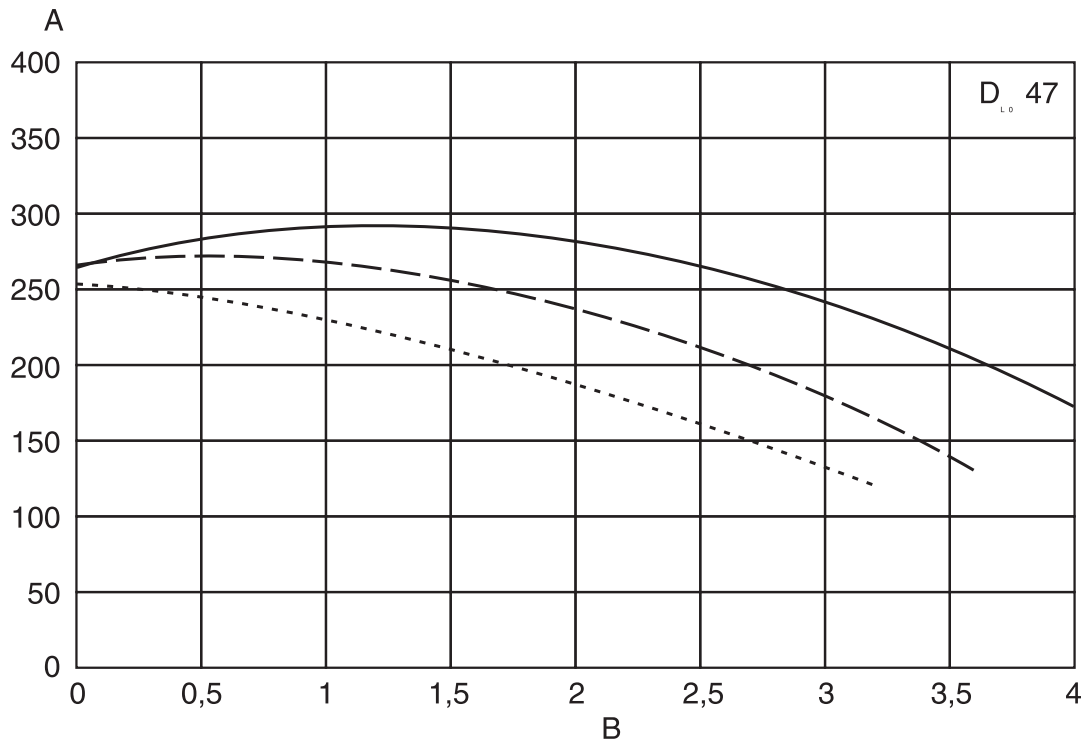
NOTE

For complete information about motor variants, please contact your Alfa Laval representative.

7.11 Performance data, in- and outlet device

Alfa Laval ref. 565805 Rev. 0

Maximum light phase counter pressure as a function of throughput and viscosity:



g0931721

A. Max. light phase counter pressure, kPa

B. Light phase throughput, m³/h

10 cSt

—————

30 cSt

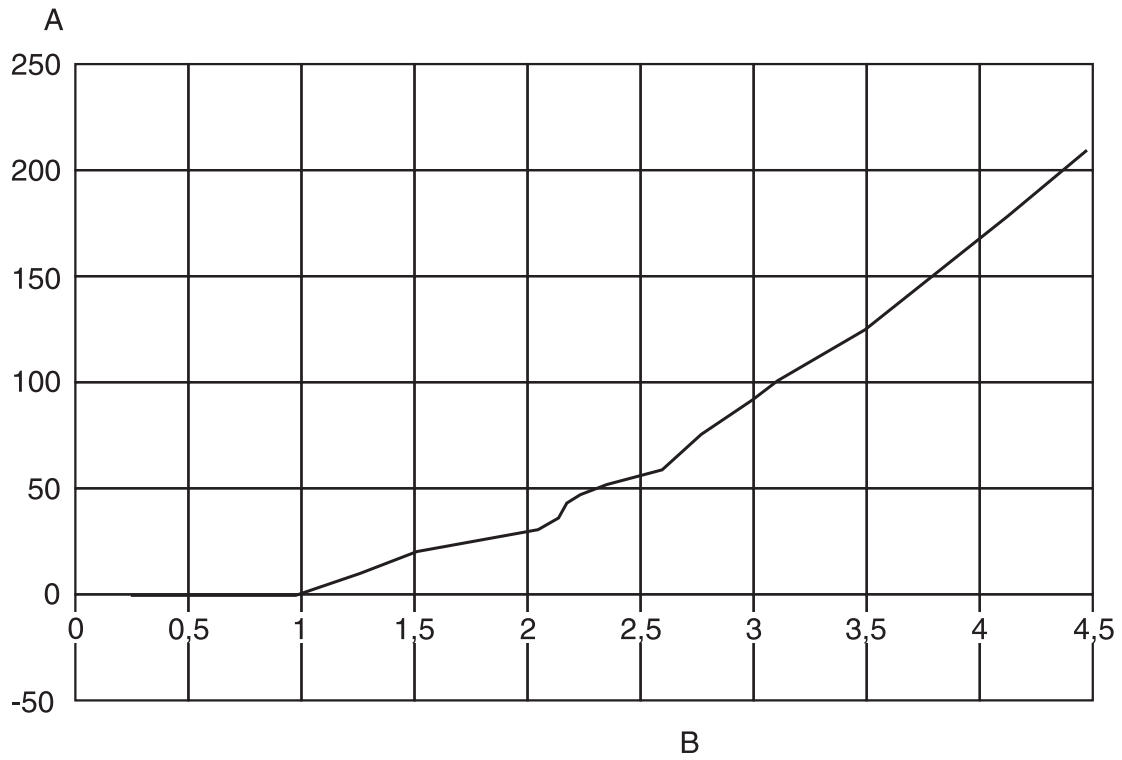
- - - - -

48 cSt

.....

Alfa Laval ref. 565805 Rev. 0

Inlet pressure as a function of throughput and viscosity



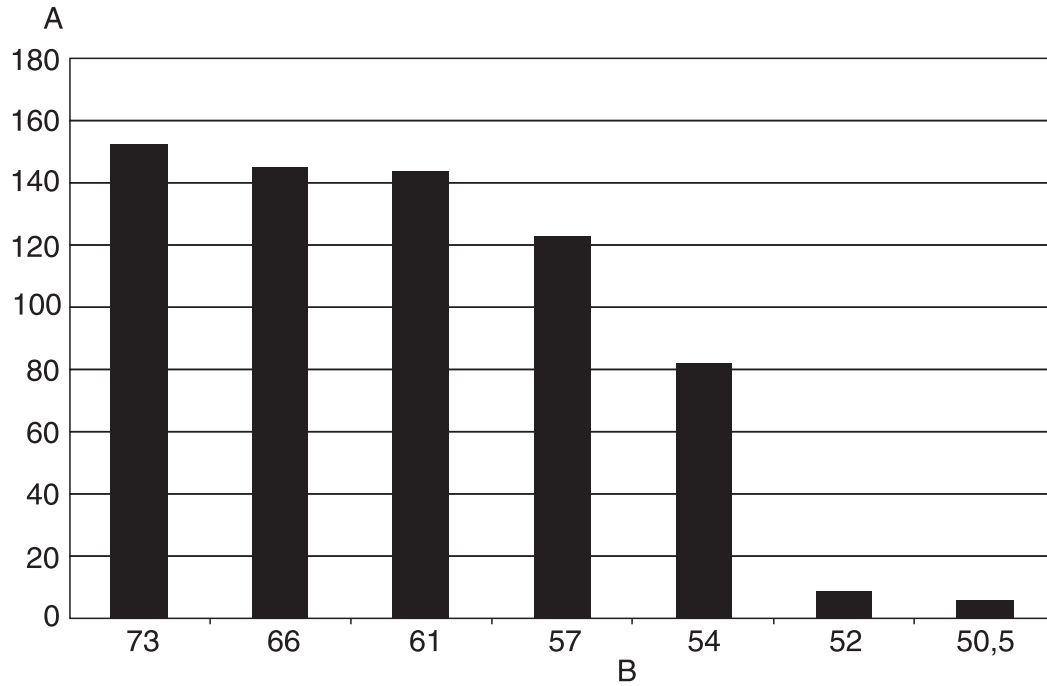
g0831731

- A. Pressure kPa
- B. Throughput m³/h

Alfa Laval ref. 565805 Rev. 0

Maximum heavy capacity as a function of gravity disc:

Only for Emergency Operation

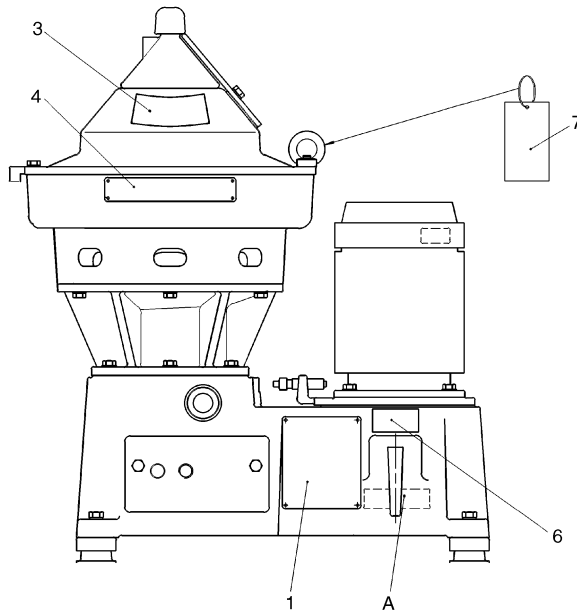


g0931741

A. litres/hour
B. Gravity disc

7.12 Machine plates and safety labels

Alfa Laval ref. 556430 Rev. 3



G0635141

1. Machine plate

Separator type

Serial No / Year

Product No

Main group no

Configuration no

Designation

Max allowed speed (bowl)

Direction of rotation (bowl)

Speed motor shaft

El. current frequency

Recommended motor power

Max. density of feed

Max. density of sediment

Max. density of operating liquid

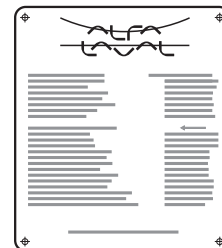
Process temperature min./max.

Inside diameter of bowl body

Manufacturer

Service enquiries

www.alfalaval.com



3. Safety label

Text on label:

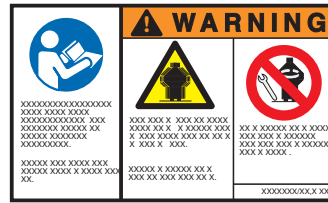
Warning

Read the instruction manuals **before** installation, operation and maintenance. Consider inspection intervals.

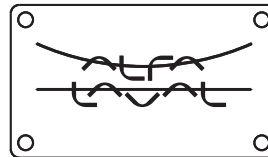
Failure to strictly follow instructions can lead to fatal injury.

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

Out of balance vibration will become worse if bowl is not full.



4. Name plate

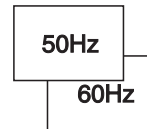


5. Arrow

Indicating direction of rotation.



7. Power supply frequency

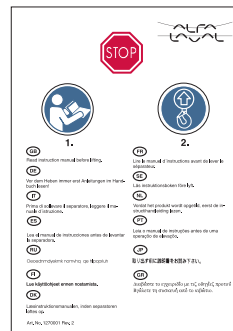


8. Lifting instructions

Text on label:

Read instruction manual before lifting.

*** Space reserved for plate indicating representative**



7.13 Storage an Installation

7.13.1 Introduction

These installation specifications are valid for the separator.

The installation instructions are specifications, which are compulsory requirements.

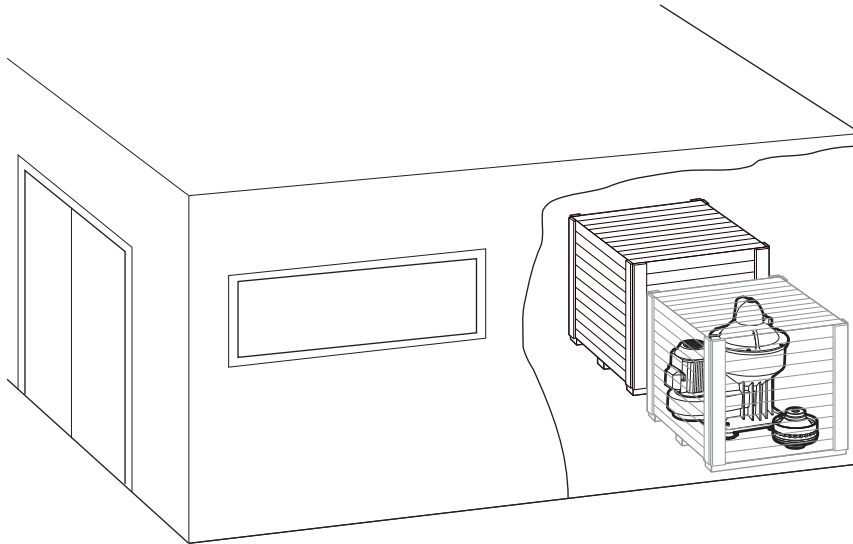
Any specific requirements from classification societies or other local authorities must be followed

**NOTE**

If the specifications are not followed, Alfa Laval can not be held responsible for any malfunctions related to the installation.

7.13.2 Protection and storage of goods

1. The separator must be stored indoors at 5 - 55 °C, if not delivered in a water-resistant box, designated for outdoor storage.



G08736B1

2. If there is a risk for water condensation, the equipment must stand well ventilated and at a temperature above dew point.
3. If the storage time exceeds 12 months, the equipment must be inspected every 6 months and, if necessary, the protection be renewed.

The following protection products are recommended:

1. Anti-rust oil (Dinitrol 112 or equivalent) with long lasting effective treatment for external surfaces. The oil should prevent corrosion attacks and leaves a waxy surface.
2. Anti-rust oil (Dinitrol 40 or equivalent) is a thin lubricant for inside protection. It gives a lubricating transparent oil film.
3. Solvent, e.g. white spirit, to remove the anti-rust oil after the storage period.
4. Moist remover to be packed together with the separator equipment.

7.13.3 Storage at out of operation

If the separator is out of operation for more than **1 month**:

1. Lift out the bowl.
2. Protect the spindle taper from corrosion by lubricating it with oil.
3. Keep the separator and bowl well stored, dry and protected from mechanical damage.

For details see [7.13.2 Protection and storage of goods on page 157](#)

7.13.4 Before start-up

If the separator has been out of operation for:

1 months or longer

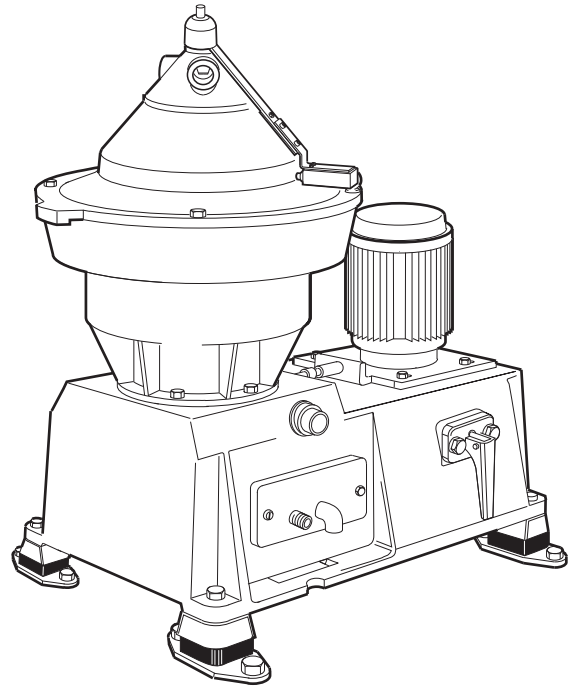
- Pre-lubricate the spindle bearings.

6 months or longer

- Perform an Intermediate service and make sure to pre-lubricate the spindle bearings.
- Change the oil before starting.

18 months or longer

- Perform an Major service and make sure to pre-lubricate the spindle bearings.
- Change the oil before starting.



G0464881

7.13.5 Connections to surrounding equipment

Local safety regulations

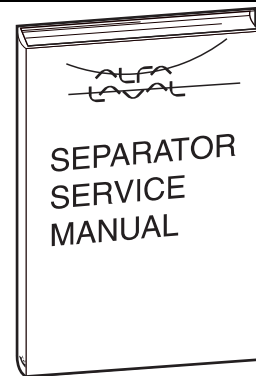
If the local safety regulations prescribe that the installation has to be inspected and approved by responsible authorities before the plant is put into service, consult with such authorities before installing the equipment and have the projected plant design approved by them.



G0873911

Service media

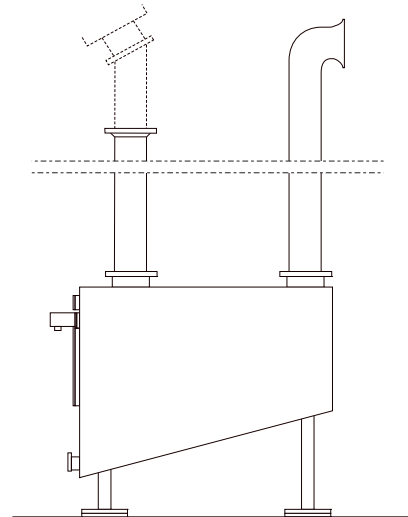
Ensure that all service media (electric power, operating and safety liquids etc.) required for the separator have the correct quality and capacity.



G0874021

Sludge discharge tank

If the sediment from the separator is discharged into a tank, this tank must be sufficiently ventilated. The connection between the separator and the tank must be of the size and configuration specified. If the solids are discharged from the separator bowl casing into a closed system, ensure that this system cannot be overfilled or closed in such a way that the solids cannot leave the bowl casing. This could cause a hazardous situation.



G0874311

Valves, Pipes and Similar Equipment

- Components like valves need to be cleaned with solvent and treated with anti-rust oil (type 112).
- Water pipes should be drained and treated with anti-rust oil (type 112).
- Articles made of rubber or plastics (e.g. seals) must not be treated with anti-rust oil.

7.13.6 Reassembly and Start up

- Clean away the anti-rust oil with white spirit.
- Remove the silica gel bags from all units.
- Follow all relevant instructions in the Service Manual and Operating Instructions.

7.13.7 Storage and transport of goods

Storage

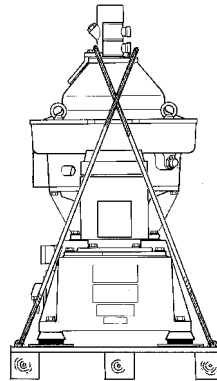
Specification

Upon arrival to the store, **check all components and keep them:**

- A. Well stored and protected from mechanical damage.
- B. Dry and protected from rain and humidity.
- C. Organized in the store in such a way that the goods will be easily accessible when installation is about to take place.

A separator can be delivered with different types of protection:

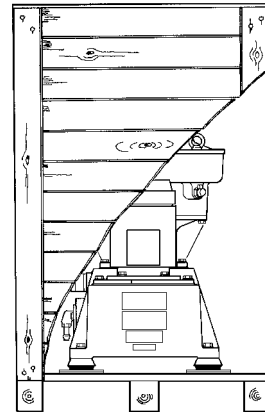
- Fixed on a pallet.
The separator must be stored in a storage room well protected from mechanical damage as well as from rain and humidity.



G0057111

Fixed on a pallet

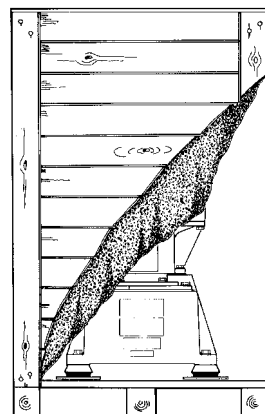
- In a wooden box which is not water tight.
The separator must be stored dry and protected from rain and humidity.



G0057211

In a wooden box which is not water tight

- In a special water-resistant box for outdoor storage.
The separator and its parts have been treated with an anti-corrosion agent. Once the box has been opened, store dry and protected from rain and humidity.
The packaging for outdoor storage is only to special order.



G0057311

In a special water-resistant box for outdoor storage

Transport

Specification

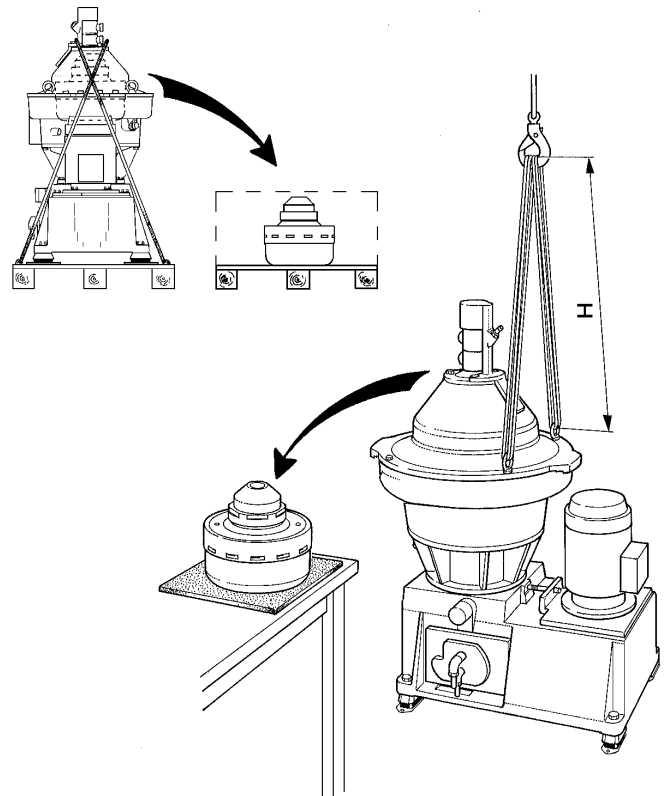
- During transport of the separator, the frame hood and bowl **must always be removed from the machine.**
- When lifting a separator it must always be **hung securely.** See chapter [Lifting instructions on page 52.](#)



Crush hazards

Use correct lifting tools and follow lifting instructions.

- During erection, all inlets and outlets to separators and accessories must be covered to be protected from dirt and dust.



G0057581

H = minimum 750 mm

7.13.8 Planning of installation

Space for separator

The separator shall be placed in such a way that suitable space for maintenance and repair is obtained.

The space required for one or more separators can be calculated by consulting the drawings in the chapters [Basic size drawing on page 136](#), [Foundation drawing on page 146](#) and instructions for ancillary equipment, electrical and electronic equipment and cables.



G0020611

Check the drawings when planning the installation

Specification

- See chapter [Foundation drawing on page 146](#) for the service space required with the separator installed. The spanner for the large lock ring should have sufficient space to make a complete turn without touching any of the ancillary equipment surrounding the separator.

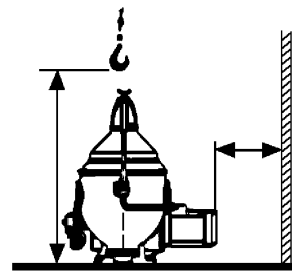
Recommendation

- The spanner for the large lock ring should have sufficient space to make a complete turn without touching any of the ancillary equipment surrounding the separator.

Important measurements

Important measurements are the minimum lifting height for lifting tackle, shortest distance between driving motor and wall, free passage for dismantling and assembly, maintenance and operation.

Plan your installation with sufficient room for the controls and operation so that instruments are easily visible. Valves and controls must be within convenient reach. Pay attention to space requirements for maintenance work, work benches, dismantled machine parts or for a service trolley.



G0020721

Lifting height for transport of bowl*Specification*

- A minimum height is required to lift the bowl, bowl parts and the bowl spindle, see chapter [Foundation drawing on page 146](#).

Recommendation

- When two or more separators are installed it is recommended to plan the installation in such a way that parts from one separator do not have to be lifted over another separator.

Space for oil changing*Specification*

- The plug for gearbox oil draining must not be blocked by floor plate arrangement, etc.

Recommendation

- It should be possible to place a portable collecting tray under the gearbox drain plug for changing oil.

7.13.9 Foundations

NOTE

When lifting a separator it must always be **hung securely**. See chapter [Lifting instructions on page 52](#).

- See [7.8 Foundation drawing on page 146](#).
- The separator must be installed on a strong and rigid foundation to reduce the influence of vibrations from adjacent machinery.
- The foundation should be provided with a cofferdam.
- Fit the separator frame on the foundation as follows:
 - Check that the bolts do not press against the edges of the holes, otherwise the elasticity of the mounting of the separator frame will be impeded.
 - Fit height adjusting washers required.
 - Check that the separator frame is horizontal and that all feet rest on the foundation.
 - Tighten the screws.

8 *Operating*

8.1 Operating routine

These operating instructions describe routine procedures to be followed before and during the start, running, and stopping sequences of the separator.

If system documentation is available, always follow the operating instructions therein. If there is no system documentation, the instructions below are to be followed.

8.2 Clarifier Operation

8.2.1 Operating water interface

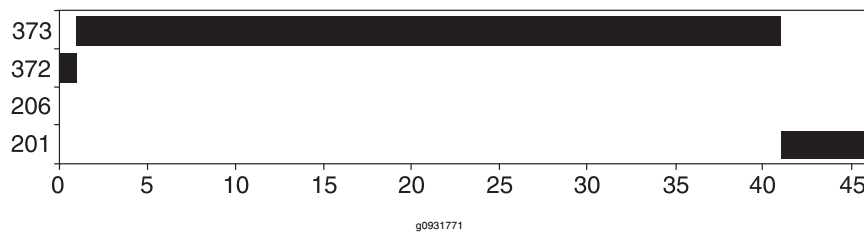
Alfa Laval ref. 565849 Rev. 1

Proposed operation of operating water interface.

Closing the bowl:

1. Initialise by opening connection 372 for 1 second.
2. Close the bowl by opening connection 373 for 40 seconds.
3. Open the feed (connection 201).

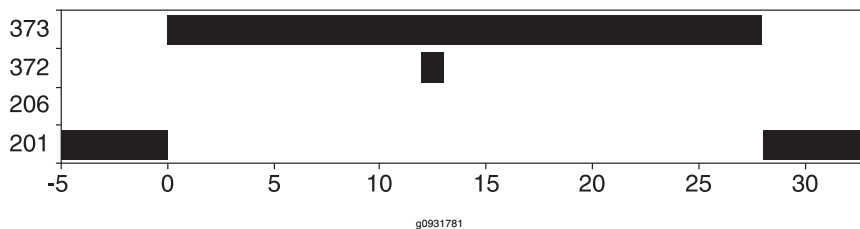
Starting sequence illustrated graphically:



Performing a discharge:

1. Close the feed (connection 201).
2. Open connection 373.
3. After 12 seconds open connection 372 during 1 second.
4. After another 15 seconds close connection 373.
5. Open the feed (connection 201).

Starting sequence illustrated graphically:



During the separating process the make-up water supply volume is maintained by opening connection 373 for 2 seconds every 15 minutes.

8.3 Purifier Operation

8.3.1 Operating water interface

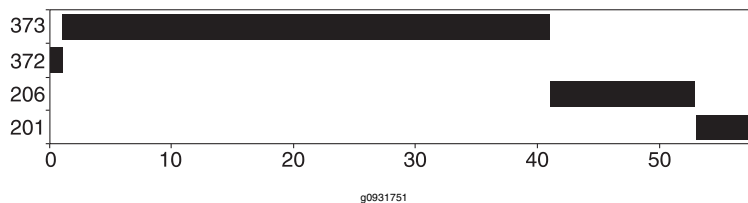
Alfa Laval ref. 565819 Rev. 0

Proposed operation of operating water interface for purifier execution.

Closing the bowl and supplying liquid seal:

1. Initialise by opening connection 372 for 1 second.
2. Close the bowl by opening connection 373 for 40 seconds.
3. Supply liquid seal by opening connection 206 for 12 seconds.
4. Open the feed (connection 201).

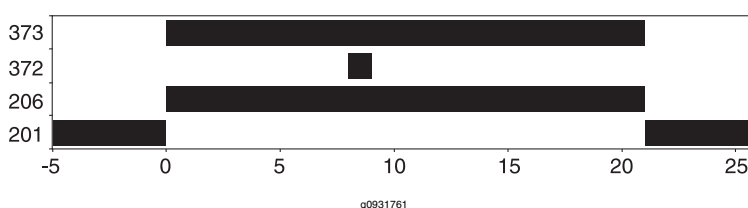
Starting sequence illustrated graphically:



Performing a discharge:

1. Close the feed (connection 201).
2. Open connection 373 and perform a displacement (of the interface) by opening connection 206.
3. After 8 seconds open connection 372 during 1 second.
4. After another 12 seconds close connections 206 and 373.
5. Open the feed (connection 201).

Starting sequence illustrated graphically:



8.3.2 Selection of gravity disc

The separator is delivered with a set of gravity discs with different diameters for purification operation. The hole diameter of the gravity disc sets the position of the oil/water interface in the separator. The separation efficiency can be optimized by selection of the correct diameter for each oil quality.

As a guide the Gravity disc nomogram can be used. The size of the first gravity disc to be tried can be read directly from the nomogram.

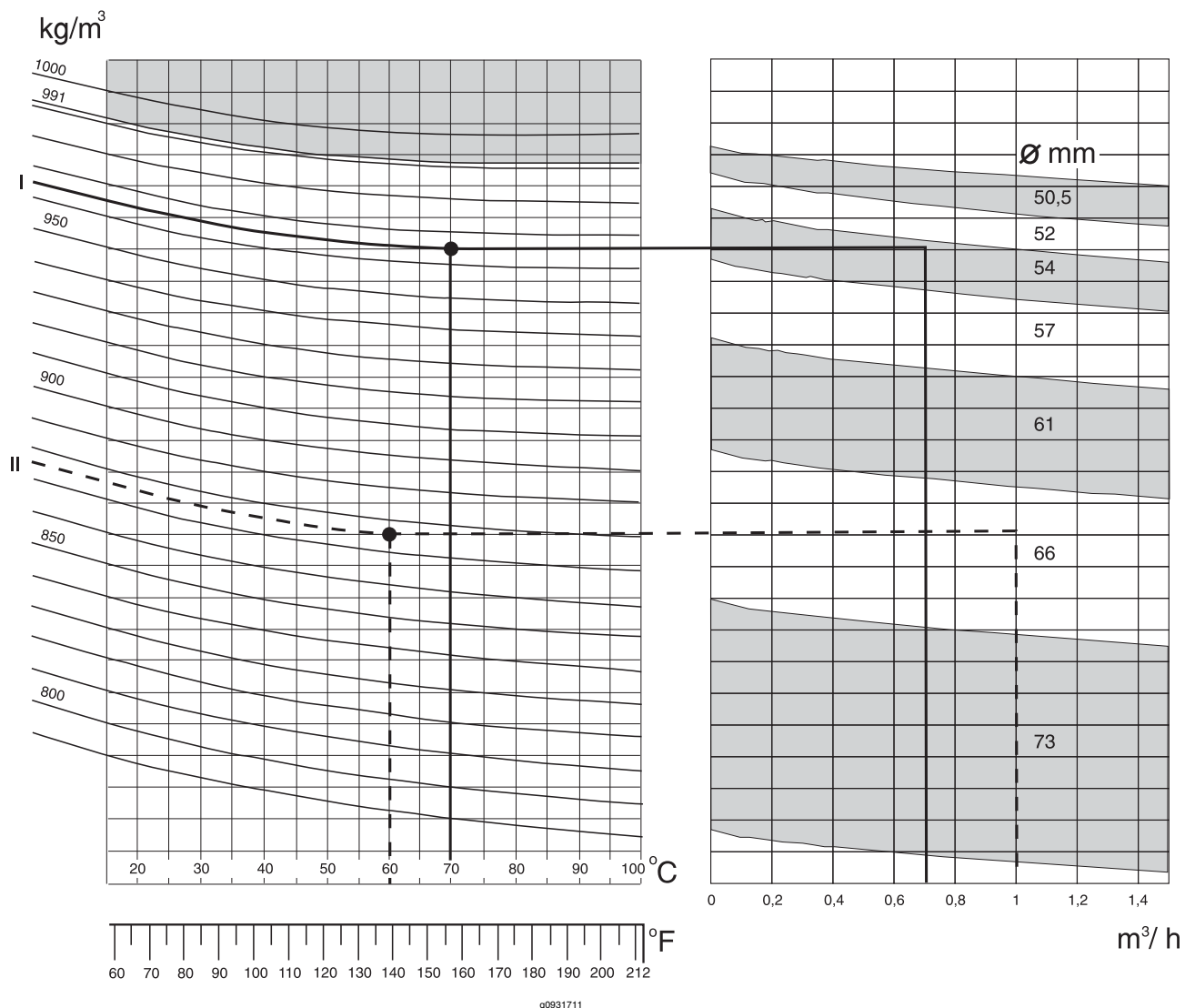
The best separation results are obtained by using a gravity disc with as large size as possible, which will not cause a broken water seal in the bowl or an emulsification in the water outlet.

The presence of salt water in the oil may demand the use of a gravity disc with bigger hole than indicated in the nomogram. The nomogram is based on the properties of fresh water in the oil.

For operating the separator as a clarifier the diameter of the disc should be 40 mm.

8.3.3 Gravity disc nomogram

Alfa Laval ref. 565798 Rev. 0



Oil density, kg/m³ at 15 °C
 Oil temperature, °C, °F
 Gravity disc hole diameter, • mm
 Throughput, m³/h

The nomogram is based on the properties of fresh water.

Example I in nomogram		Example II in nomogram	
Reference in graph:	Reference in graph:
Oil density	965 kg/m ³ at 15 °C (60 °F)	Oil density	875 kg/m ³ at 15 °C (60 °F)
Separation temperature	70 °C (158 °F)	Separation temperature	60 °C (140 °F)
Throughput	0,7 m ³ /h	Throughput	1 m ³ /h
From the graphs (heavy line), the correct gravity disc has a hole diameter of 54 mm.		From the graphs (broken line), the correct gravity disc has a hole diameter of 66 mm.	

8.4 Before first Start

Technical demands for connections and logical limitations for separator are listed in chapter "Technical Reference".

1. Ensure that the separator is correctly installed and that feed lines and drains have been flushed clean.



Breakdown hazard

Assemble the separator completely before start. All couplings, covers, and guards must be in place and properly tightened. Non compliance may lead to breakdown.



Electrical hazard

Follow local regulations for electrical installation and earthing (grounding).

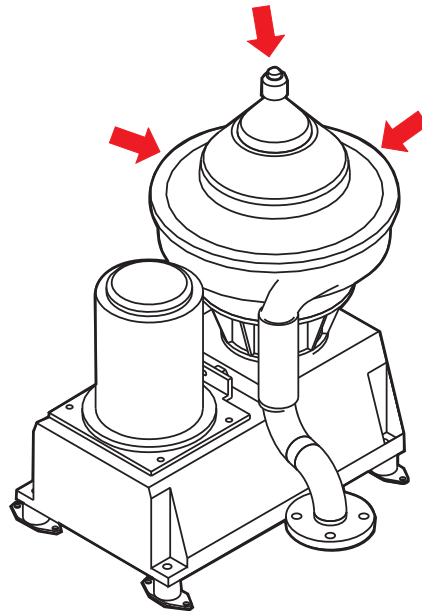


Breakdown hazard

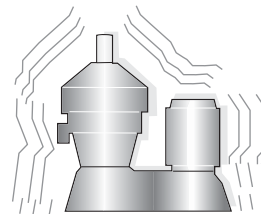
Check that the power frequency is in agreement with the machine plate. If incorrect, resulting overspeed may cause breakdown.



Use the separation system for the purpose, and within the limits, specified by Alfa Laval. Failure to do so could cause a violent breakdown.



P003595B



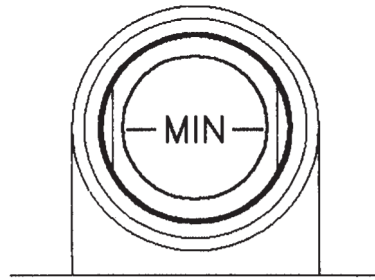
P003992A

50 Hz? 60 Hz?

2. Check the oil sump level. Top up if necessary.
 - The oil level should be slightly above middle of the sight glass.



Too much or too little oil can damage the separator bearings.



G0868543

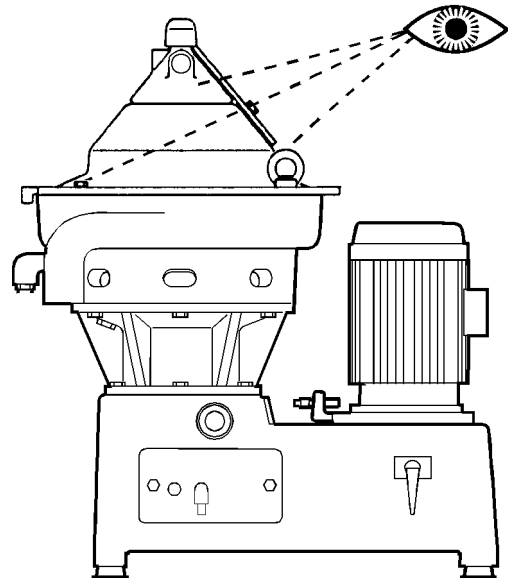
8.5 Start after a service

Pay special attention to unusual conditions when starting the separator after a service.

8.5.1 Before normal start

Check these points before every start.

1. Make sure that the bowl is clean and that the separator is properly assembled.
2. Make sure that the bolts of the outlet cover and the frame hood are fully tightened.



G0465431

Check assembly and tightenings

3. Make sure that all couplings and connections are securely tightened to prevent leakage.

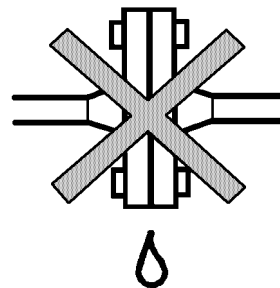
NOTE

Slip hazard

Check all connections for leakage.

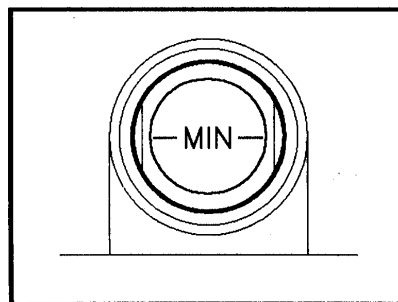
Oil leakage may make the floor slippery.

4. Make sure that the inlet pipe is tightened.



Check for leakages (not admitted)

5. Read the oil level. The line in the middle of the sight glass shows the minimum level. Refill if necessary. For grade and quality of oil see [5.9 Lubricants on page 59](#).



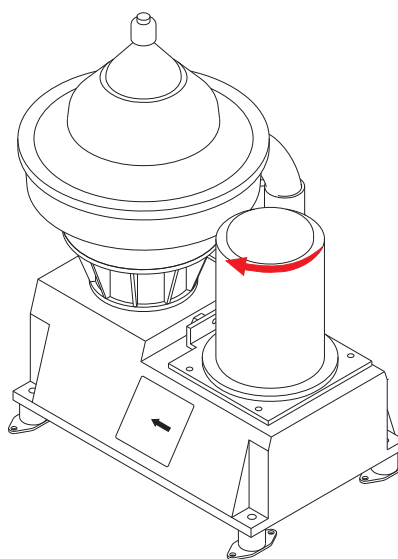
Check the oil level

Rotation Direction

Check the rotation of the bowl by doing a quick start/stop. The motor fan must rotate in a clockwise direction.



If power cable polarity has been reversed, the separator will rotate in reverse, and vital rotating parts can loosen.



P003596B



Disintegration hazards

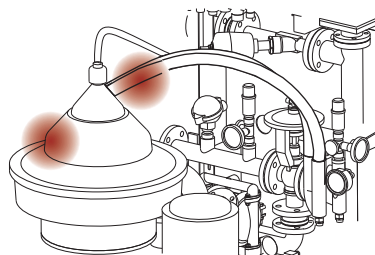
After change of feed the sludge discharge interval must be adjusted.

Too long intervals between discharges can result in breakdown.



Burn hazard

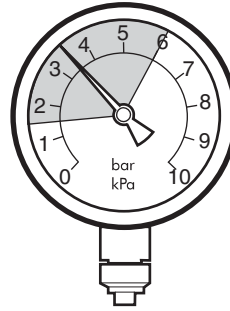
Avoid contact with hot surfaces. Process pipes, various machine surfaces, and processed liquid can be hot and cause burns.



P004073C

8.5.2 Starting and running-up procedure

1. Open the water supply valve(s). Make sure that the water supply is on 150-600 kPa (1,5-6 bar).



Water supply

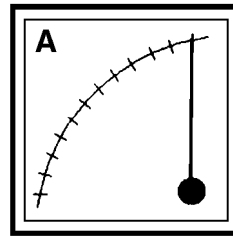
2. Start the separator.
3. Be alert for unusual noises and conditions.
4. Note the normal occurrence of critical speed periods. Some vibrations occur for short periods during the starting cycle, when the separator passes through its critical speeds. This is normal and passes over without danger. Try to learn the vibration characteristics of the critical speed pattern.



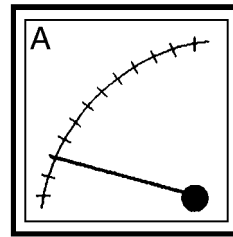
Disintegration hazards

When excessive vibration occurs, keep bowl filled and stop separator. The cause of the vibration must be identified and rectified before the separator is restarted. Excessive vibration may be due to incorrect assembly or insufficient cleaning of the bowl.

5. Check the current to the separator motor to ensure that the separator has reached full speed: During start, the current reaches a peak and then slowly drops to a low and stable value. For normal length of the start-up period see [7.3 Technical Data on page 133](#).



Current increases during start...



... to decrease to a stable value when full speed has been reached

6. For **purification**:
- Supply water to form the water-seal. The water should have the same temperature as the process liquid.
 - Close the water feed when water flows out through the water outlet.
 - Start the oil feed slowly to avoid breaking the water seal.
7. For **clarification**:
- Start the oil feed with full flow.
8. For both **purification** and **clarification** modes:
- Check the separator inlet and outlet pressures. See recommended values in your system documentation.
9. Adjust to desired throughput.

8.5.3 Separation

Do regular checks on:

- oil inlet temperature (if applicable)
- water collecting tank level (if applicable)
- sound/vibration of the separator
- back pressure
- motor current

8.5.4 Stopping procedure

1. Turn off the oil feed.
2. Feed displacement water until water flows out through the water outlet. Then close this feed.
3. Stop the separator.
4. Wait until the separator has come to a complete standstill.

Remove the safety device and look through the slot in the frame hood to see the movement of the bowl.

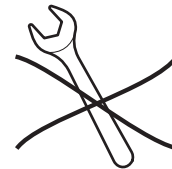
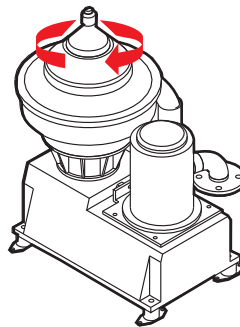
Separator standstill

Dismantling work must not be started before all rotating parts have come to a complete standstill.



Entrapment hazard

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



100293CB

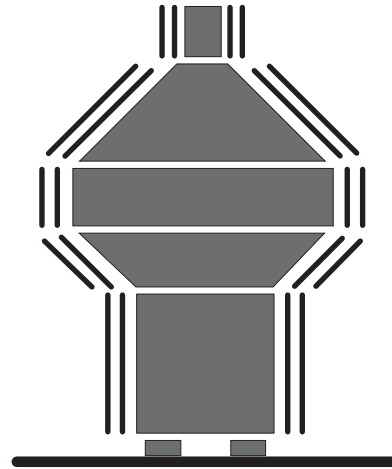
8.5.5 Safety stop

If the separator begins to vibrate excessively during operation, stop it immediately by pushing the safety stop. The separator motor is switched off.

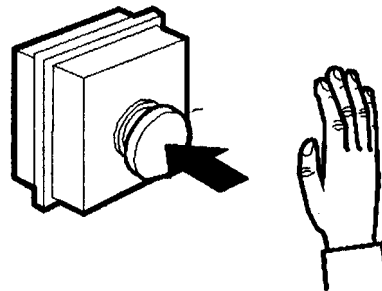
- Keep the bowl filled during the run-down to minimize the excessive vibration.
- **Evacuate the room.** The separator may be hazardous when passing its critical speeds during the run-down.



Disintegration hazards
Never discharge a vibrating separator.



Hazard!



Push the safety stop!

8.6 After Safety Stop

Separator standstill

Dismantling work must not be started before all rotating parts have come to a complete standstill.



Entrapment hazard

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

Avoid accidental start



Entrapment hazard

To avoid accidental start, switch off and lock power supply before starting any dismantling work. Make sure that separator has come to a complete standstill before starting any dismantling work.

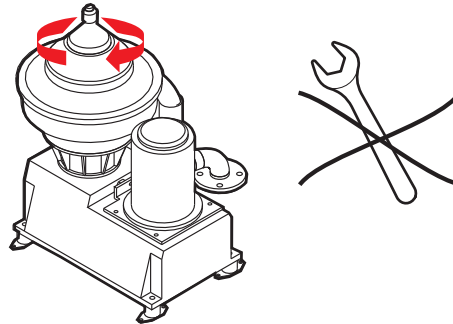
Remedy the cause

The cause of the emergency must be remedied before attempting to restart the separator. If the cause is not found, an overhaul must be performed on the separator, and all moving parts thoroughly checked.



Disintegration hazard

Do not start the separator after an emergency stop without first remedying the cause of the emergency. Make sure that the bowl is clean before restart.



100283CB

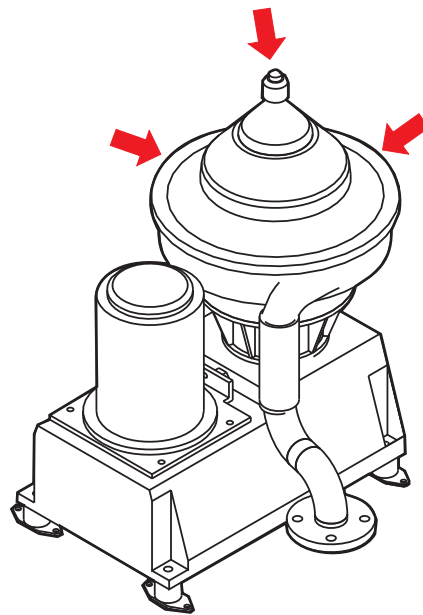
Separator reassembled

The separator must be fully reassembled with all covers and guards in place and tightened before unlocking the power supply and starting the system.



Breakdown hazard

Assemble the separator completely before restart. All couplings, covers, and guards must be in place and properly tightened. Non compliance may lead to breakdown.



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