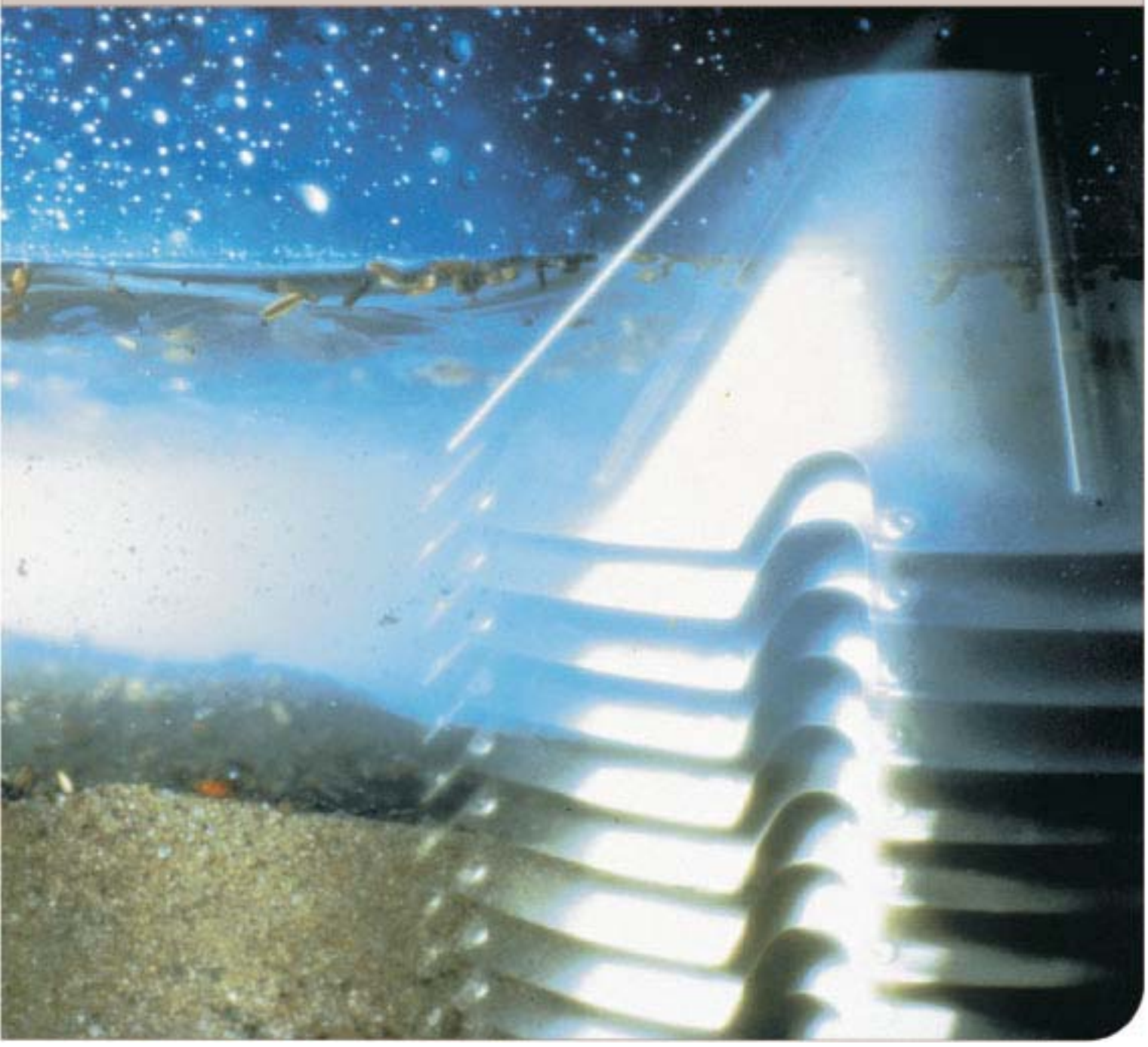
Instruction book

High Speed Separator

MAB 102B-14



Product No. 881134-01-03/ 2
Book No. 575884-02 Rev. 2

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Contents

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

Not following the instructions can result in serious accidents.

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

1 Read this first

This manual is designed for operators and service engineers working with the Alfa Laval separator MAB 102B-14.

For information concerning the function of the separator, see “3 Separator Basics” on page 17, and “4 Operating Instructions” on page 29.

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

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

Separator Manual and Spare Parts Catalogue

This Separator Manual consists of:

Safety Instructions

Pay special attention to the safety instructions for the separator. Not following the safety instructions can cause accidents resulting in damage to equipment and serious injury to personnel.

Separator Basics

Read this chapter if you are not familiar with this type of separator.

Operating Instructions

This chapter contains operating instructions for the separator only.

Service Instructions

This chapter gives instructions for daily checks, cleaning, oil changes, servicing and check points.

Dismantling / Assembly

This chapter contains step-by-step instructions for dismantling and assembly of the separator for service and repair.

Trouble-tracing

Refer to this chapter if the separator functions abnormally.

If the separator has been installed as part of a processing system always refer to the Trouble-tracing part of the System Manual first.

Technical Reference

This chapter contains technical data concerning the separator and drawings.

Installation

General information on installation planning.

Lifting instruction.

Index

This chapter contains an alphabetical list of subjects, with page references.

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

G0010421

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.**

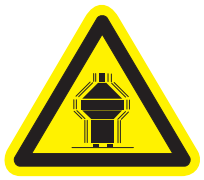
S0151211

Disintegration hazards

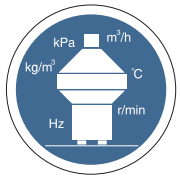
- When power cables are connected, always check direction of motor rotation. If incorrect, vital rotating parts could unscrew.


S01512F1

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

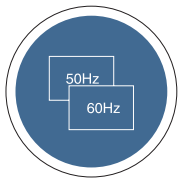

S01512N1

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



S01512P1

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

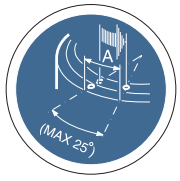


S01512L1

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

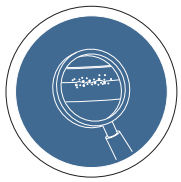

S0151241

- 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.



S01512G1

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


S01512H1

Entrapment hazards

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

S01512O1

- 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.

S0151261

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.

S0151271

Crush hazards

- Use correct lifting tools and follow lifting instructions.

S01512M1

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

S01512Y1

Noise hazards

- Use ear protection in noisy environments.

S0151291

Burn hazards

- Lubrication oil and various machine surfaces can be hot and cause burns.

S01512A1

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.

S01512D1

Cut hazards

- Sharp edges on bowl discs and threads can cause cuts.

S01512B1

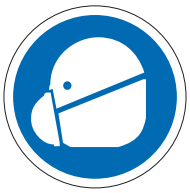
Flying objects

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

S01512C1

Health hazard

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



S01512V1

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

Type of hazard

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

WARNING

Type of hazard

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

CAUTION

Type of hazard

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

NOTE

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.

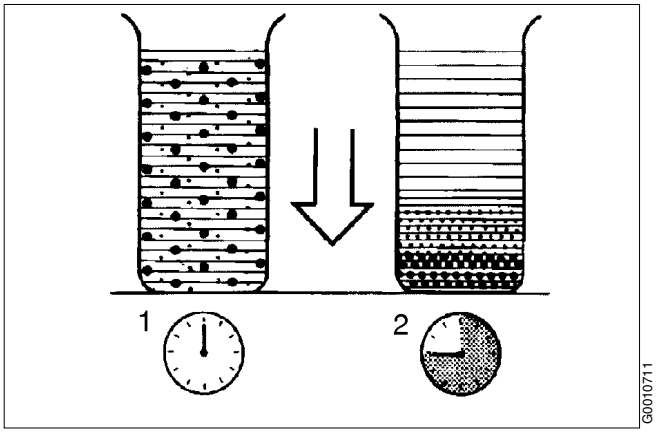
3 Separator Basics

Contents

3.1 Basic principles of separation

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.



Sedimentation by gravity

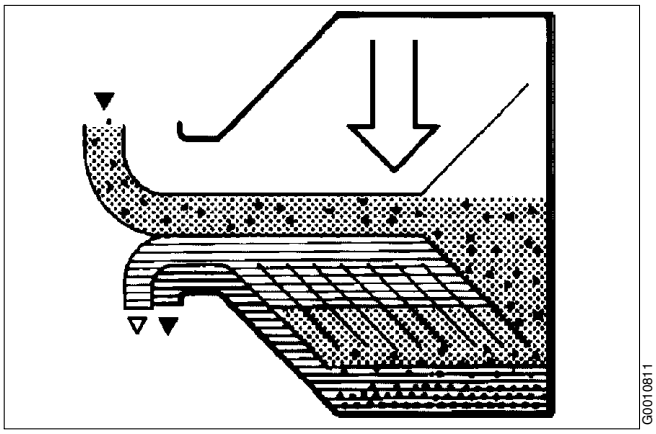
Separation by gravity

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.

Continuous separation and sedimentation can be achieved in a settling tank having outlets arranged according to the difference in density of the liquids.

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



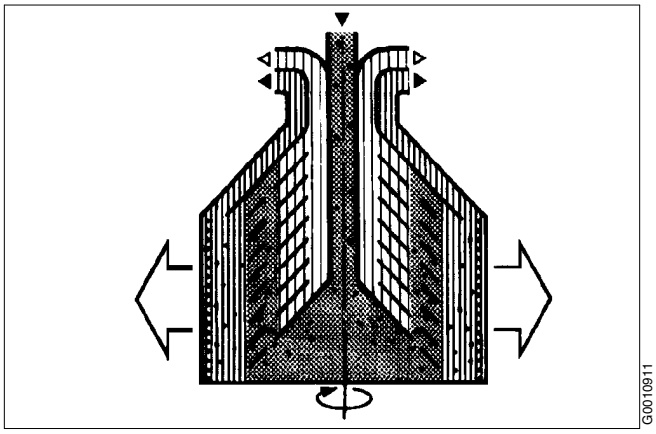
Sedimentation in a settling tank, with outlets making it possible to separate the lighter liquid parts from the heavier

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.

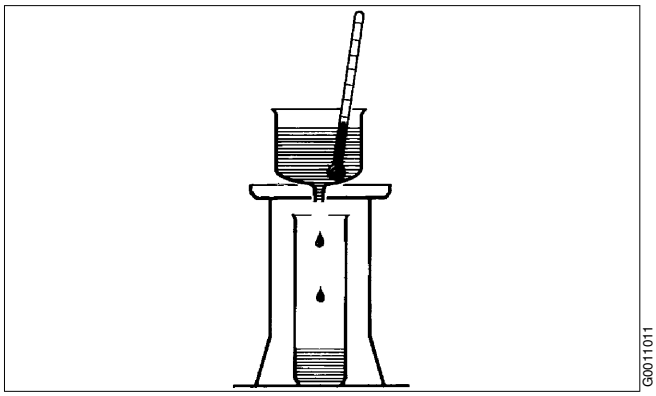


The centrifugal solution

3.1.1 Factors influencing the separation result

Separating temperature

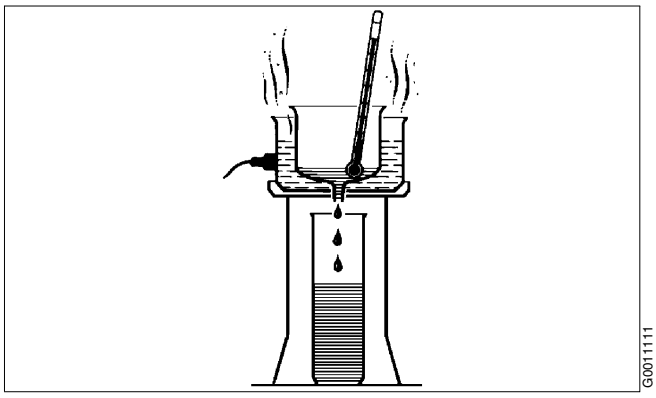
For some types of process liquids (e.g. mineral oils) a high separating temperature will normally increase the separation capacity. The temperature influences oil viscosity and density and should be kept constant throughout the separation.



High viscosity (with low temperature)

Viscosity

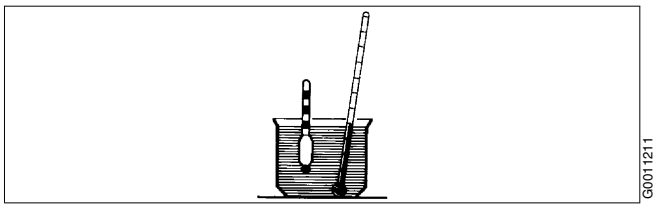
Low viscosity facilitates separation. Viscosity can be reduced by heating.



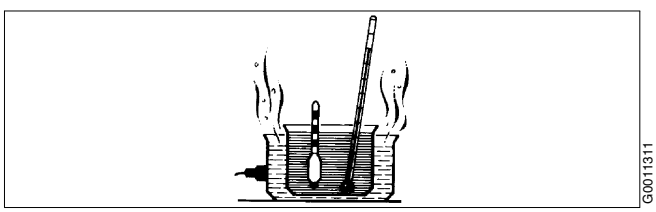
Low viscosity (with high temperature)

Density difference (specific gravity ratio)

The greater the density difference between the two liquids, the easier the separation. The density difference can be increased by heating.



High density (with low temperature)



Low density (with high temperature)

Phase proportions

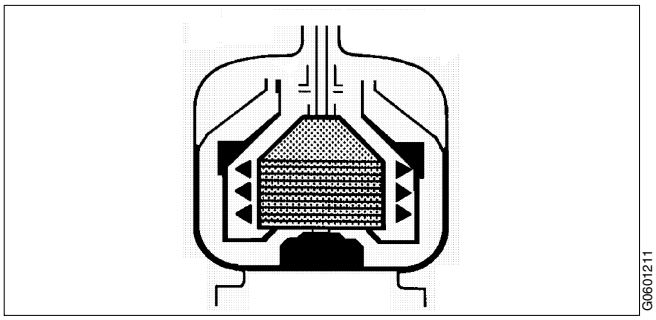
An increased quantity of water in a oil will influence the separating result through the optimum transporting capacity of the disc stack. An increased water content in the oil can be compensated by reducing the throughput in order to restore the optimum separating efficiency.

The throughput

The throughput sets the time allowed for the separation of water and sediment from the oil. A better separation result can often be achieved by reducing the throughput, i.e. by increasing the settling time.

Sludge space - sludge content

Sediment will accumulate on the inside periphery of the bowl. When the sludge space is filled up the flow inside the bowl is influenced by the sediment and thereby reducing the separating efficiency. In such cases the time between cleaning should be reduced to suit these conditions.



Sludge accumulation

Disc stack

A neglected disc stack containing deformed discs or discs coated with deposits will impair the separating result.

3.2 Overview

The separator comprises a processing part and a driving part. It is driven by an electric motor (6).

Mechanically, the separator machine frame is composed of a bottom part, a top part and a collecting cover. The motor is flanged to the frame as shown in the illustration. The frame feet have vibration damping.

The bottom part of the separator contains the horizontal driving device (1), driving shaft with couplings, a worm gear and a vertical spindle.

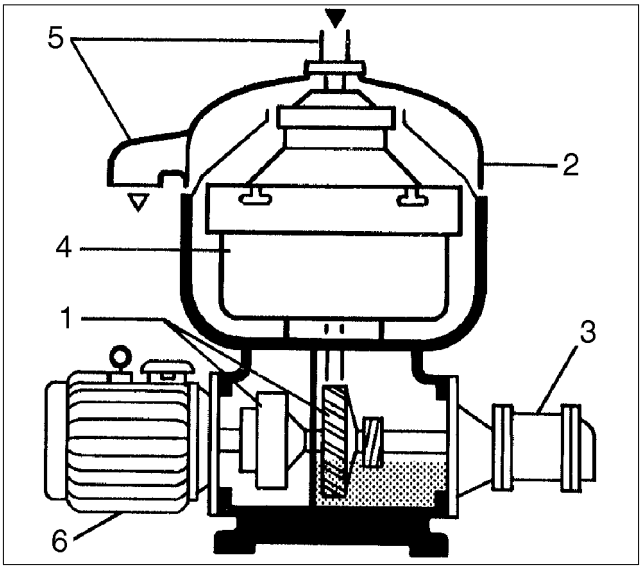
The bottom part also contains an oil bath for the worm gear.

A pump (3) is attached to the driving spindle and located on the side of the bottom part. This pump has dual function. It is the feed inlet pump and the clean oil discharge pump.

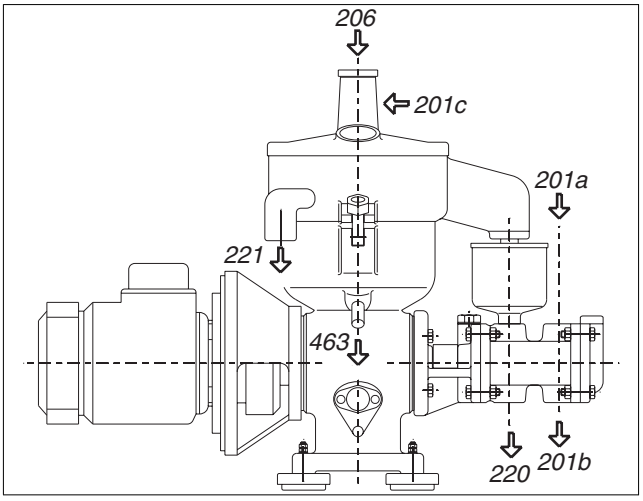
The frame top part and the collecting cover contain the processing parts of the separator, the inlet and outlets and piping.

The liquid is cleaned in the separator bowl (4). This is fitted on the upper part of the vertical spindle and rotates at high speed inside the space formed by the frame top part and collecting cover.

The main inlets and outlets are shown with connection numbers in the illustration. These numbers correspond with the numbers used in the connection list and the basic size drawing which can be found in chapter “8 Technical Reference” on page 111.



1. *Horizontal driving device, friction coupling and worm gear*
2. *Collecting cover.*
3. *Inlet and outlet gear pump*
4. *Separator bowl*
5. *Inlet / outlet*
6. *Electric motor*



Inlet and outlet connections

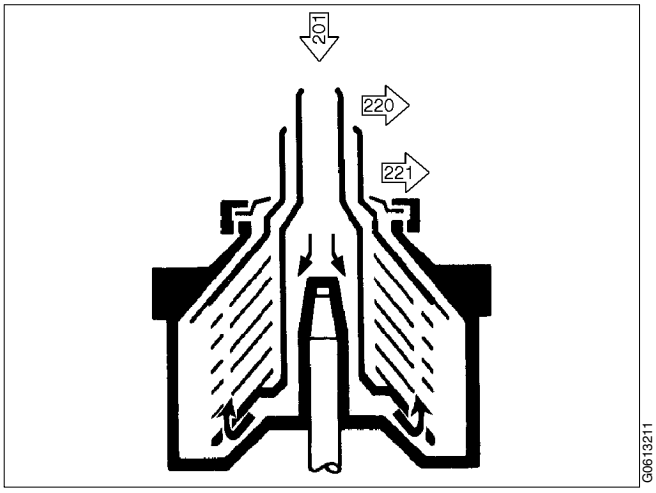
3.3 Separating function

Unseparated oil is fed into the bowl through the inlet pipe and is pumped via the distributor towards the periphery of the bowl.

When the oil reaches holes of the distributor, it will rise through the channels formed by the disc stack where it is evenly distributed.

The oil is continuously cleaned as it flows towards the center of the bowl. When the cleaned oil leaves the disc stack it rises upwards, flows over the gravity disc and leaves the bowl through outlet (220). Separated water, sludge and solid particles are forced towards the periphery of the bowl and collected in the sludge space.

The space between bowl hood and top disc are normally filled with water.



Process flow through separator bowl

3.3.1 Purifier bowl

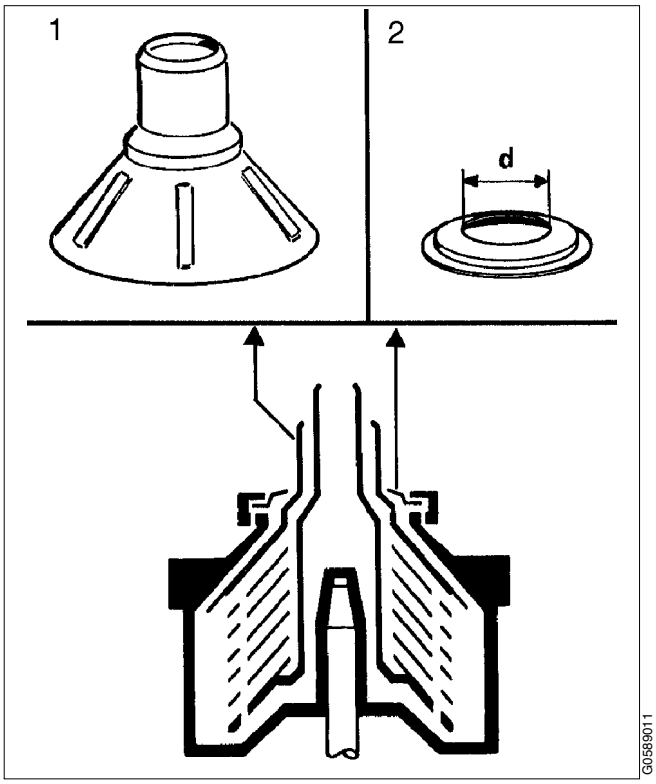
The illustration shows characteristic parts of the purifier bowl:

1. Top disc with neck
2. The gravity disc, which should be chosen according to directions in chapter “4.1.2 Selection of gravity disc” on page 30.

This bowl has two liquid outlets. The process liquid flows through the distributor to the interspaces between the bowl discs, where the liquid phases are separated from each other by action of the centrifugal force. The heavy phase and any solids move along the underside of the bowl discs towards the periphery of the bowl, where the solids settle on the bowl wall.

The heavy phase flows along the upper side of the top disc towards the neck of the bowl hood and leaves the bowl via the gravity disc the outer way.

The light phase flows along the upper side of the bowl discs towards the bowl centre and leaves the bowl via the hole in the top disc neck the inner way.



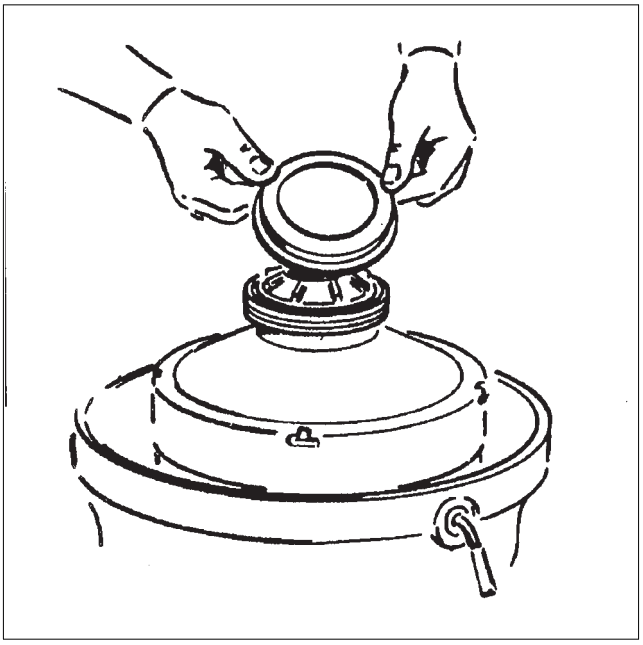
Purifier bowl

3.3.2 Position of interface - gravity disc

In a purifier bowl the position of the interface should be located between the disc stack edge and the outer edge of the top disc.

The position of the interface is adjusted by altering the pressure balance of the liquid phases oil and water inside the separator. That is done by exchanging the gravity disc. For this purpose a number of gravity discs with various hole diameters is delivered with the machine.

The gravity disc is located inside the bowl hood. A gravity disc with a larger hole will move the interface towards the bowl periphery, whereas a disc with a smaller hole will place it closer to the bowl centre.



Gravity disc

Selection of gravity disc

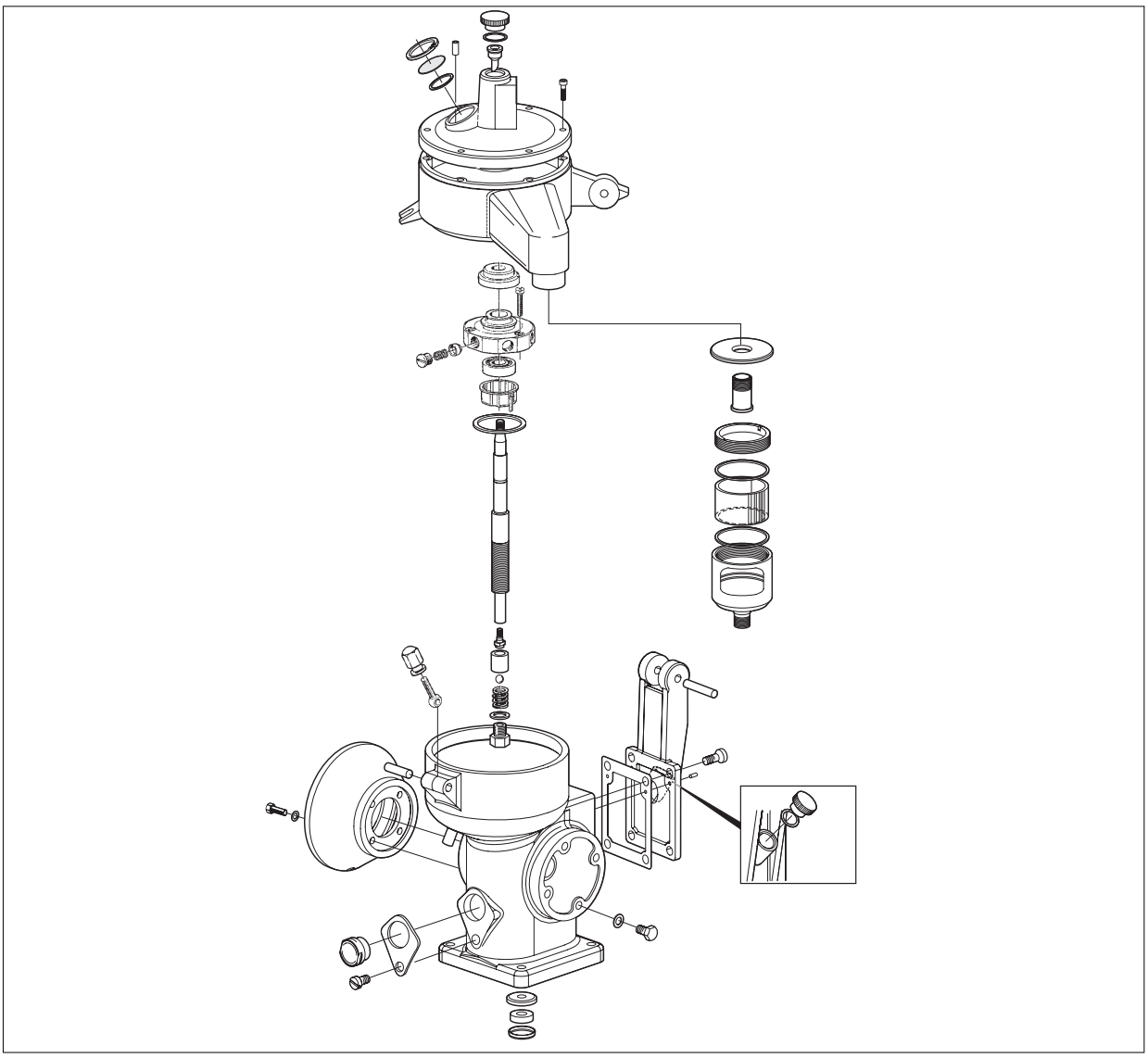
For selection of gravity disc, see nomogram in chapter “8.2.1 Gravity disc nomogram” on page 114.

When selecting a gravity disc the general rule is to use the disc having the largest possible hole without causing a break of the water seal.

The heavier or more viscous the light phase and the larger the liquid feed the smaller the diameter should be.

When the heavy phase (water) is wanted more free from the light one (oil), the interface should be placed nearer the bowl centre, however not inside the outer edge of the discs (the gravity disc is too small), as this would prevent the liquid flow.

3.4 Mechanical function

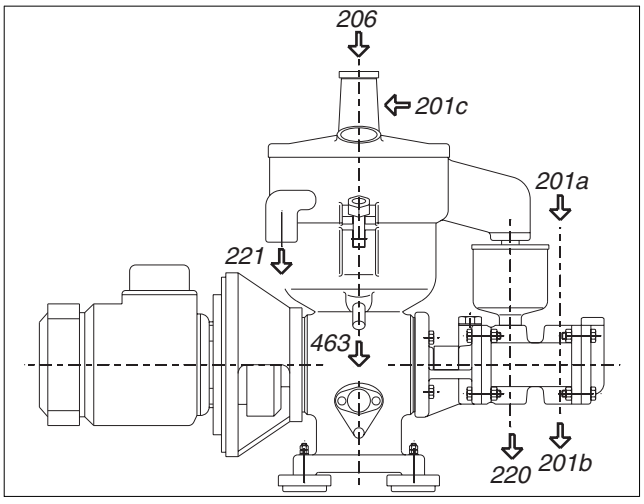


Exploded view

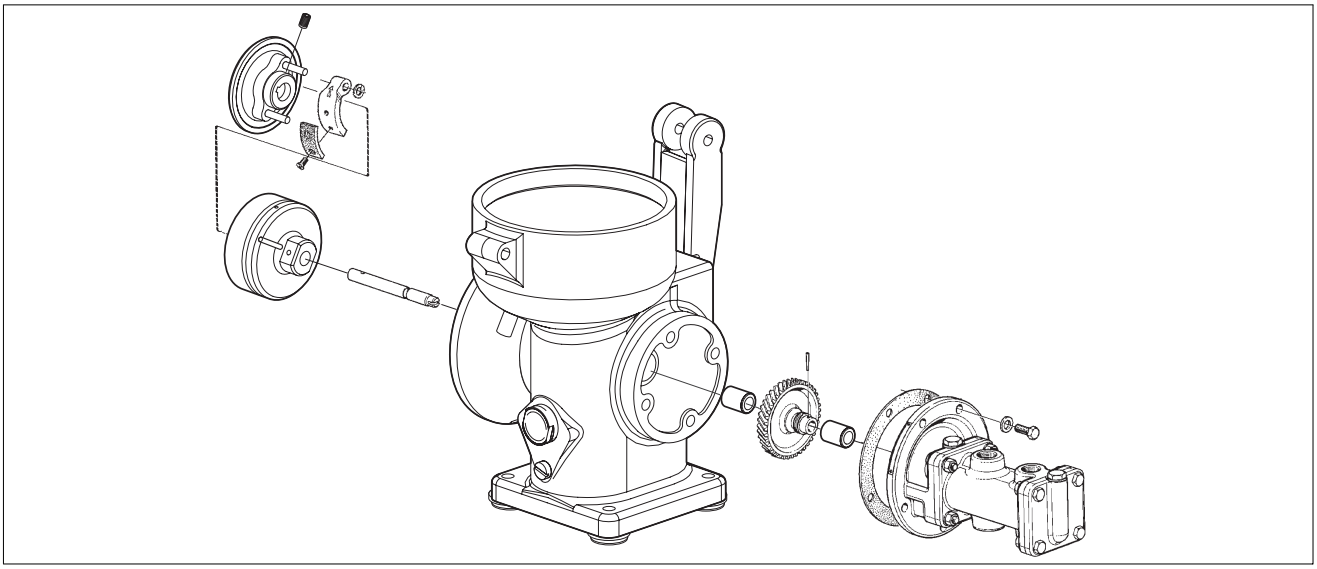
3.4.1 Inlet and outlet

The inlet and outlets consists of the following parts:

- The inlet (201).
- The inlet for water seal (206).
- The outlet for clean oil (220) from pump.
- The outlet for water (221).



3.4.2 Mechanical power transmission



Horizontal drive

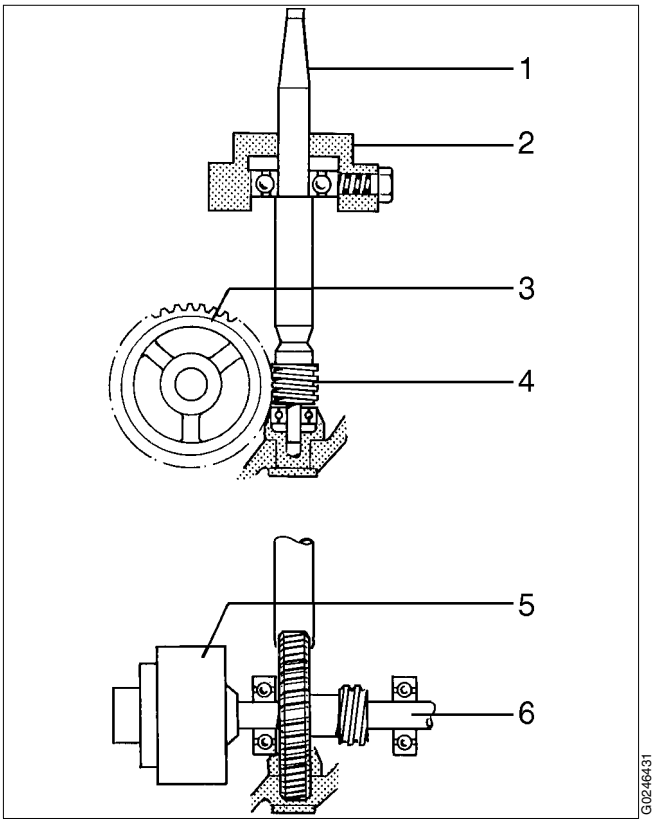
The main parts of the power transmission between motor and bowl are illustrated in the figure.

The friction coupling ensures a gentle start and acceleration and at the same time prevents overloading of the worm gear and motor.

The worm gear has a ratio which increase the bowl speed several times compared with the motor speed. For correct ratio see chapter “8 Technical Reference” on page 111.

To reduce bearing wear and the transmission of bowl vibrations to the frame and foundation, the top bearing of the bowl spindle is mounted in a spring casing.

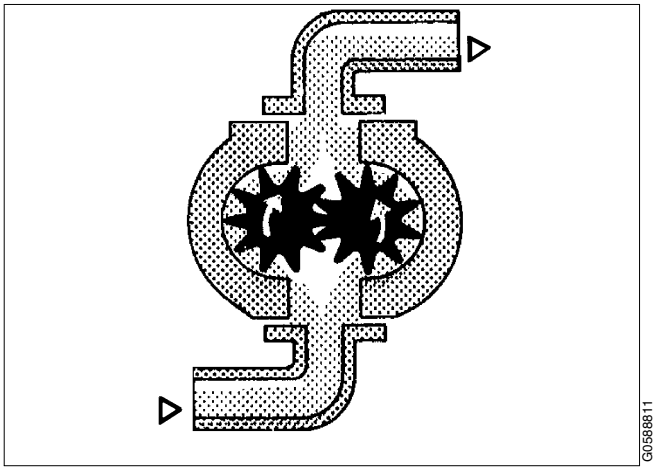
The worm wheel runs in a lubricating oil bath. The bearings on the spindle and the worm wheel shaft are lubricated by the oil splash produced by the rotating worm wheel.



1. *Bowl spindle*
2. *Top bearing and spring casing*
3. *Worm wheel*
4. *Worm*
5. *Friction coupling*
6. *Worm wheel shaft*

3.4.3 Inlet and outlet pump

A gear pump is attached to the driving spindle and located on the side of the separator. This pump has dual function. It is the feed inlet pump and the clean oil discharge pump.

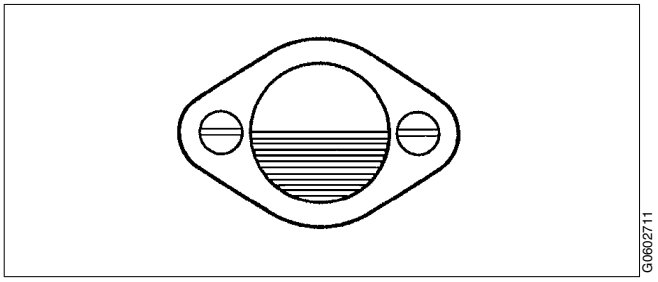


Gear pump

3.4.4 Indicators

Sight glass

The sight glass shows the oil level in the worm gear housing.



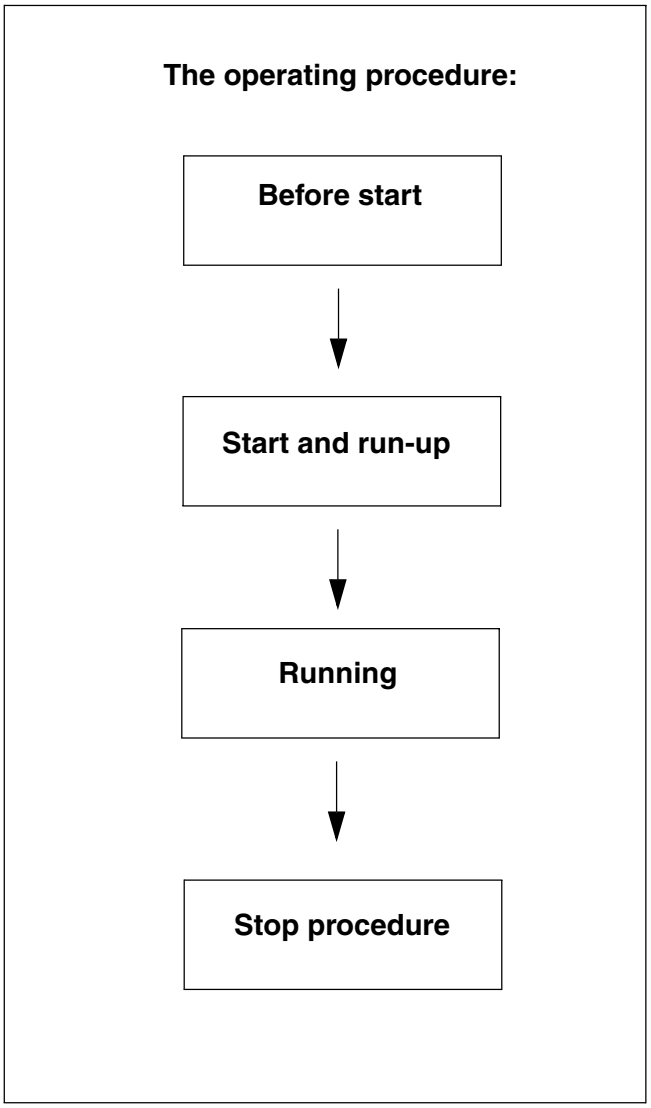
Sight glass - oil level

3.5 Definitions

Back pressure	Pressure in the separator outlet.
Clarification	Liquid/solids separation with the intention of separating particles, normally solids, from a liquid (oil) 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 (water) outlet in the bowl, thus no liquid seal exists.
Counter pressure	See Back pressure.
Density (specific gravity)	Mass per volume unit. Expressed in kg/m^3 at 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, inlet/outlet and operating water device. Renewal of seals in bowl inlet/outlet and operating water device.
Major Service (MS)	Overhaul of the complete separator, including bottom part (and activities included in an Intermediate Service, if any). Renewal of seals and bearings in bottom part.
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 (oil), which is the major part of the mixture, shall be purified as far as possible.
Sediment (sludge)	Solids separated from a liquid.
Throughput	The feed of process liquid to the separator per time unit. Expressed in m^3/or lit/h.
Viscosity	Fluid resistance against movement. Normally expressed in centistoke (cSt = mm^2/sec), at 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.

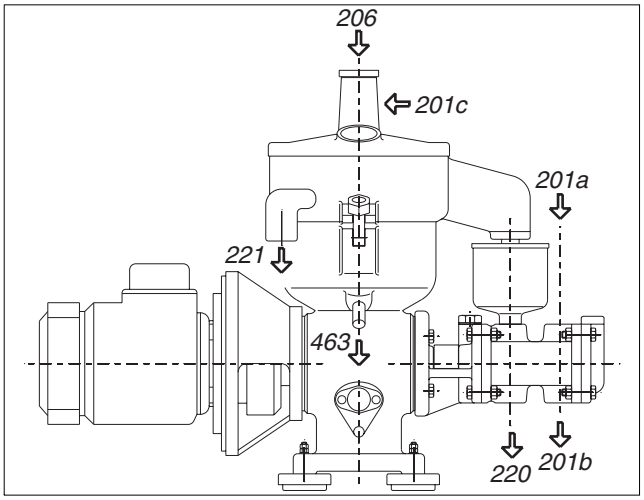
4 Operating Instructions

Contents



4.1 Operating routine

These instructions is related only the separator itself. If the separator is a part of a system or module follow also the instructions for the system.



An explanation of the separator connections is given in *“8.4 Connection list” on page 118*

4.1.1 Before first start

Technical demands for connections and logical limitations for the separator is described in the chapter “8 Technical Reference” on page 111 in the documents:

1. Technical data
2. Basic size drawing
3. Connection list
4. Interface description
5. Foundation drawing.

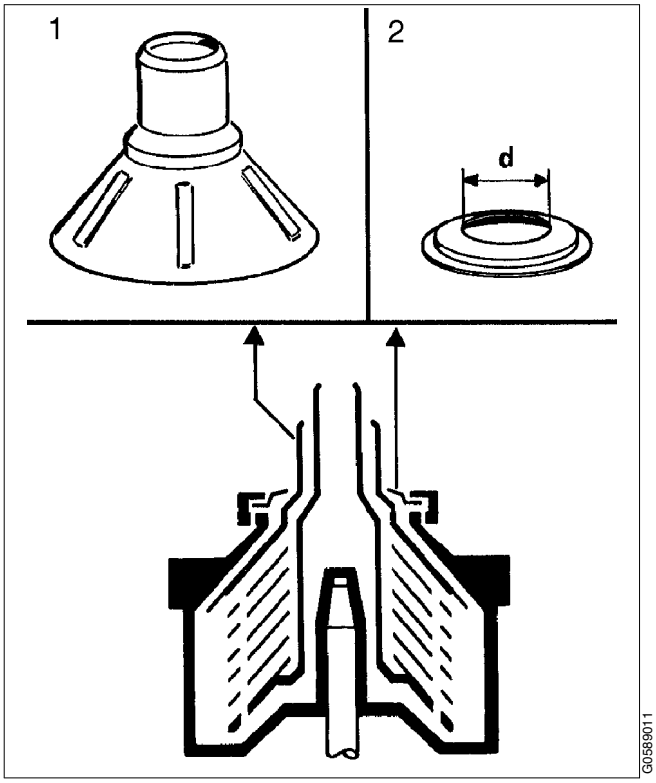
Before first start the following checkpoint shall be checked:

- Ensure the machine is installed correctly and that feed-lines and drains have been flushed clean.
- Fill oil in the gear housing. Fill up to the middle of the sight glass. Use the correct grade of oil. The separator is delivered without oil in the worm gear housing. For grade and quality, see “8.7 Lubricants” on page 124.

4.1.2 Selection of gravity disc

The separator is delivered with a set of gravity discs. The diameter (d) 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 process.

As a guide the nomogram in chapter “8.2.1 Gravity disc nomogram” on page 114 can be used.

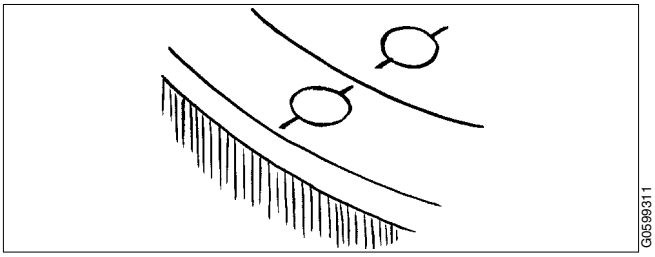


The gravity disc sets the position of oil-water interface

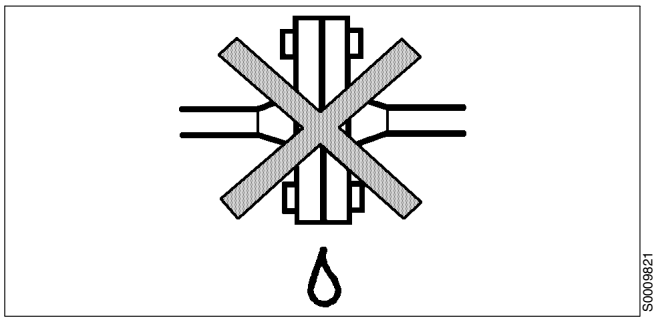
4.1.3 Before normal start

Check these points before every start.

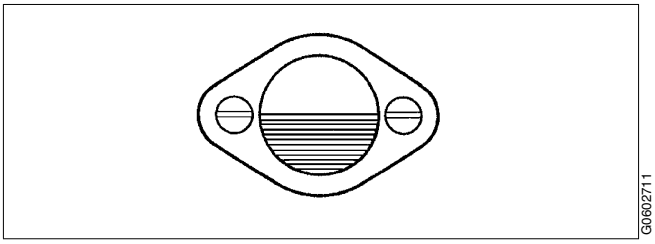
1. Ensure the bowl is clean and that the separator is properly assembled.



2. Make sure that all inlet and outlet couplings and connections have been correctly made and are properly tightened to prevent leakage.



3. Check that the bolts of the outlet cover and the hooks and screws for the frame hood are tightened.
4. Read the oil level. The middle of the sight glass indicates the **minimum** level. Refill if necessary. For grade and quality, see “8.7 Lubricants” on page 124.

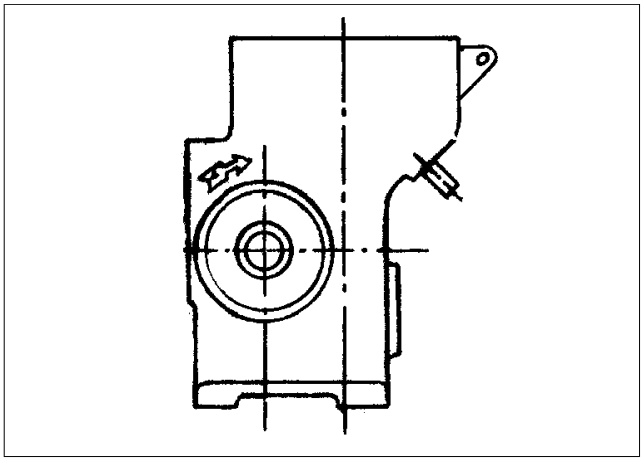


5. Make sure the direction of rotation of the motor and bowl corresponds to the sign on the frame.

4.1.4 Starting and running-up procedure

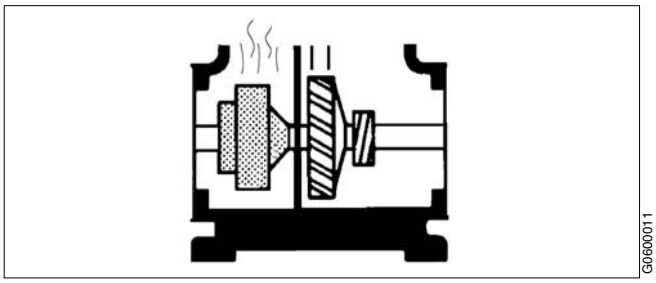
1. After starting the separator, visually check to be sure that the motor and separator have started to rotate.

2. Check the direction of rotation. The arrow indicating direction of rotation of horizontal driving device.



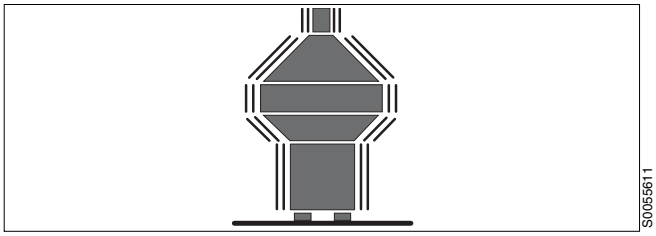
3. Be alert for unusual noises or conditions.

   Smoke and odour may occur at the start when friction pads are new.



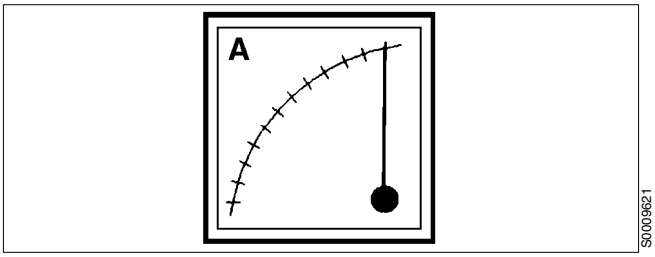
Smell

4. Note the normal occurrence of critical speed vibration periods.



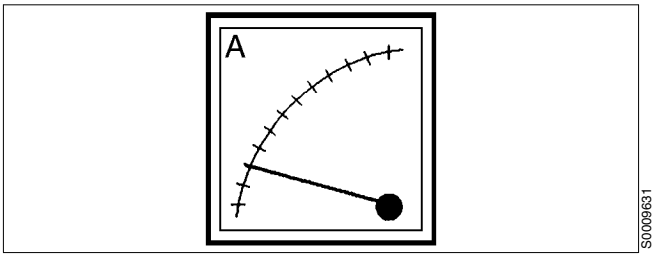
Vibration

5. Motor current indicates when the separator has come to full speed.



Current increases when the coupling engages...

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 “8.2 Technical data” on page 113.



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

WARNING

Disintegration hazards

When excessive vibration occurs, **keep liquid feed on** and **stop** separator.

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

Excessive vibrations may be due to incorrect assembly or poor cleaning of the bowl.

4.1.5 At full speed

1. For **purification** mode:

   a. Supply water (206), approx. 0,5 litre (depending on Gravity disc) to form the water-seal. Continue until water flows out through the water outlet (221). The water should have the same temperature as the process liquid and be supplied quickly.

   b. Close water feed.

   c. Start the oil feed slowly to avoid breaking the water seal. Fill the bowl as quickly as possible.

4.1.6 During operation

Do regular checks on:

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

4.1.7 Stopping procedure

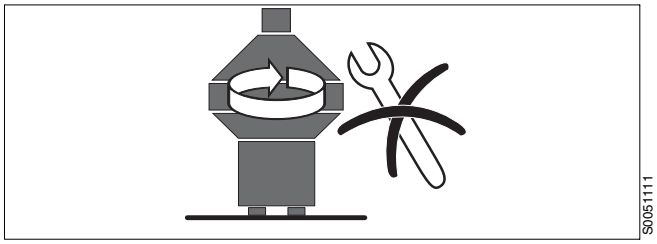
1. Feed sealing water.
2. Turn off the oil feed.
3. Stop the separator.
4. Wait until the separator has come to a complete standstill (approx. 7 minutes).
5. Manual cleaning should be carried out before next start up. See “4.2.1 Removal of separated sludge” on page 37.

WARNING

Entrapment hazards

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

The motor fan indicate if the separator is rotating or not.



4.1.8 Emergency stop

The emergency stop is always installed according to local safety regulations. It is often a button placed on the wall near the separator or on the control equipment.

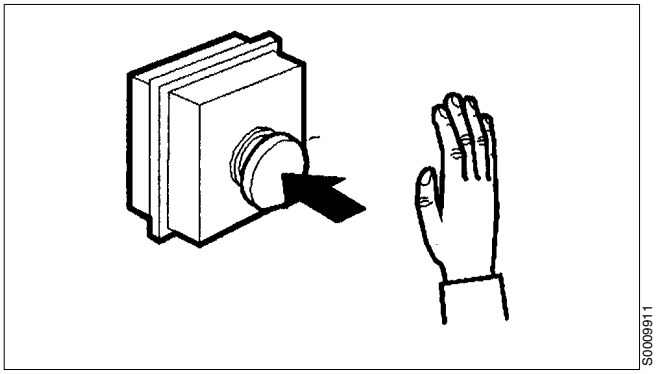
The following should happen automatically:

- The bowl is kept filled with liquid until standstill.
- The separator motor is switched off.

Evacuate the room. The separator may be hazardous when passing resonance frequencies during the run-down.

After an emergency stop the cause of the fault must be identified.

If all parts have been checked and the cause remains unclear contact your Alfa Laval representative for advice.



Emergency stop

4.2 Cleaning the bowl

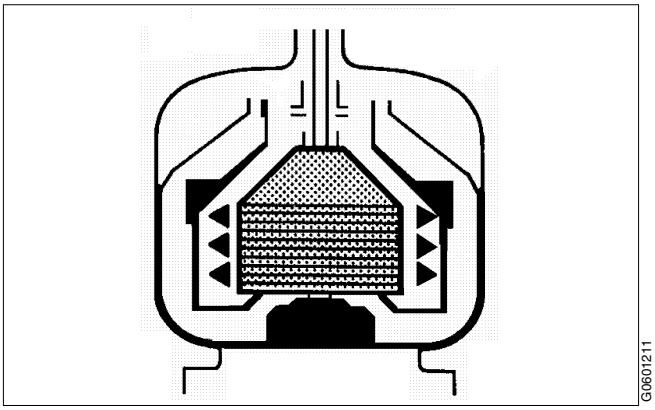
The separated sludge is accumulating on the inside surface of the separator bowl. How often the separator needs to be cleaned, depends on the amount of sediment entering the separator. High solids content or high throughput has the consequence that the cleaning need to be done more often.

Guidelines for emptying intervals:

Marine diesel oil - 1 week

Lubricating oil - 1 day

Intervals for a specific case must be based on experience.

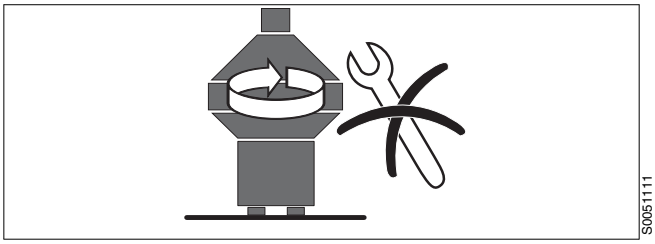


Sludge accumulation

4.2.1 Removal of separated sludge

Remove the sludge collected on the inside of the bowl as follows:

1. Stop the separator.



WARNING

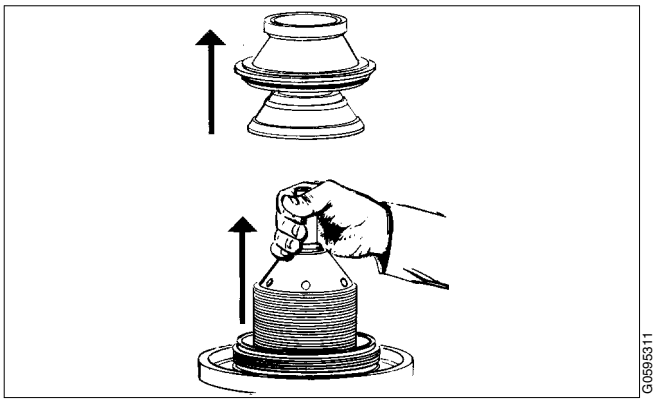
Entrapment hazards

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

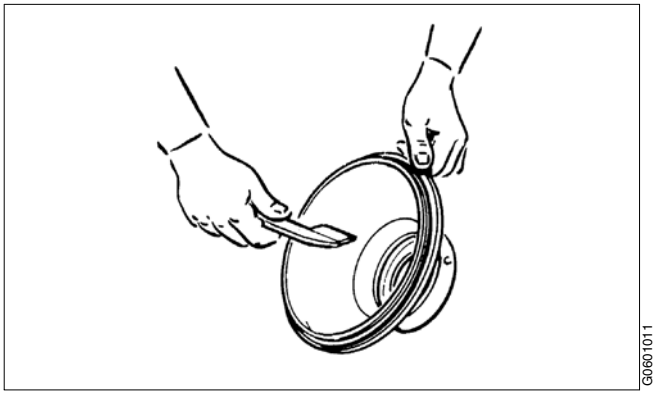
The motor fan indicate if the separator is rotating or not.

2. Raise the collecting cover open. For instructions, see chapter “6 Dismantling/ Assembly” on page 77.

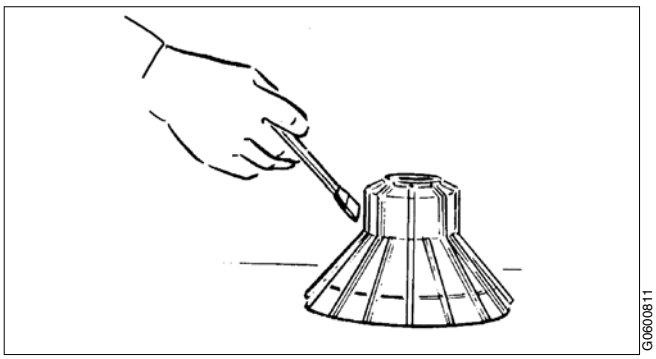
3. Remove separator bowl using socket spanner to release cap nut, and lift the bowl from the frame.
4. Place separator bowl in bowl holder and secure. See “6.2 Dismantling - (IS)”.
5. Open the separator bowl.



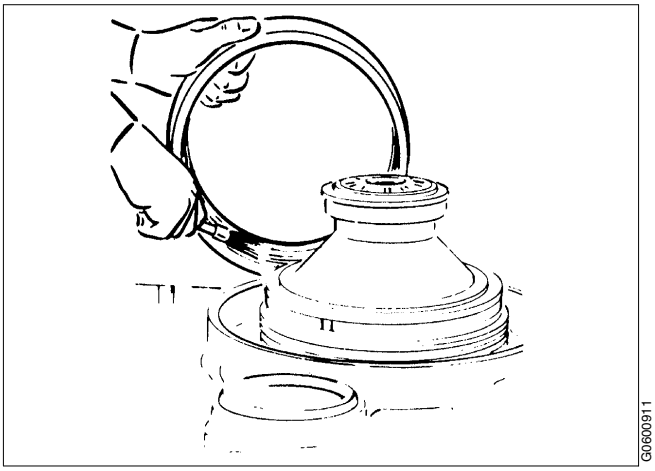
6. Clean the bowl hood.



7. Clean the channels on the top disc upper side.

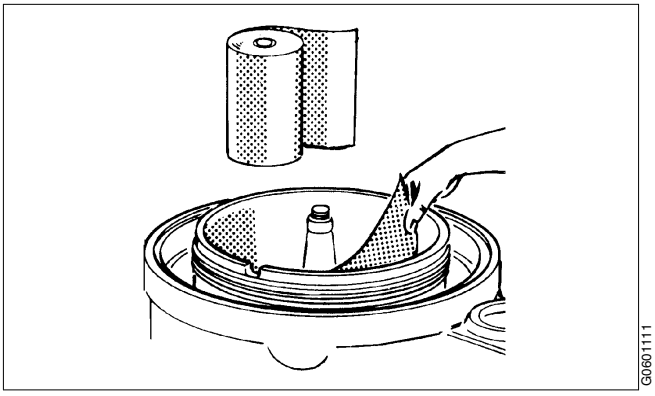


8. Remove sediment from the bowl body, clean and lubricate lock ring.



4.2.2 Sediment paper

To facilitate the cleaning of separators, a liner of plastic paper can be inserted in the bowl. Cut the paper into shape, moisten its plastic-coated side and press it against the inside of the bowl body. When cleaning remove the paper with the sediment cake.



Sediment paper

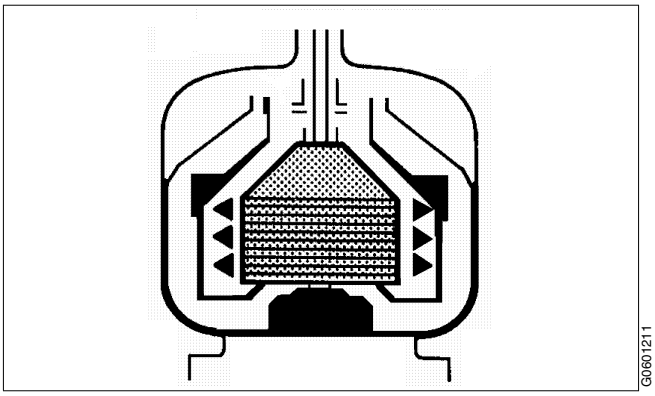
4.2.3 Disc stack

When the sediment is not sticky, the disc stack can be cleaned by “hurling”.

1. Clean the other bowl parts.
2. Assemble the bowl.
3. Close and lock the collecting cover.
4. Run up to full speed without liquid feed.
5. After “hurling” either continue separation or stop and open the bowl and remove the sediment.

If the sediment adheres firmly, dissolve it by submerging the distributor and the disc stack in a suitable detergent.

If “hurling” has no effect, clean the discs one by one.



Bowl cleaning by ‘hurling’

4.2.4 Assembly the bowl

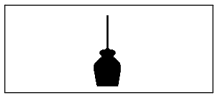
Each bowl constitutes a balanced unit. Exchange of any major part necessitates rebalancing of the bowl. To prevent mixing of parts, e.g. in an installation comprising of several machines of the same type, the major bowl parts carry the machine manufacturing number or its last three digits.

NOTE
Be sure bowl parts are not interchanged. Out of balance vibration will reduce ball bearing life.

Purifier bowl

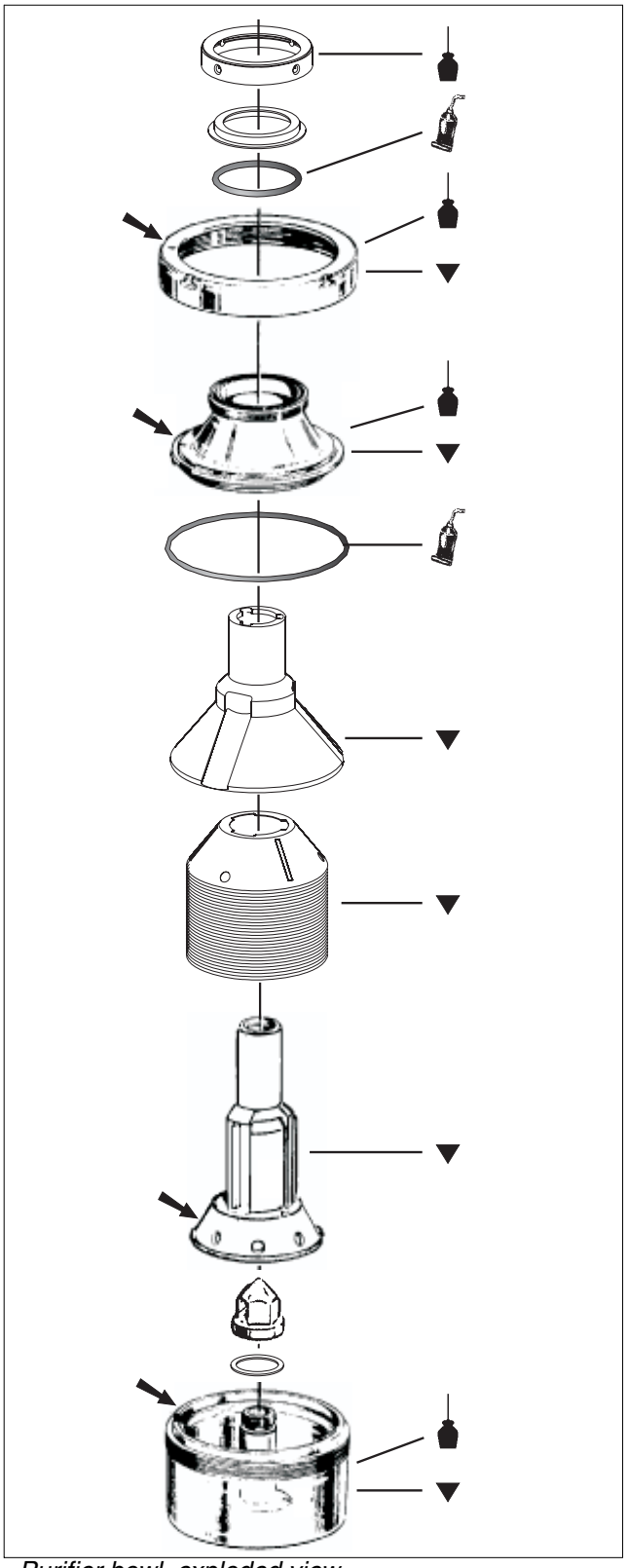
The arrows indicate positions of guides on the bowl parts.

Lubrication needed



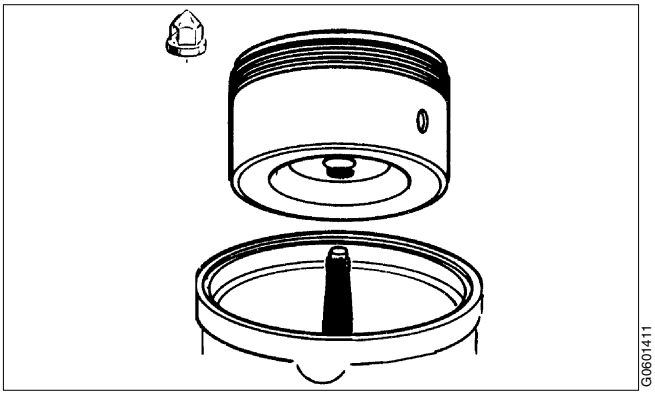
Balanced parts. Exchange necessitates rebalancing of bowl.

Lubrication paste needed

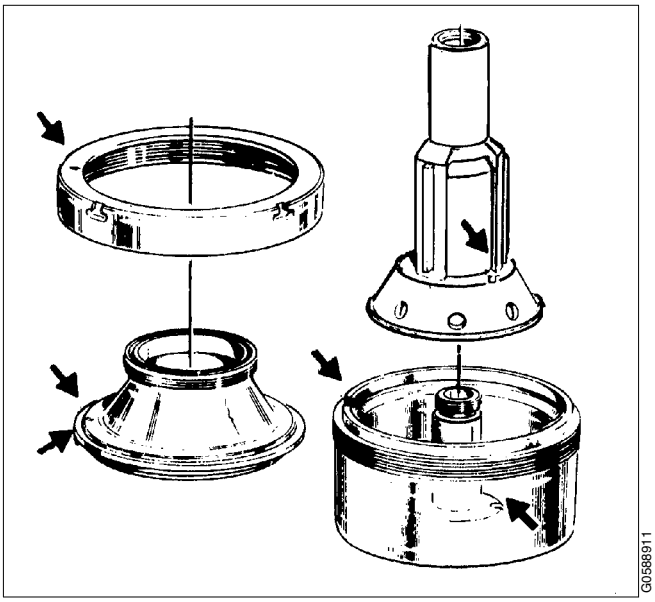


Purifier bowl, exploded view

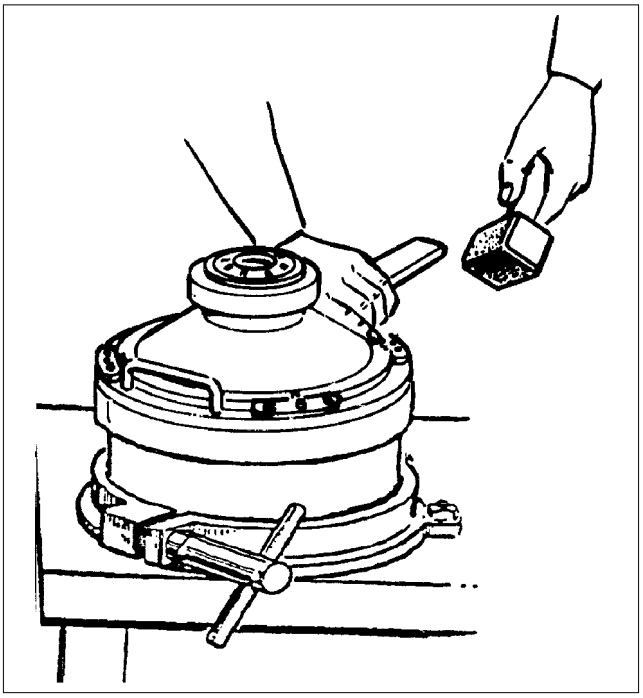
1. Clean spindle top and bowl body nave with a cloth.



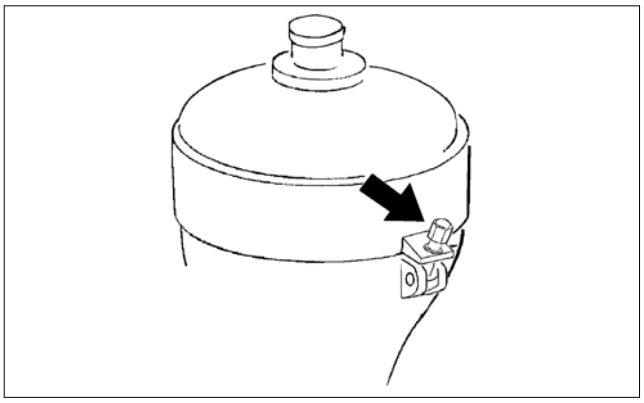
2. Bring bowl parts into positions defined by the guides.



3. Place bowl in bowl holder and secure. Screw large lock ring counter clockwise until bowl hood lies tightly against bowl body.



4. Lower and clamp the collecting cover and tighten both cap nuts to a maximum torque of 12 Nm.



Max. torque = 12 Nm.

5 Service Instructions

Contents

5.1 Periodic Maintenance

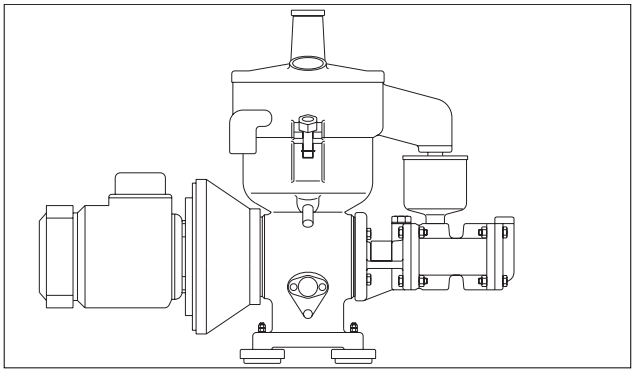
5.1.1 Introduction

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

WARNING

Disintegration hazard

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



Periodic maintenance prevent stoppages

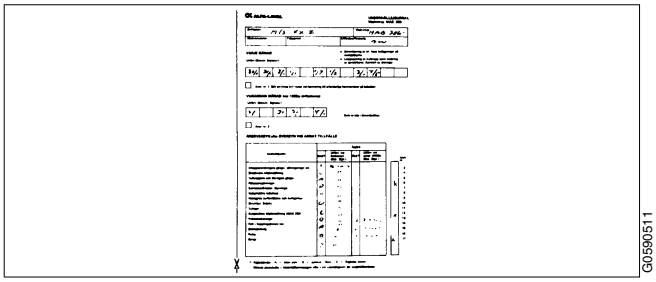
5.1.2 Maintenance intervals

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

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

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

After a standstill for more than six months the spindle bearings should be prelubricated before restart. See also “5.7.4 Shutdowns” on page 75.



Maintenance log

Oil change

Change oil after every operation period of maximum 2000 hours or at least once every year if the total number of operating hours is less than 2000 hours.

NOTE

The oil change interval must be shortened when the separator environment is damp.

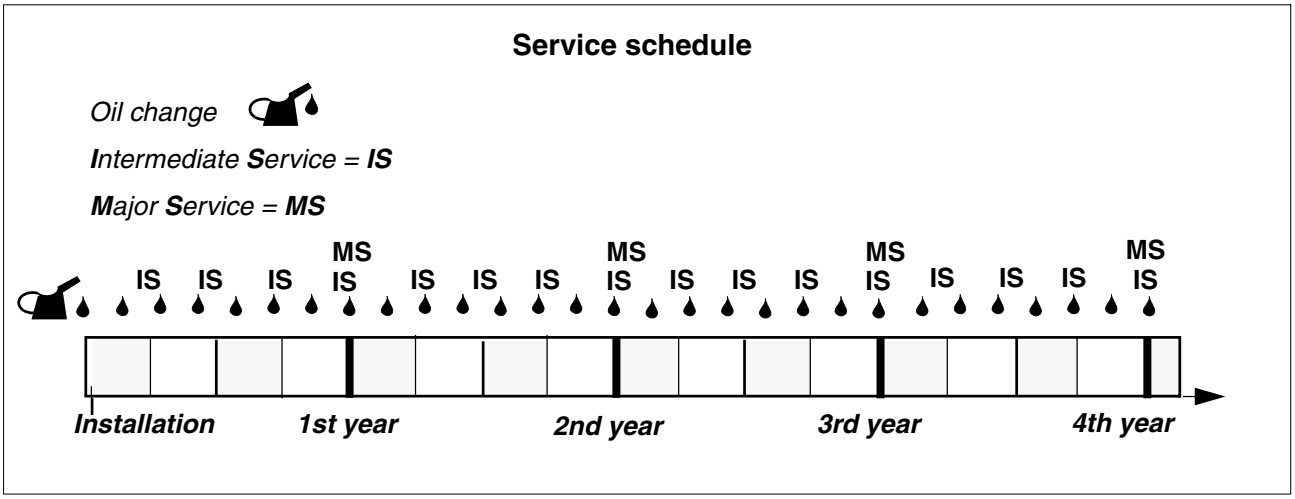
Change the oil at every bowl service

IS - Intermediate Service (IS)

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

Major Service (MS)

Major Service consists of an overhaul of the complete separator every 12 months or 8000 operating hours. Seals and bearings in the bottom part are renewed.



5.1.3 Maintenance procedure

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

A Major Service should be carried out in the following manner:

1. Dismantle the parts as mentioned in the Service Log and described in “6.2 Dismantling - (IS)” on page 79.

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

2. Inspect and clean the dismantled separator parts according to the Service Log.

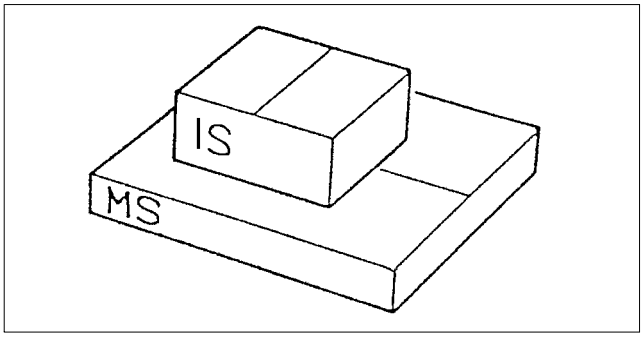
3. Fit all the parts delivered in the Service kit while assemble the separator as described in “6.4 Assembly - (MS)” on page 88. The assembly instructions have references to check points which should be carried out during the assembly.

5.1.4 Service kits

Service kits are available for Intermediate Service (IS) and Major Service (MS).

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

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



Intermediate & Major service kit

NOTE

Renew all parts included in the Intermediate Service kit (IS) and Major Service kit (MS).

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.

5.2 Maintenance Logs

Keep a log of inspection and maintenance performed. Parts repeatedly replaced should be given special consideration. The cause of repeated failures should be determined and corrected. Discuss your problems with an Alfa Laval representative and, when necessary, request a visit by an Alfa Laval Service engineer.

Rate of corrosion and erosion and notification of cracks should also be a part of this log. Note the extent of damage and date the log entries so that the rate of deterioration can be observed.

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	Collecting cover and connecting housing	-	
Separator bowl			
Check for vibration and noise		72	
Worm wheel shaft and gear casing			
Check for vibration and noise			
Check	Oil level in gear housing	48	
Electrical motor			
Check for heat, vibration and noise		1)	

1) See manufacturer's instruction

5.2.2 Oil change

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

Main component and activity	Part	Page	Notes
Worm wheel shaft and gear housing			
Check	Worm wheel and worm	64	
Renew	Oil * in gear housing	48	

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

In a new installation, or after replacement of gear, change the oil after 200 operating hours.

See chapter “8 Technical Reference” on page 111 for further information.

5.2.3 IS-Intermediate Service

Name of plant:		Local identification:	
Separator:	MAB 102B-14	Manufacture No./Year:	
Total running hours:		Product No:	881134-01-03/ 2
Date:		Signature:	

Main component and activity	Part	Page	Notes
Inlet and outlet			
Clean and inspect	Threads of inlet pipe(s)	-	
	Connecting housing	-	
Separator bowl			
Clean and check	Lock ring	56	
	Bowl hood	37	
	Top disc	-	
	Gravity disc	-	
	Bowl discs	-	
	Distributor	-	
	Bowl body	-	
	Corrosion	52	
	Erosion	54	
	Cracks	55	
	Disc stack pressure	93	
Renew	O-rings and sealings	-	

5.2.4 MS-Major Service

Name of plant:		Local identification:	
Separator:	MAB 102B-14	Manufacture No./Year:	
Total running hours:		Product No:	881134-01-03/ 2
Date:		Signature:	

Main component and activity	Part	Page	Notes
Worm wheel shaft and gear housing			
Check	Worm wheel and worm	64	
	Radial wobble of worm wheel shaft	-	
	Axial play of coupling disc	61	
Renew	Oil in gear housing	48	
Vertical driving device			
Clean and check	Bowl spindle	60	
	Wear of driver and of groove in worm	64	
	Buffers	59	
	Ball bearing housing indentations	63	
	Radial wobble of bowl spindle	59	
Renew	Ball bearings and top bearing springs	60	
Brake			
Pump			
Clean and check	Bushings, wearing seals, shear pin coupling and impeller shaft.	97	
Renew	Lipseal ring	97	

Name of plant: Local identification:

Separator: MAB 102B-14 Manufacture No./Year:

Total running hours: Product No: 881134-01-03/ 2

Date: Signature:

Main component and activity	Part	Page	Notes
Friction coupling			
Clean and check	Friction coupling	74	
Renew	Friction pads		
Frame feet			
Renew	Rubber cushions	102	
Electrical motor			
Clean and check	Position of coupling disc	61	
Lubrication (if nipples are fitted)	-	-	
Signs and labels on separator			
Check attachment and readability, replace if needed	Safety label on collecting cover	144	
Monitoring equipment (option)			
Function check	Cover interlocking switch	65	

5.3 Check points at Intermediate Service (IS)

5.3.1 Corrosion

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

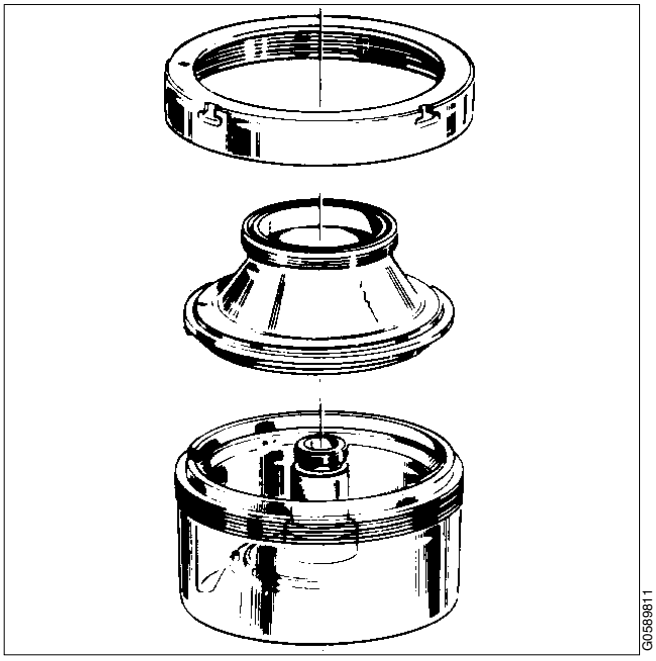
WARNING

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.



Main bowl parts

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.

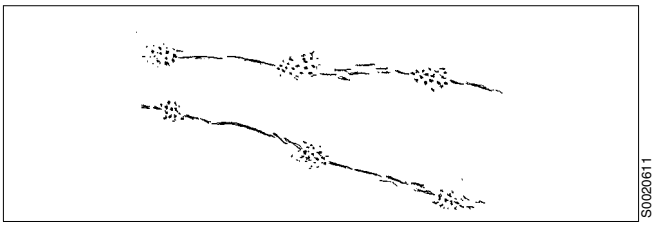
Stainless steel

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

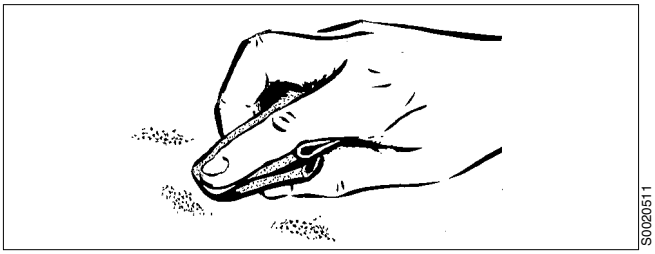
- Exposed to a stationary solution.
- In a crevice.
- Covered by deposits.
- Exposed to a solution that has a low pH 75
- value.

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

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



Corrosion forming a line



Polish corrosion spots

WARNING

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.

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

Other metal parts

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

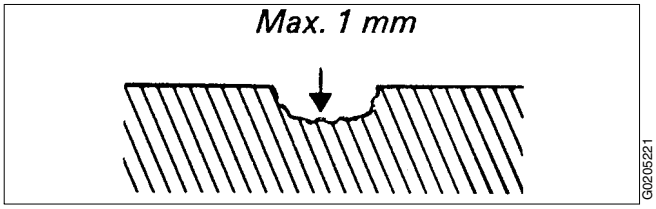
5.3.2 Erosion

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

WARNING

Disintegration hazard

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



Maximum depth of damage

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

Erosion is characterised by:

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

Surfaces particularly subjected to erosion are:

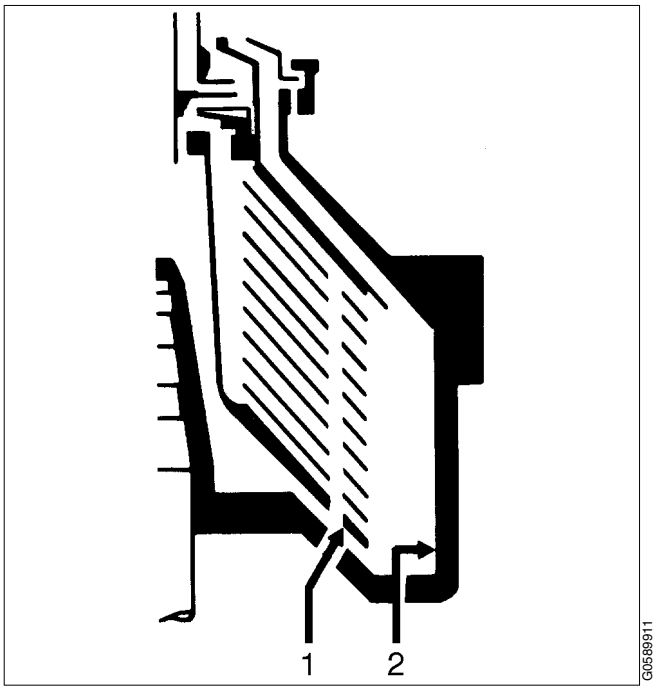
1. The underside of the distributor in the vicinity of the distribution holes and wings.
2. The internal surface of the bowl body that faces the conical part of the distributor.

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

WARNING

Disintegration hazard

Erosion damage can weaken parts by reducing the thickness of the metal. Replace the part if erosion can be suspected of affecting its strength or function.



Erosion check points

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.

WARNING

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.

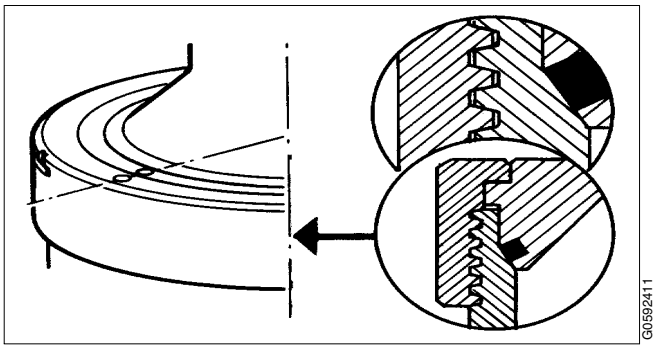
It is particularly important to inspect for cracks in rotating parts.

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 Lock ring; wear and damage

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

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



Wear of lock ring

WARNING

Disintegration hazards

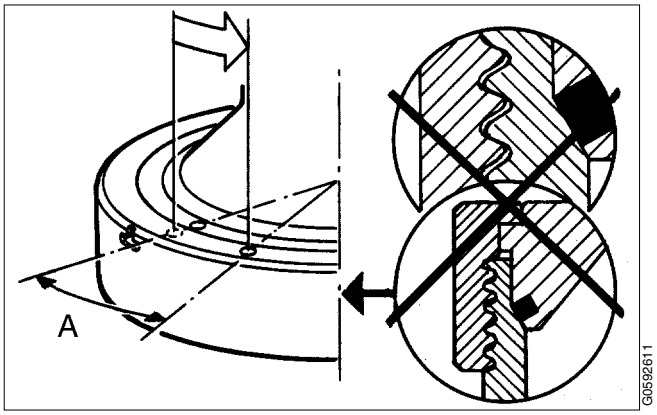
Wear on large lock ring thread must not exceed safety limit. The ϕ-mark on lock ring must not pass opposite ϕ-mark by more than the specified distance.

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

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

Contact Your Alfa Laval representative

- If the original mark on the lock ring passes the corresponding mark on the bowl hood by more than 25° (or 25 mm).
- If the alignment marks become illegible. The thread wear need to be inspected and the new position of alignment marks determined.



Maximum wear A=25 ° (or 25 mm)

Damage

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

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

Check for burrs and protrusions caused by impact. Watch your fingers for sharp edges.

If damage is established, rectify using a whetstone or fine emery cloth (recommended grain size 240).

If the damage is considerable, use a fine single-cut file, followed by a whetstone.

5.4 Check points at Major Service (MS)

5.4.1 Corrosion

Same as described in “5.3.1 Corrosion” on page 52.

5.4.2 Erosion

Same as described in “5.3.2 Erosion” on page 54.

5.4.3 Cracks

Same as described in “5.3.3 Cracks” on page 55.

5.4.4 Lock ring; wear and damage

Same as described in “5.4.4 Lock ring; wear and damage” on page 58.

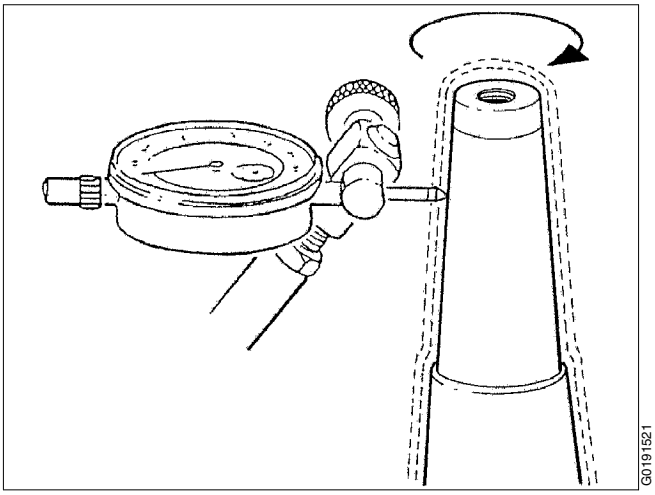
5.4.5 Radial wobble of bowl spindle

- Spindle wobble is indicated by rough bowl run (vibration).

The bowl spindle wobble should be checked if the bowl spindle has been dismantled or if rough bowl running (vibration) occurs.

NOTE

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



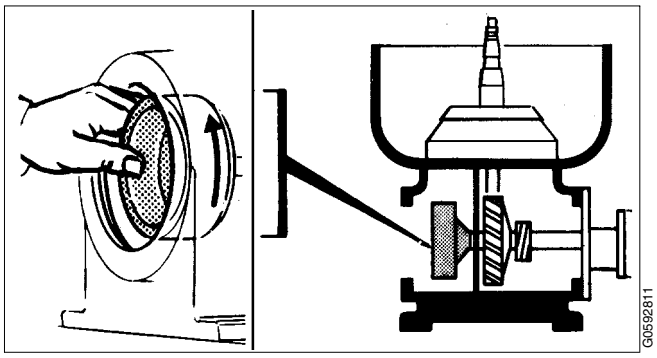
Maximum spindle wobble 0,15 mm

Check the wobble before mounting the bowl.

Before measuring, make sure that the buffer plugs are properly tightened.

- Fit a dial indicator in a support and fasten it to the frame.
- Remove the motor to get access to the coupling drum. Use the coupling drum to revolve the spindle manually.
- Measure the wobble at the top of the tapered end of the spindle. Maximum permissible radial wobble is 0,15 mm.
- If wobble is too large, renew all the ball bearings on the spindle.

Measure wobble after assembly. If it is still excessive, the spindle is probably damaged and must be replaced, contact your Alfa Laval representative.



Rotate spindle by hand

5.4.6 Bowl spindle cone and bowl body nave

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

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

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

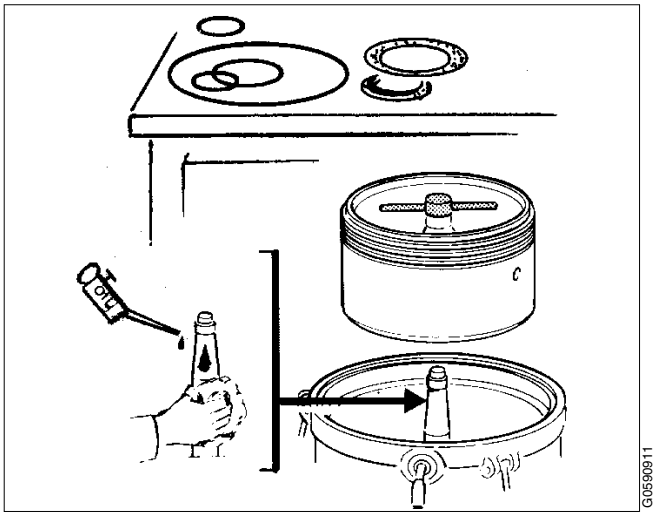
- Remove any impact marks with a scraper and/or whetstone.

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

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

Wipe off the spindle top and nave bore in the bowl body. Lubricate the tapered end of the spindle and wipe it of with a clean cloth before assemble.

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

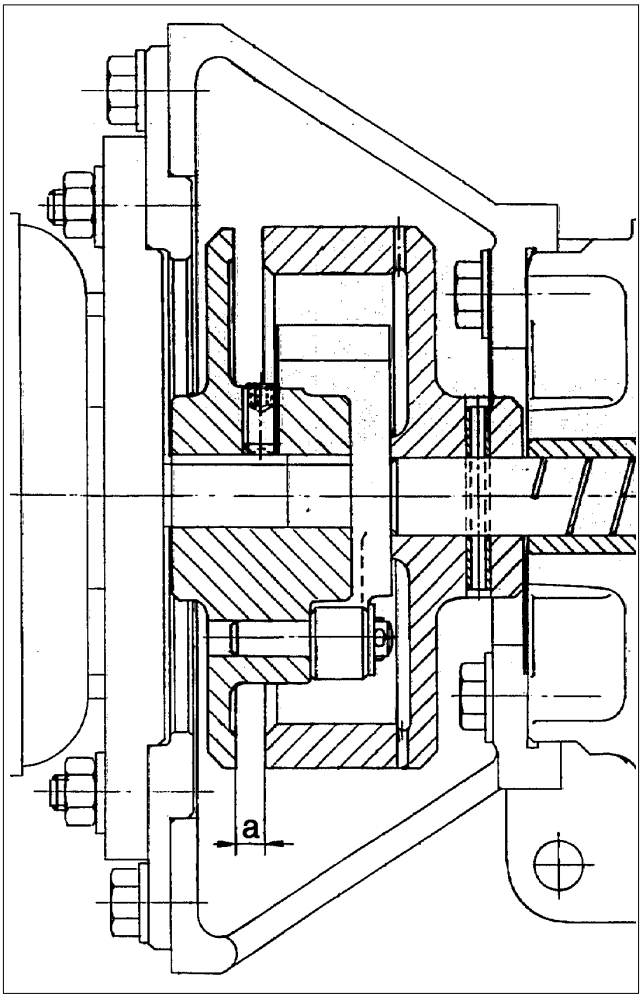


Put a little oil on the bowl spindle and wipe it of with a clean cloth to prevent corrosion

5.4.7 Coupling disc of motor

The position of the coupling disc on the motor shaft is establishing the location of the friction pads inside the coupling.

When the machine is delivered with motor, the pulley has been fastened in its correct position on the motor shaft. Score the position of the pulley before loosening it from motor shaft. The axial play for the elastic plate - measurement "a" in illustration should be about 6,5 mm.



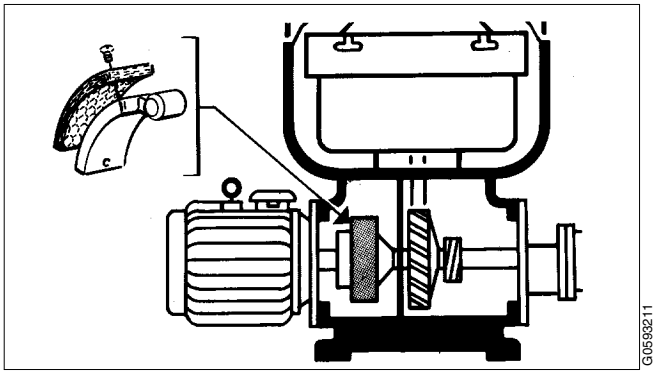
The speed described for the input shaft to the machine (the worm wheel shaft) must on no conditions be exceeded, and which is stamped on the type plate of the machine. The worm gear ration and friction blocks of the clutch are suited to this speed.

5.4.8 Friction pads

Worn or oily pads will cause a long running-up period. Replace all the pads even when only one of them is worn.

If the pads are oily:

- Clean the pads as well as the inside of the coupling drum with a suitable degreasing agent.
- Roughen up the friction surfaces of the pads with a coarse file.



Friction coupling

CAUTION

Inhalation hazard

When handling friction blocks/pads use a dust mask to make sure not to inhalate any dust.

Do not use compressed air for removal of any dust. Remove dust by vacuum or wet cloth.

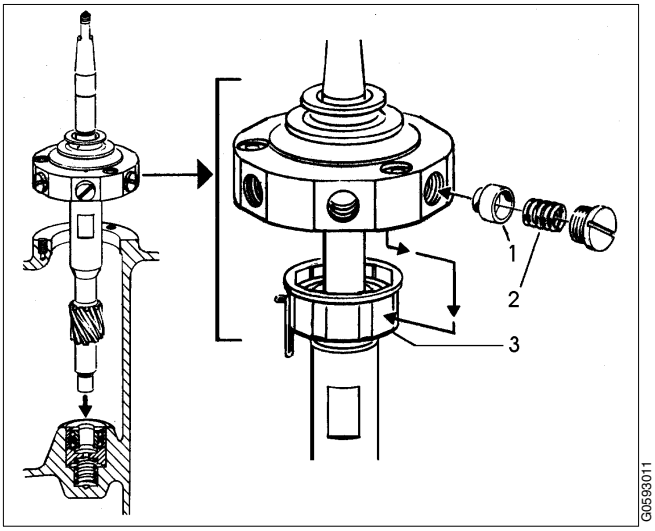
See Safety instructions for environmental issues regarding correct disposal of used friction blocks/pads.

5.4.9 Top bearing springs

Weakened or broken buffer springs may give rise to machine vibration (rough bowl running).

The condition (stiffness) of a spring can hardly be determined without using special testing equipment. So, an estimation of the spring condition must be based on the knowledge of the machine run before the overhaul. It is recommended, however, to replace all the springs at the annual overhaul.

In case of a sudden spring fracture, all springs should be replaced even when only one spring has broken.



1. Radial buffer
2. Buffer spring
3. Ball bearing housing

5.4.10 Ball bearing housing

- Defective contact surfaces for the buffers on the ball bearing housing may give rise to machine vibration (rough bowl running).

Examine the contact surface for the buffers (1) on the ball bearing housing (3). In case of defects (indentations deeper than 0,1 mm) replace the housing as well as buffers and springs.

5.4.11 Worm wheel and worm; wear of teeth

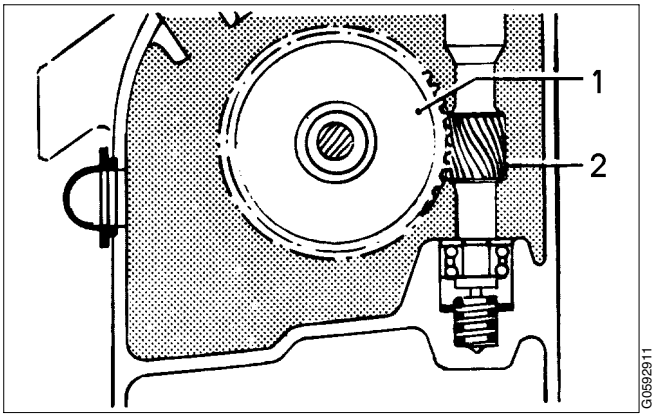
Check the teeth of worm wheel and worm for wear.

See “5.4.12 Tooth appearance examples” on page 65.

Examine the contact surfaces and compare the tooth profiles. The gear may operate satisfactorily even when worn to some degree.

NOTE

Replace both worm wheel and worm at the same time, even if only one of them is worn.



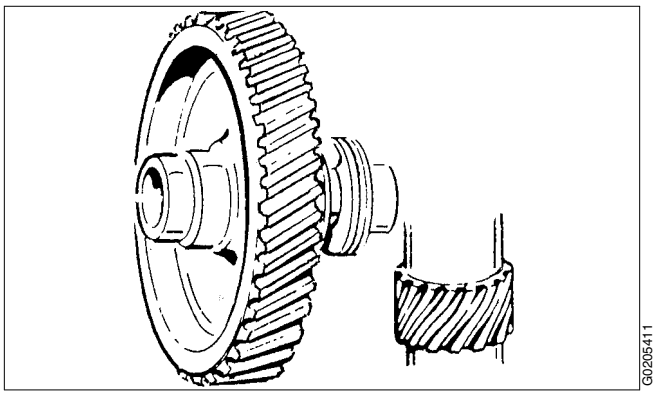
1. Worm wheel
2. Worm (part of bowl spindle)

NOTE

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

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

In all these cases it is imperative to change to a high-temperature oil. See chapter “8.7 Lubricants” on page 124.



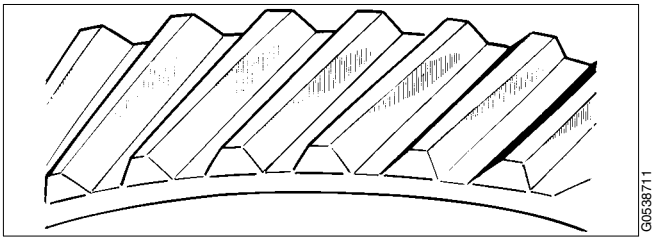
Inspect the gear for deposits and pits

5.4.12 Tooth appearance examples

Satisfactory teeth:

Uniform wear of contact surfaces. Surfaces are smooth.

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

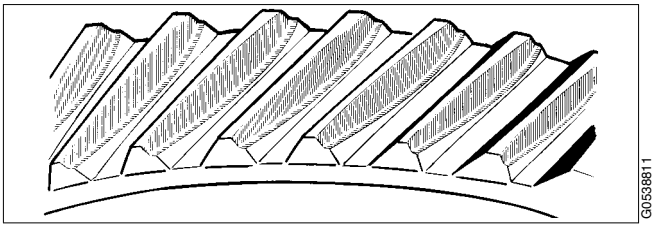


Satisfactory teeth

Worn teeth:

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

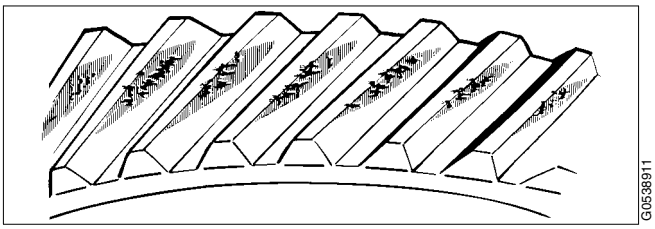
- the wear is uniform over the whole of the flank of a tooth
- and all teeth are worn in the same way.



Worn teeth

Spalling:

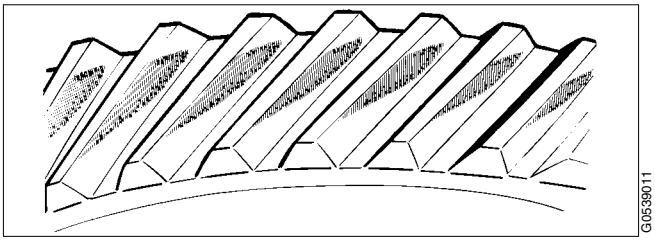
Small bits of the teeth have broken off, so-called spalling. This is generally due to excessive load or improper lubrication. Damage of this type need not necessitate immediate replacement, but careful checking at short intervals is imperative.



Spalling

Pitting:

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

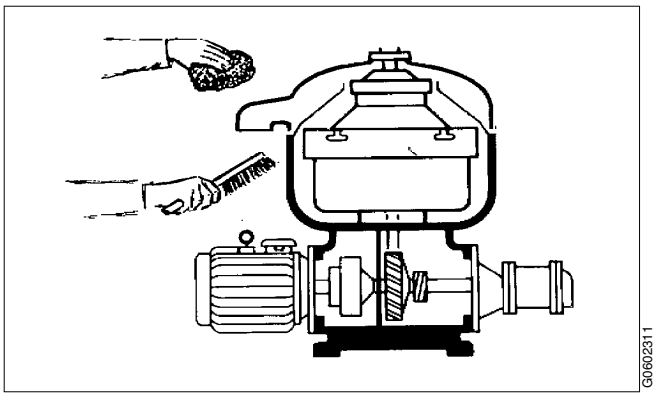


Pitting

5.5 Cleaning

5.5.1 External cleaning

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



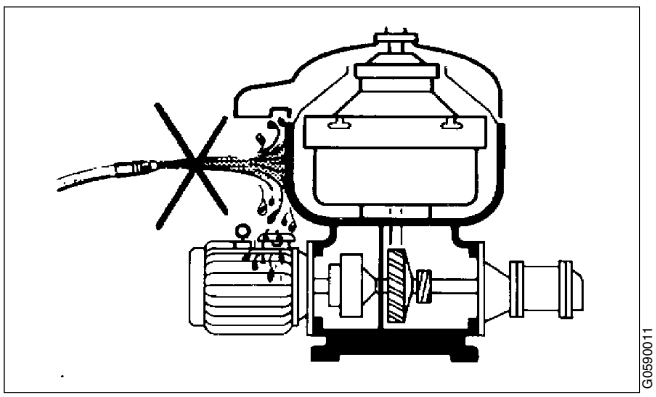
Use a sponge or cloth and a brush when cleaning

Never wash down a separator with a direct water stream.

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

- Some 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.



Never wash down a separator with a direct water stream. Never play a water jet on the motor

5.5.2 Cleaning agents

When using chemical cleaning agents, make sure you follow the general rules and supplier's 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 of fuel oil separators has been developed for this purpose. The liquid is water soluble, non-flammable and does not cause corrosion of brass and steel. It is also gentle to rubber and nylon gaskets in the separator bowl.

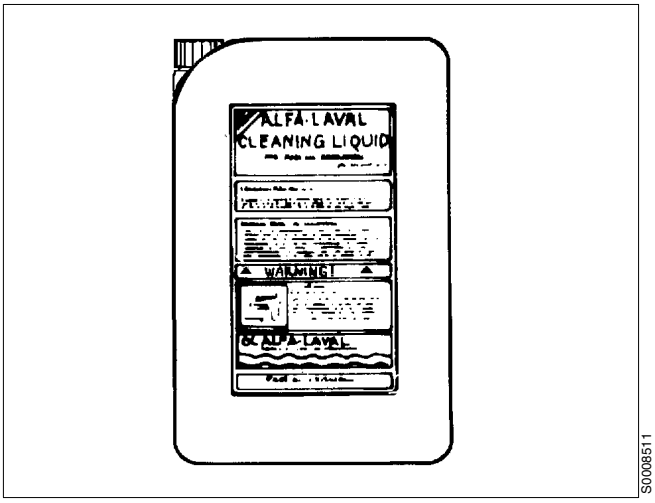
  Before use, dilute the liquid with water to a concentration of 3-5%. Recommended cleaning temperature is 50-70 °C.

CAUTION

Skin irritation hazard

Read the instructions on the label of the plastic container before using the cleaning liquid.

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



Alfa Laval cleaning liquid for lube oil separators is available in 25-litre plastic containers.

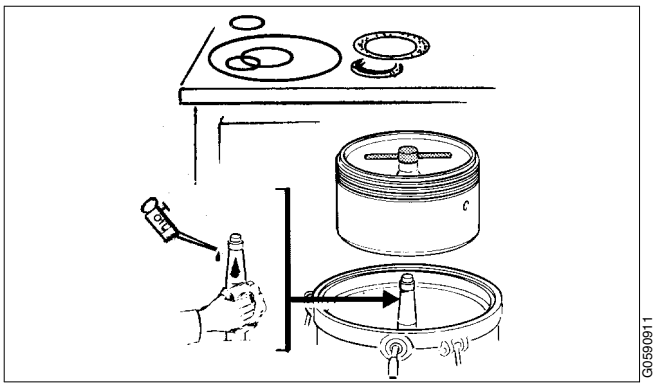
Alfa Laval cleaning liquid for fuel oil separators is available in 5-litre plastic containers.

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.



Oil parts to protect from corrosion

5.5.3 Cleaning of bowl discs

Bowl discs

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

NOTE

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

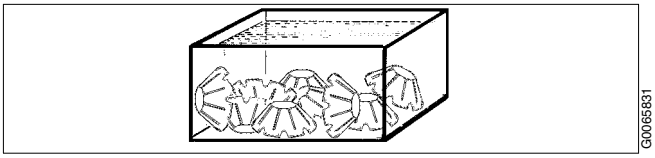
A gentle chemical cleaning is therefore preferable to mechanical cleaning.

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

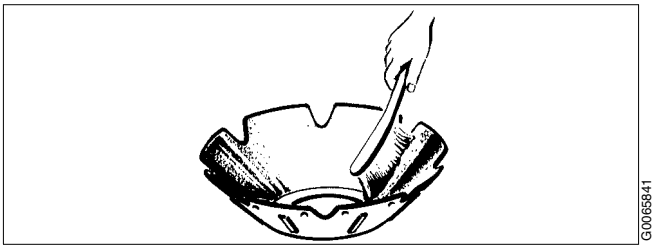
CAUTION

Cut hazard

The discs have sharp edges.



Put the discs one by one into the cleaning agent



Clean the discs with a soft brush

5.6 When changing oil

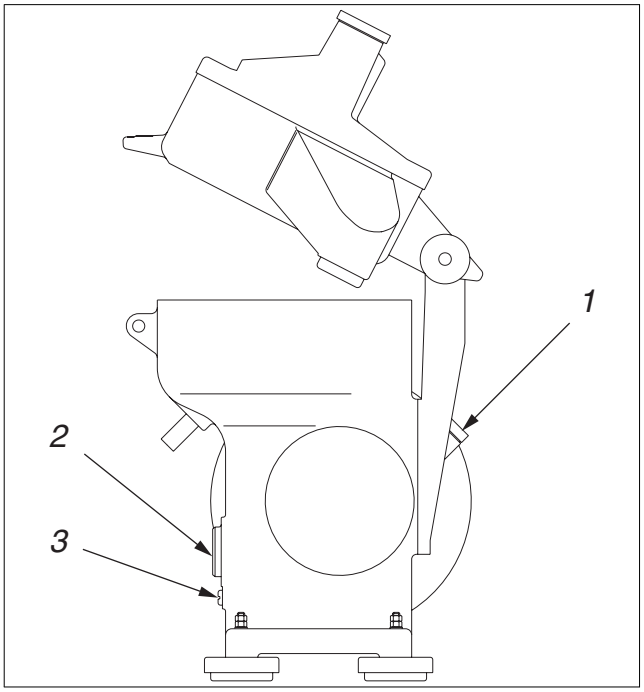
Check at each oil change

Check the teeth of both the worm wheel and worm for wear.

5.6.1 Oil change procedure

NOTE

Before adding or renewing lubricating oil in the worm gear housing, the information concerning different oil groups, handling of oils, oil change intervals etc. given in chapter “8 Technical Reference” on page 111 must be well known.



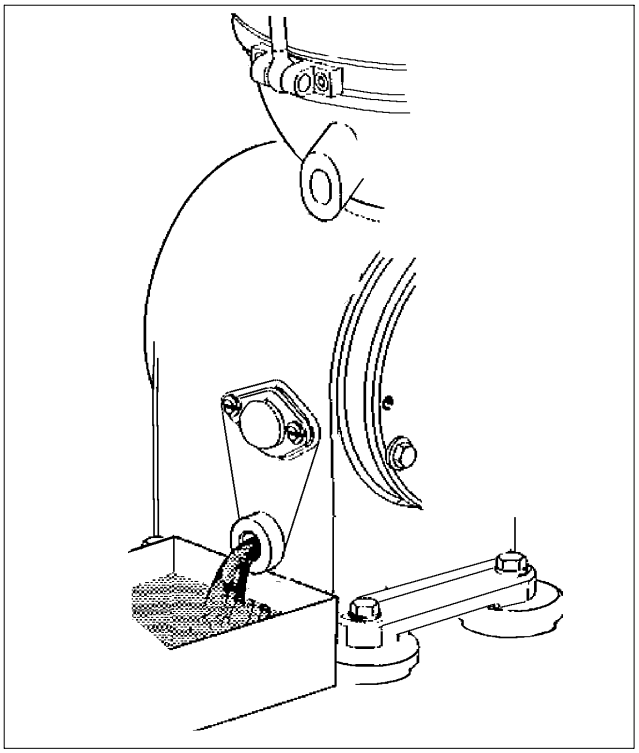
1. *Oil filling plug*
2. *Sight glass*
3. *Oil drain plug*

1. Place a collecting tray under the drain hole, remove the drain plug and drain off the oil.

CAUTION

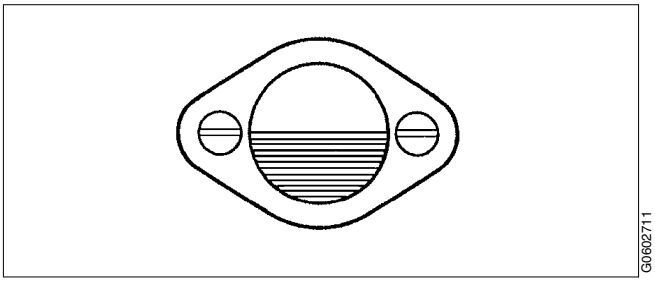
Burn hazards

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



Drain oil

2. Fill new oil in the worm gear housing. The oil level should be slightly above middle of the sight glass. See chapter “8.2 Technical data” on page 113.



Oil level in sight glass

5.7 Common maintenance directions

5.7.1 Vibration

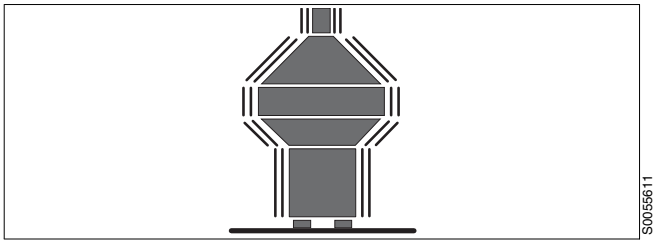
A separator normally vibrates and make noises, when it passes its critical speeds, during the start and stop periods.

It is recommended to get familiar with the normal behaviour of the machine.

Severe vibrations or noise indicates that something is incorrect. Stop the machine and identify the cause.

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

The level of vibration should not exceed maximum for separator in use (9 mm/s).



Vibration

WARNING

Disintegration hazards

When excessive vibration occurs, **keep liquid feed on** 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.

5.7.2 Ball and roller bearings

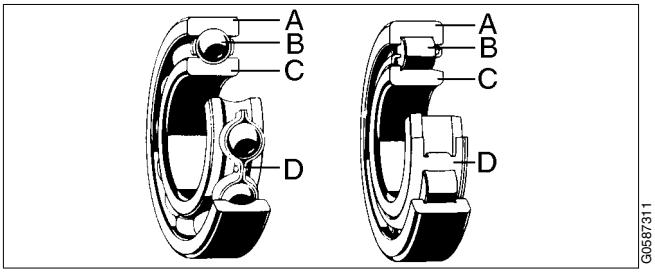
Use the greatest cleanliness when handling rolling bearings. Avoid unnecessary dismounting of bearings. Do not re-fit a used bearing, always replaced it with a new one.

Important: Specially designed bearings are used for the bowl spindle.

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

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

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



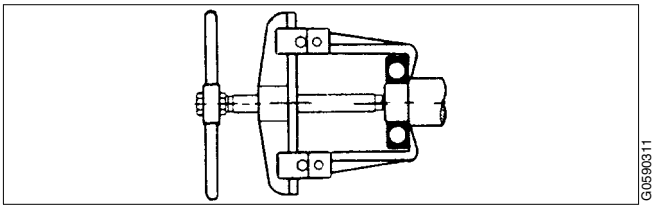
A Outer race
B Ball/Roller
C Inner race
D Cage

Dismounting

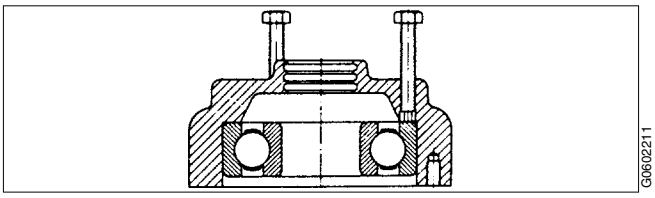
Detach the bearing from its seat by pressing against the race having the tightest fit. Use a puller or a special tool to apply the pressure to the inner race when the bearing sits tightly on the shaft, and to the outer race when the bearing is tightly fitted in the housing respectively.

Arrange dismounted bearings and other parts in assembly order to avoid confusion.

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



Use puller tool to dismount bearing

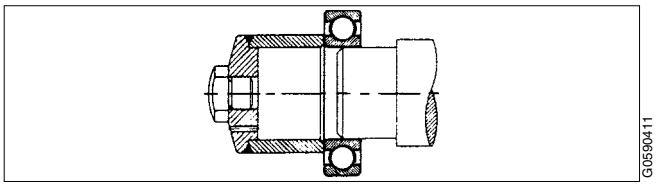


Check bearing seat

Fitting

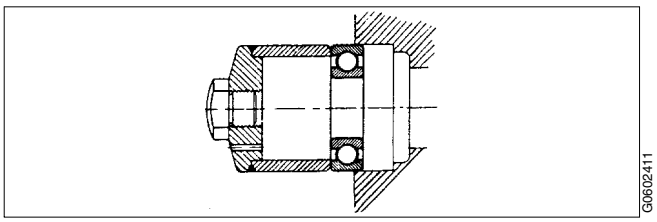
Leave new bearings in original wrapping until ready to fit. The anti-rust agent protecting a new bearing need not to be removed.

Fit a bearing on a shaft by pressure applied to the inner race and in a housing by pressure applied to the outer race. Use a suitable piece of pipe or a metal drift and a hammer. Never strike the bearing directly.



Use assembly tools

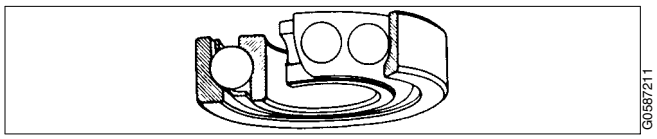
Bearings sitting with tight fit on a shaft should be heated in oil before assembly. The oil temperature should not exceed 125 °C. Never leave the bearing in the oil bath longer than required for thorough heating.



Use assembly tool

Angular contact ball bearings

Always fit single-row angular contact ball bearings with the stamped side of the inner race facing the axial load.

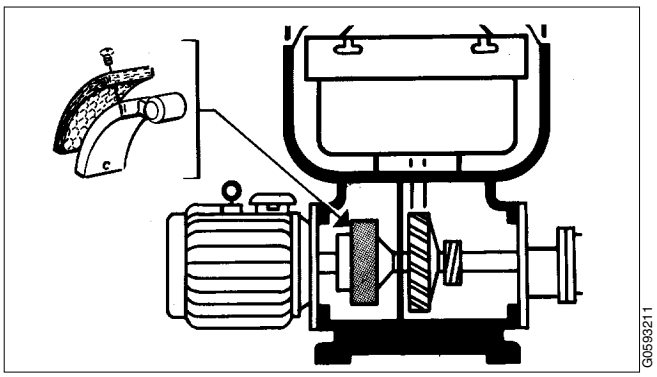


Angular contact bearing must be assembled correctly

5.7.3 Friction coupling

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

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

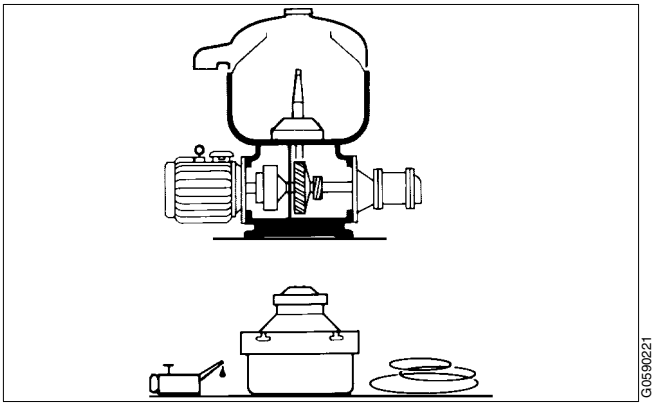


Friction coupling

5.7.4 Shutdowns

,If 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 77.



Preparation for shutdown

NOTE

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

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

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

- Protect cleaned carbon steel parts against corrosion by oiling. Separator parts that are not assembled after cleaning must be wiped and protected against dust and dirt.
- The O-rings should be removed.
- If the separator has been shut down for more than 12 months, a Major Service (MS) should be carried out.

5.8 Lifting instructions

For lifting parts and assemblies of parts use lifting slings, working load limit (WLL): 300 kg.

Lifting the separator

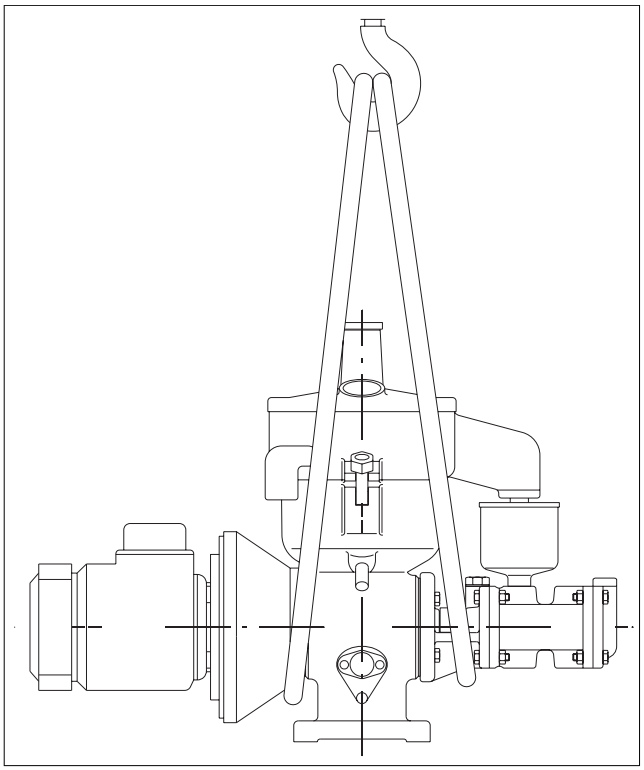
1. Remove the separator bowl.
2. Attach endless slings or cables around the separator as the image to the right show.
3. Lift and handle with care.

NOTE
Remove the separator bowl before lifting to prevent bearings to be damaged.

WARNING

Crush hazards

A dropped separator can cause accidents resulting in serious injury to persons and damage to equipment.



Do not lift the separator in any other way
Weight to lift 34 kg.

6 Dismantling/Assembly

Contents

6.1 General

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.

6.1.1 References to check points

In the text you will find references to the check point instructions in Chapter 5. The references appear in the text as in the following example:

✔ **Check point**
"5.3.4 Lock ring; wear and damage" on page 56.

In this example, look up check point "5.3.4 Lock ring; wear and damage" on page 56 for further instructions.

6.1.2 Tools

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

NOTE

For lifting parts and assemblies of parts use lifting slings, working load limit (WLL): 300 kg

6.2 Dismantling - (IS)

To avoid accidental start, switch off and lock power supply.

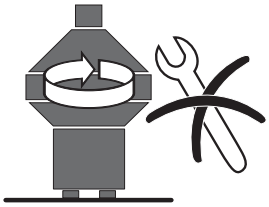
S0051011

WARNING

Entrapment hazards

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

The motor fan indicates if separator parts are rotating or not.

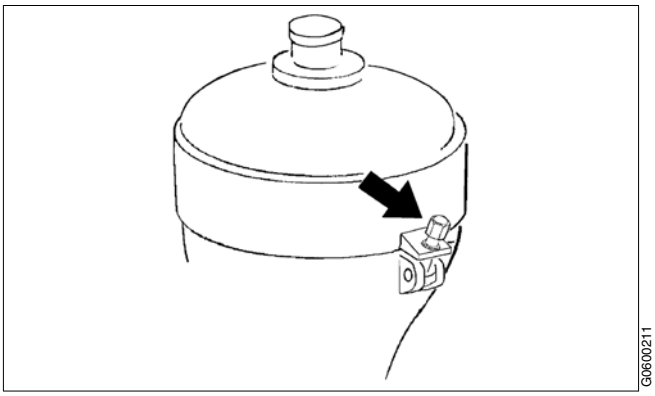


S0051111

6.2.1 Bowl

1. Be sure the bowl has stopped rotating.
   Check if motor fan has stopped.

2. Loosen the cap nuts and open the collecting cover.



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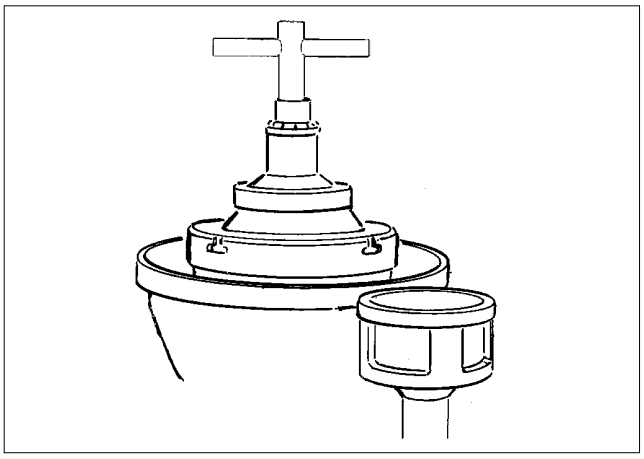
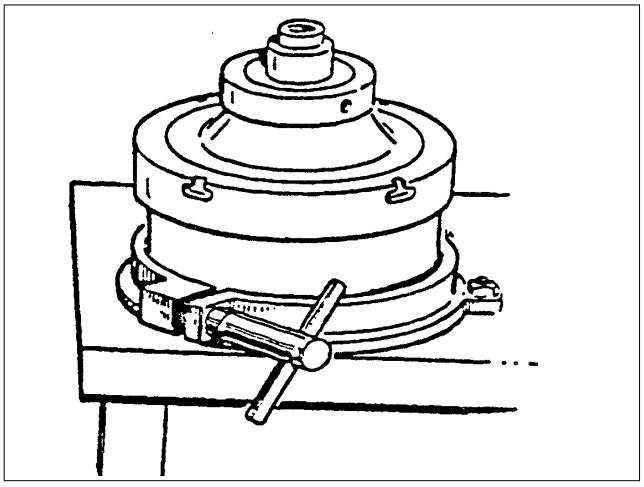
3. Unscrew bowl cap nut using socket spanner.

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

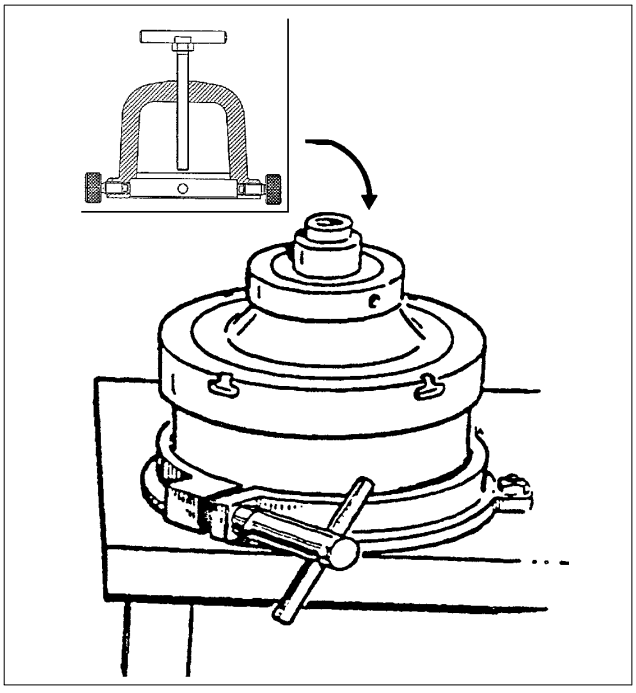

G0595041

4. Lift out separator bowl and place it in bowl holder and secure.


G0595151

5. Unscrew the small lock ring by using the special tool, “Spanner for small lock ring”.

   Left hand thread!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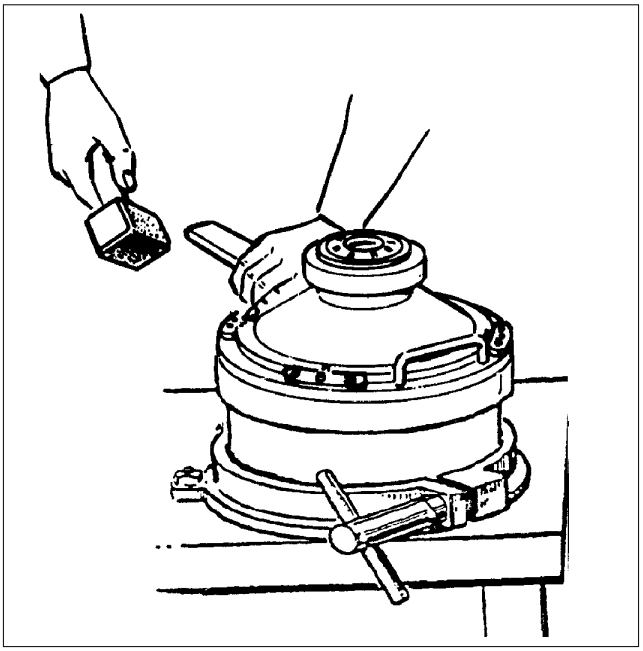
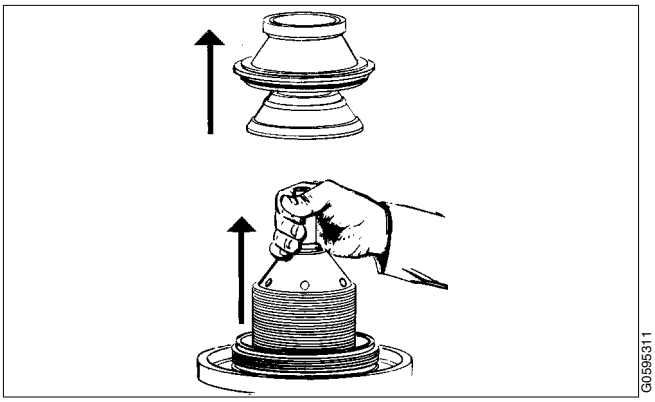
6. Unscrew the large lock ring by using the special tool; “Spanner for lock ring” and a tin hammer.

   Left hand thread!



7. Lift off gravity disc.



NOTE

If the gravity disc has to be replaced owing to changed operating conditions, see “8.2.1 Gravity disc nomogram” on page 114.

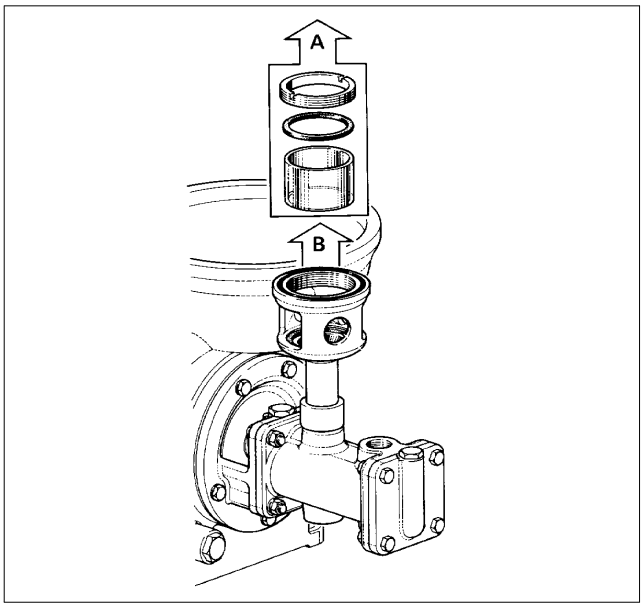
Lift out the top disc, disc stack and distributor.

CAUTION

Cut hazard

The discs have sharp edges.

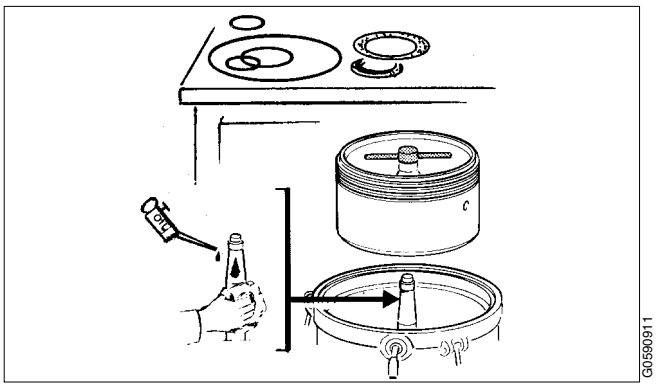
8. Remove the outlet parts.



Outlet parts

9. Soak and clean all parts thoroughly in suitable cleaning agent, see “5.5 Cleaning” on page 66. Remove O-rings and replace them with spares from the major service kit.

✔ **Check point**
“5.3.1 Corrosion” on page 52,
“5.3.2 Erosion” on page 54,
“5.3.3 Cracks” on page 55.



Clean the parts

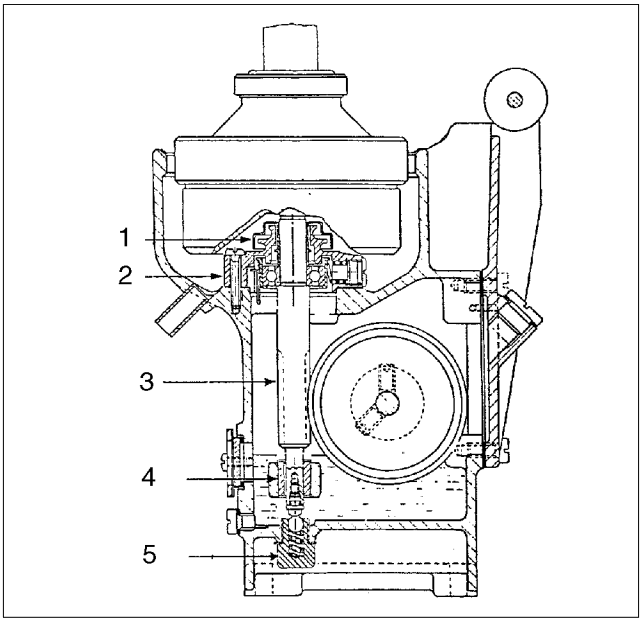
6.3 Dismantling - (MS)

6.3.1 Vertical driving device

Remove the outlet housings, feed and discharge pumps and raise the collecting cover. Remove also the separator bowl.

Before dismantling, in the case of 8000 hours service, or if the separator vibrates while running:

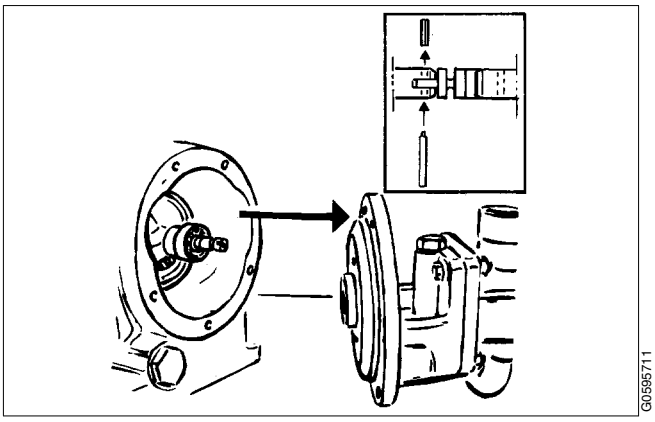
✔ **Check point**
"5.4.5 Radial wobble of bowl spindle" on page 59.



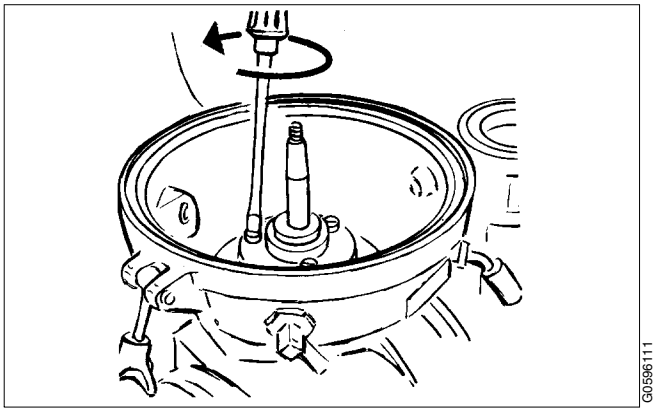
1. Throw off collar
2. Top bearing
3. Worm spindle
4. Upper bushing
5. Bottom bushing

MS-kit: The upper bushing is tapered and should be driven out of the bottom of the frame. When re-inserting this bushing, drive it home, but do not use excessive force.

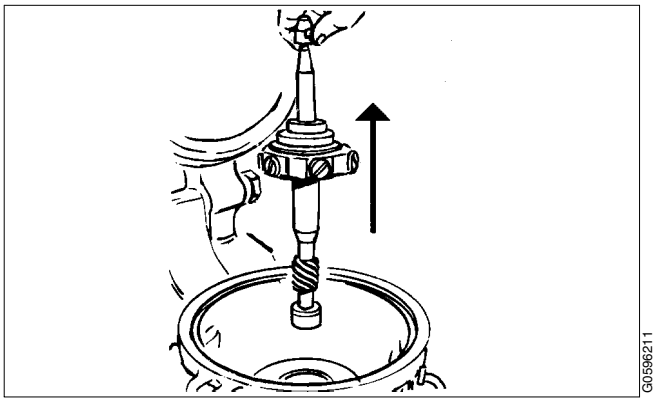
1. Remove the pump assembly. Knock the tubular pin out of the pump coupling and worm wheel shaft. Inspect the bushings and the wear of seals.



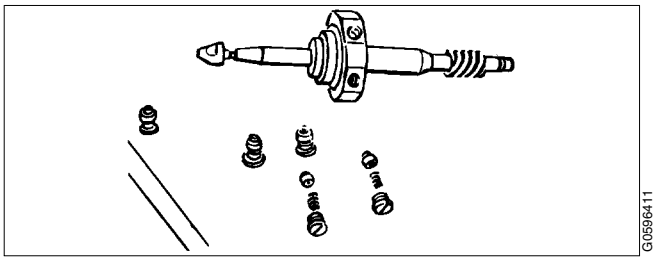
2. Loosen the top bearing holder.



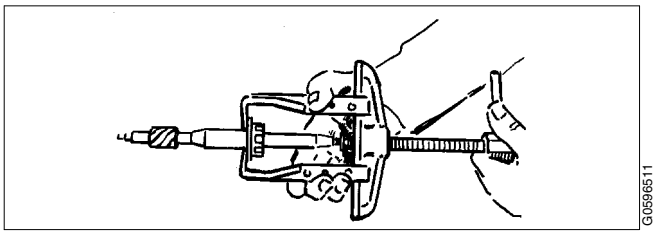
3. Fit the cap nut to the spindle top and lift the spindle.



4. Loosen and inspect the buffer springs.



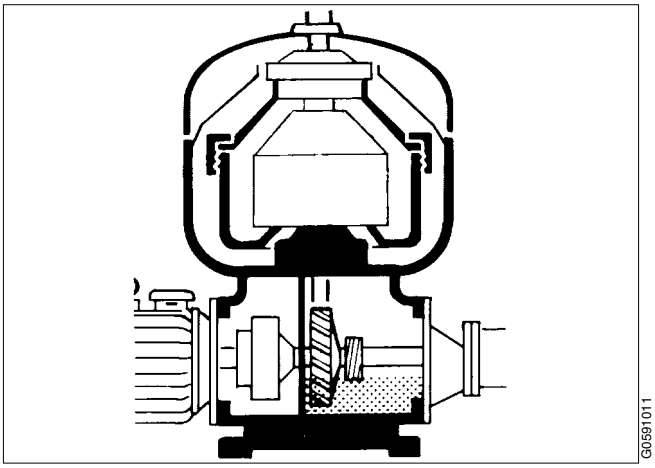
5. Pull off the upper ball bearing (together with sleeve).



NOTE

Always discard a used bearing.

6. Every 3 years: clean the oil sump.



7. Clean all dismantled parts thoroughly in a degreasing agent and check for damage and corrosion.

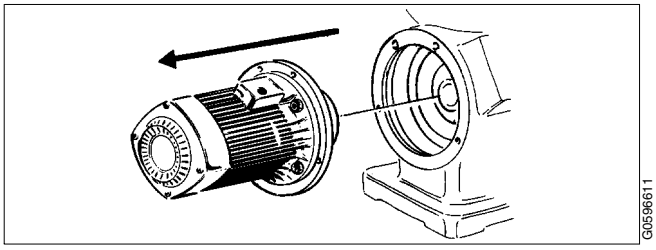
✔ **Check point**

“5.3.1 Corrosion” on page 52.

Replace all parts supplied in the spare parts kit.

6.3.2 Horizontal driving device

1. Remove the motor.



2. Renew the pads on the friction blocks.

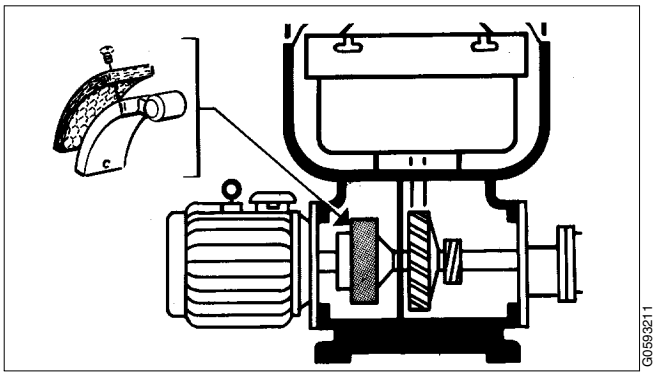
   When refitting the blocks make sure the arrow on each block points in the same direction of rotation. See the arrow on the frame.

   Secure the blocks with washer and split pin.

   If the friction elements are worn: fit new ones.

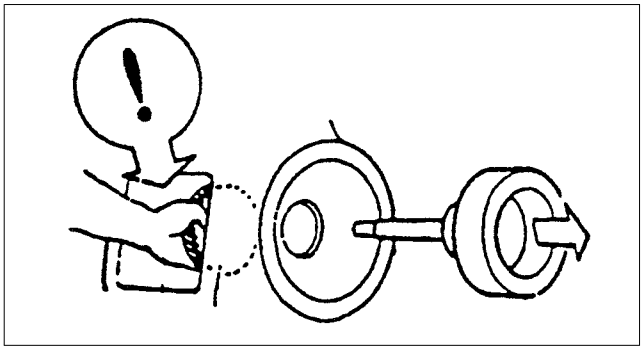
   Replace all friction elements even if only one is worn.

   If the friction elements are only greasy: clean the friction elements and the inside of the coupling drum with a degreasing agent.

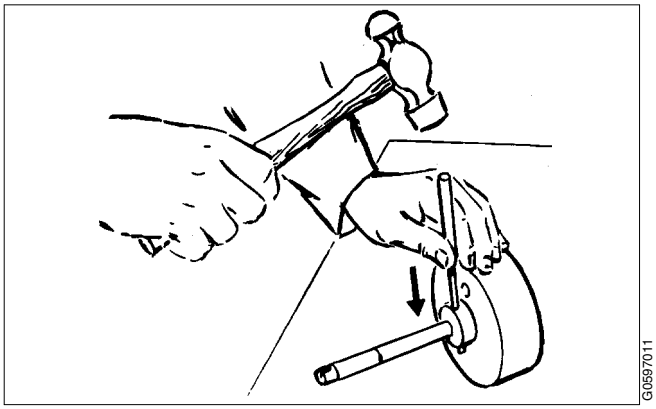


3. Remove the worm wheel shaft from frame.

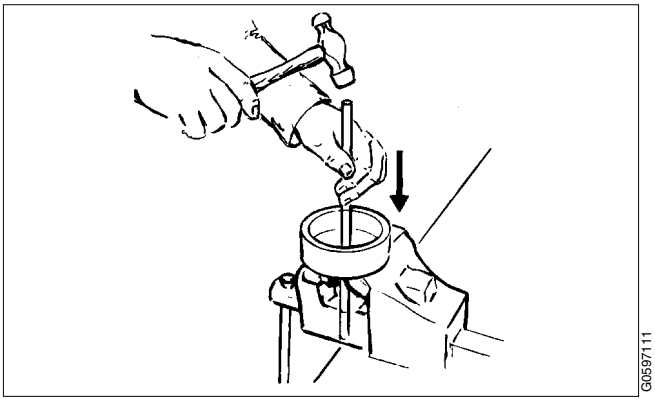
   Be careful not to drop the worm wheel into the gear housing.



4. To replace coupling drum or worm wheel shaft force out the spring pin and gently knock out the shaft.



5. Knock out the horizontal spindle.



6.4 Assembly - (MS)

Clean all parts in a degreasing agent and replace parts supplied in the Spare parts kits.

✔ **Check point**
“5.3.1 Corrosion” on page 52,
“5.3.2 Erosion” on page 54,
“5.3.3 Cracks” on page 55,
“5.4.9 Top bearing springs” on page 63,
“5.4.10 Ball bearing housing” on page 63,
“5.4.11 Worm wheel and worm; wear of teeth” on page 64.

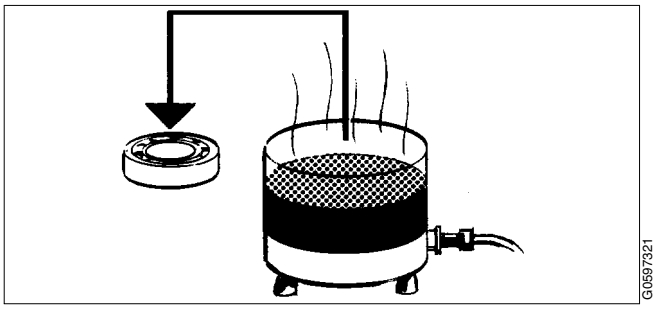
6.4.1 Vertical driving device

Before assemble the bowl spindle, make sure the relevant checks have been carried out.

Wipe off and oil the bearing seat before fitting the ball bearing.

Inspect the tapered end of the bowl spindle and assemble ball bearings.

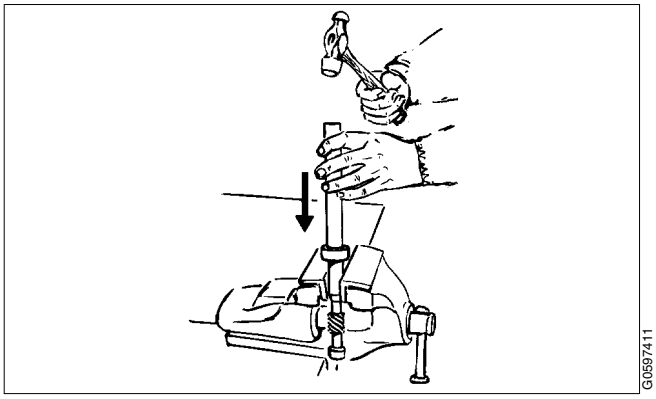
Heat the new ball bearings in oil to maximum 125 °C.



NOTE

Always fit new bearings.

1. Fit the bearing and ball bearing sleeve onto the shaft.

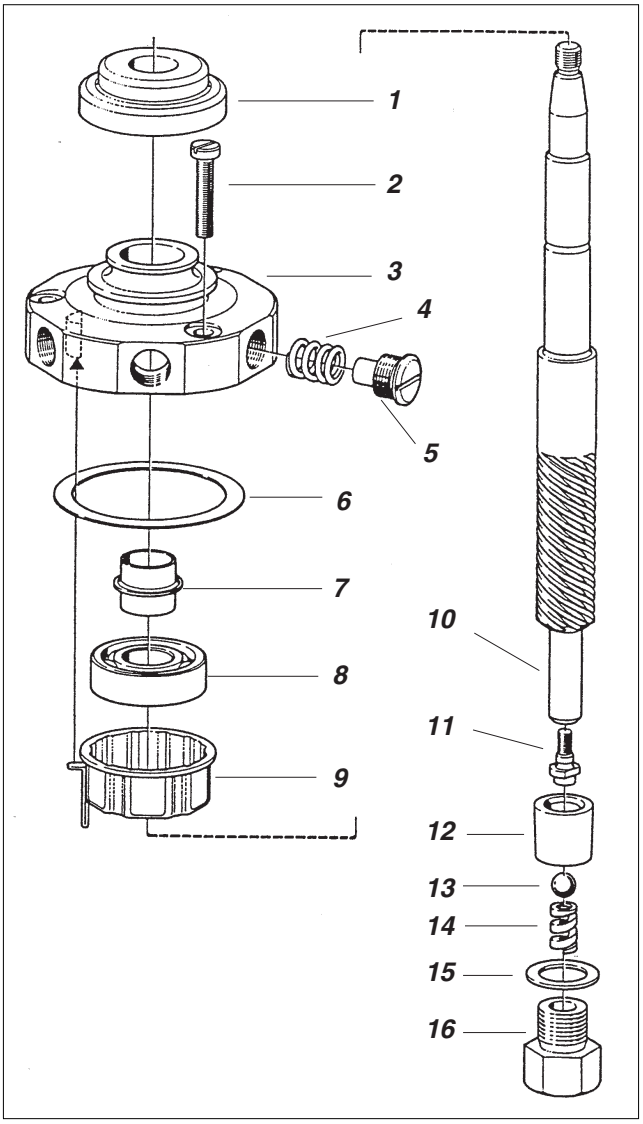


CAUTION

Burn hazards

Use protective gloves when handling the heated bearings.

2. Fit the spacing sleeve (7), packing (6) and spring casing (3) to the spindle.

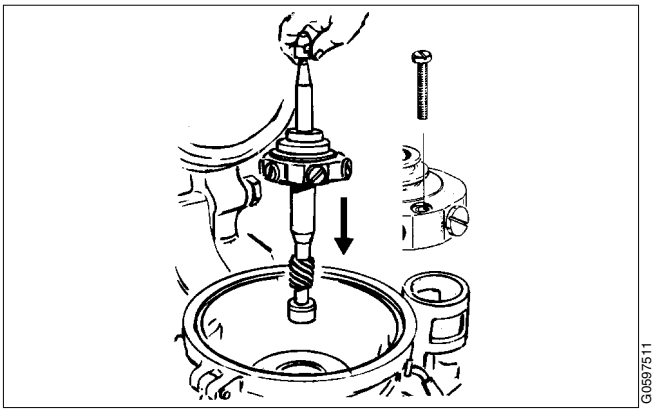


3. Tighten the buffer springs (4) with the screw plugs (5) against the ball bearing sleeve (9).

4. Fit the throw off collar (1) to the spindle.

5. Lower the spindle into position.

   Check for impact marks on the spindle cone and in the bowl body nave.



✔ **Check point**
"5.4.6 Bowl spindle cone and bowl body nave" on page 60.

NOTE

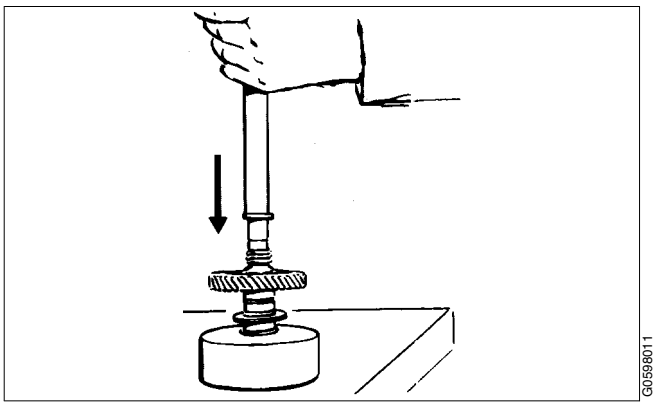
At assembly, turn the machined end of top bearing springs towards the ball bearing sleeve. Make sure that the oil groove in the upper bushing is clean.

6.4.2 Horizontal driving device

1. Clean the worm wheel shaft and the inner surface of the worm wheel nave thoroughly.

2. Push the worm wheel into its position on the shaft.

   Knock with a brass sleeve on end of wheel. Observe holes for spring pin.



   Count the number of teeth! See Chapter “8 Technical Reference” on page 111.

WARNING

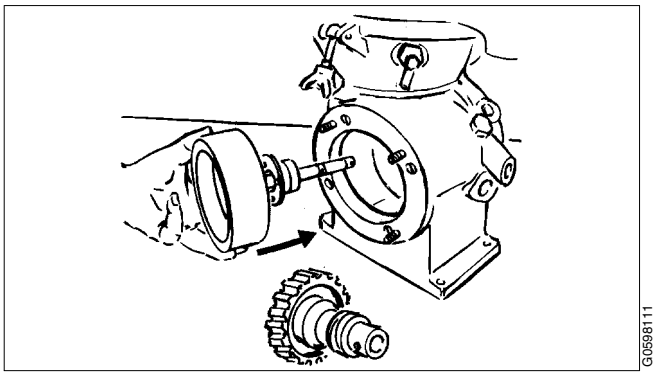
Disintegration hazard

When replacing the gear, always make sure that the new worm wheel and worm have the same number of teeth as the old ones.

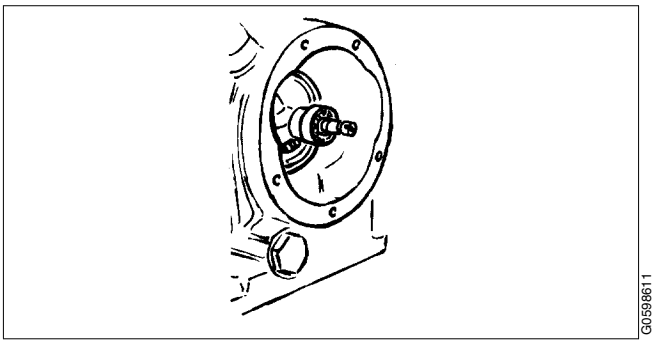
3. Check with the conical pin to get the larger side of holes in same direction, when holes coincide, mark the parts to facilitate the fitting. Remove worm wheel from shaft.

4. Clean the bushing housing in the frame and oil the outer race of the bushings.

   Force the worm wheel shaft into its position in the frame and apply worm wheel to shaft, check so that the bushings enters correctly. Re-assembly conical pin to secure worm wheel.

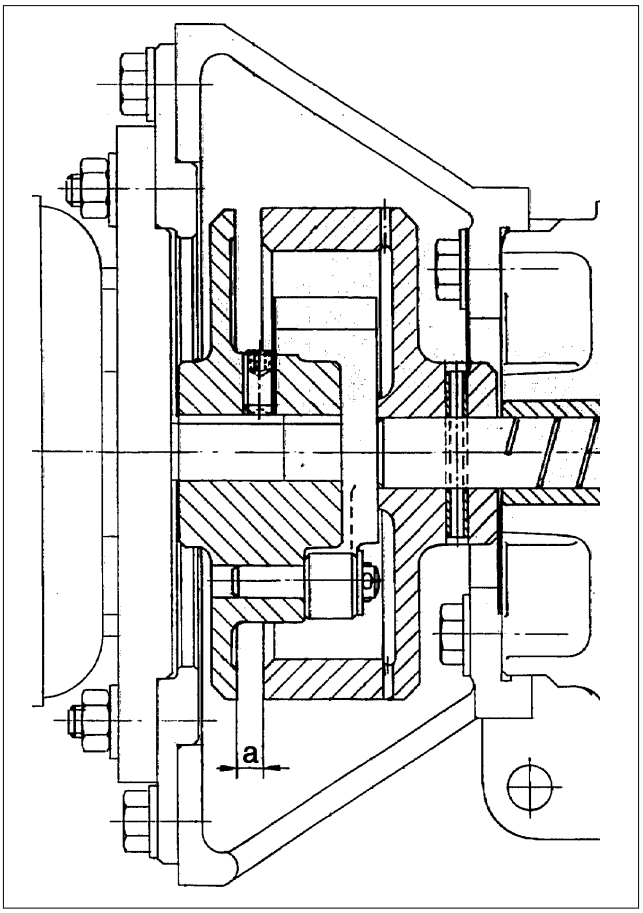


5. Fit pump and shear pin coupling.
   See “6.6.1 Exchange of shear pin coupling” on page 97.



6. If the coupling disc has been loosened without first marking its position on the motor shaft, the correct position "a" for position of coupling disc must be determined again.

✔ **Check point**
“5.4.7 Coupling disc of motor” on page 61.

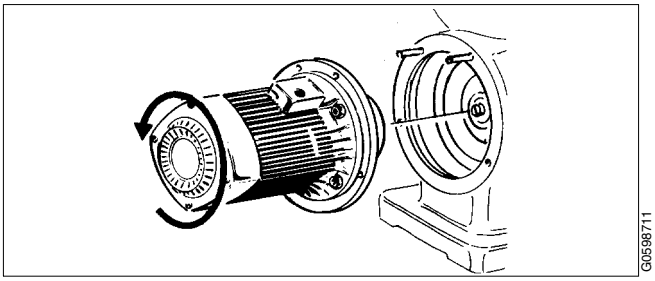


7. Fit the motor.

WARNING

Disintegration hazards

When power cables have been connected, always check direction of rotation. If incorrect, vital rotating parts could unscrew causing disintegration of the machine.



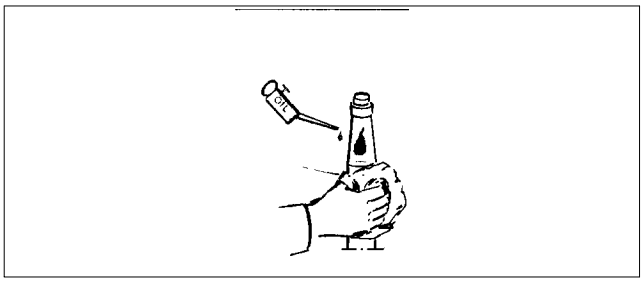
6.5 Assembly - (IS)

6.5.1 Bowl

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

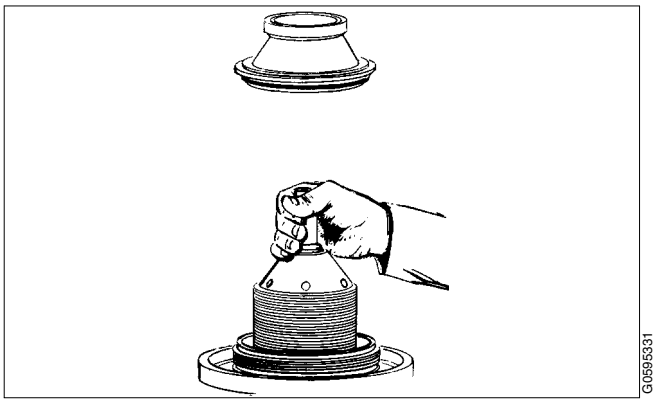
✔ **Check points**
“5.4.6 Bowl spindle cone and bowl body nave” on page 60.

1. Wipe off spindle top and nave bore in the bowl body. Apply a few drops of oil onto the taper, smear it over the surface and wipe it off with a clean cloth.

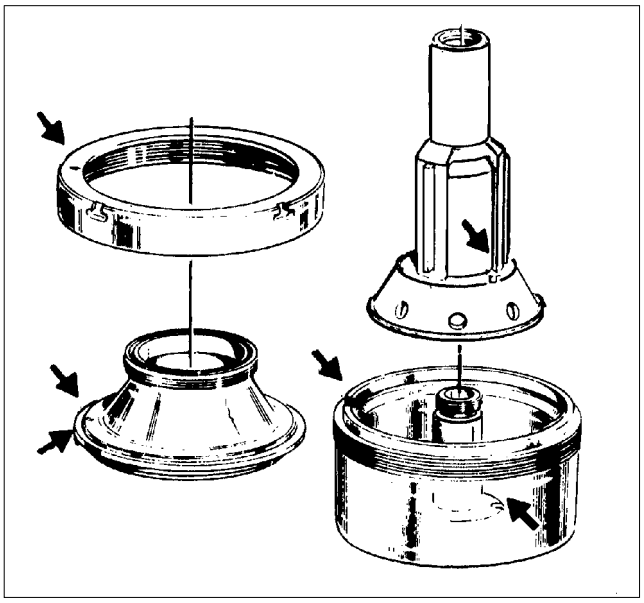


2. Before assemble the bowl discs, check the threads of the bowl hood and bowl body.

✔ **Check point**
“5.3.4 Lock ring; wear and damage” on page 56.

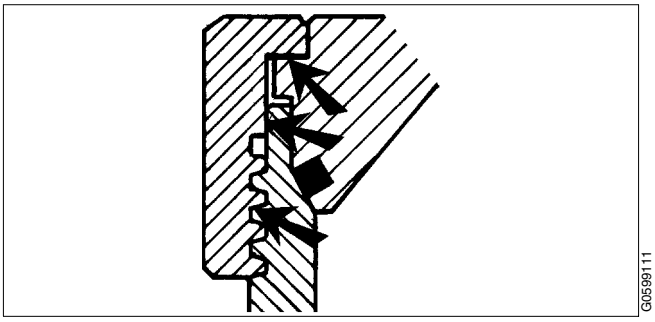


3. Fit bowl hood into position. Make sure guides are correctly located.

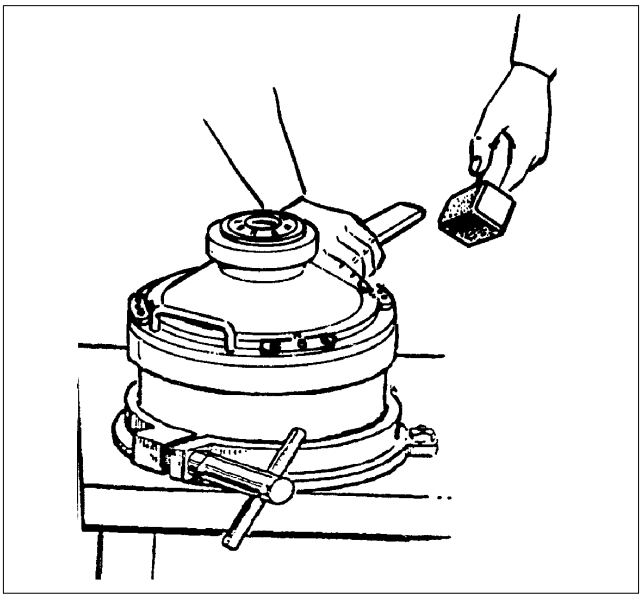


4. Degrease lock ring threads, contact and locating faces (see arrows above). Apply Lubrication paste to the threads and faces stated.

   Brush in the paste according to the manufacturer's direction.



5. Secure the bowl from rotating in bowl holder.

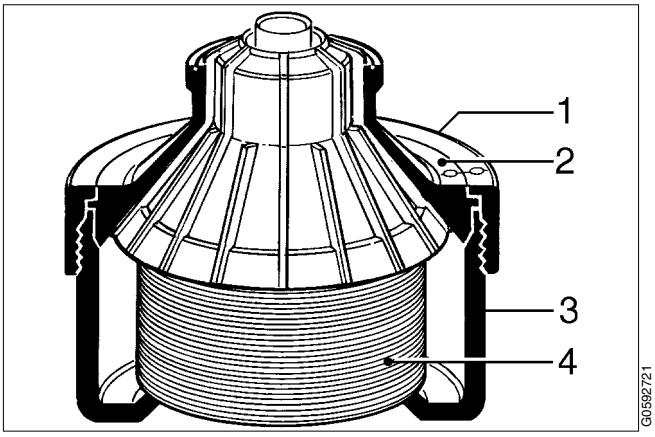


6.5.2 Disc stack pressure

The lock ring (1) should press the bowl hood (2) firmly against the bowl body (3). The hood in turn should exert a pressure on the disc stack (4), clamping it in place.

NOTE

Insufficient pressure in disc stack can cause out of balance vibration and reduced lifetime of ball bearings.



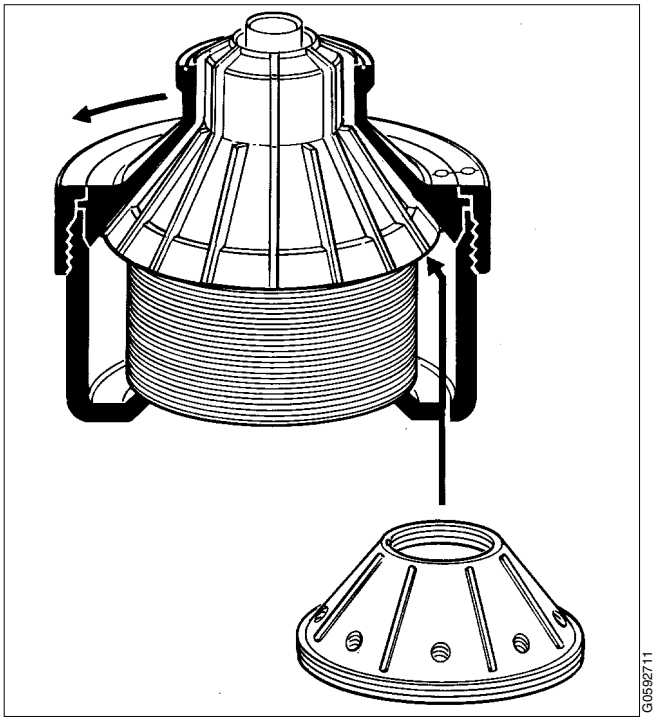
Disc stack pressure check

Compress the disc stack by tightening the lock ring, see chapter “6.5.1 Bowl” on page 92.

Correct pressure is obtained when it is possible to tighten the lock ring so far by hand that the ϕ-mark on the lock ring is positioned 60° - 90° before the mark on the bowl hood.

To achieve this, add an appropriate number of discs to the top of the disc stack beneath the top disc.

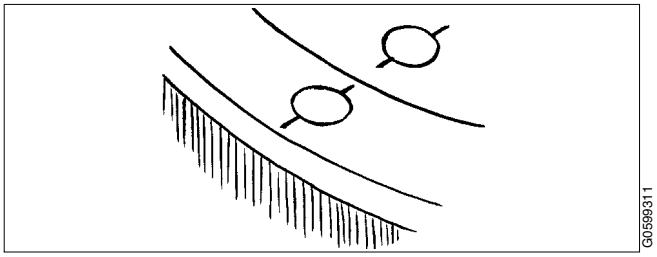
Then advance the lock ring by giving the spanner handle some blows till the ϕ-marks are passed and the bowl is fully assembled.



Add discs to achieve disc stack pressure

6. Tighten lock ring counter-clockwise (left-hand thread) until bowl hood lies tightly against bowl body (in a new bowl marks will now be in line with each other - see image).

Left-hand thread!



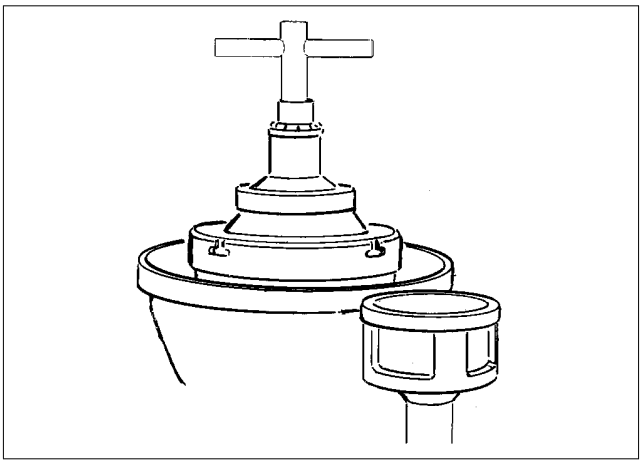
WARNING

Disintegration hazard

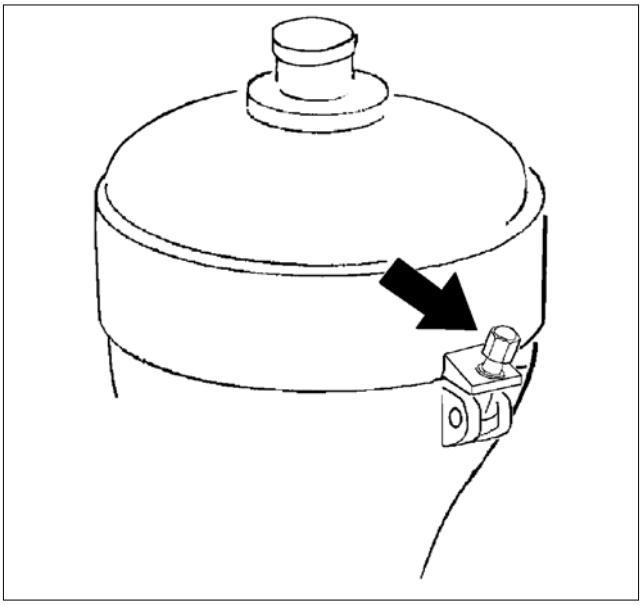
The assembly mark on the bowl hood must never pass the mark on the bowl body by more than 25° (or 25 mm).

7. Fit the bowl body on the spindle. Be careful not to damage the spindle cone.

   Screw cap nut onto the spindle. Tighten firmly.

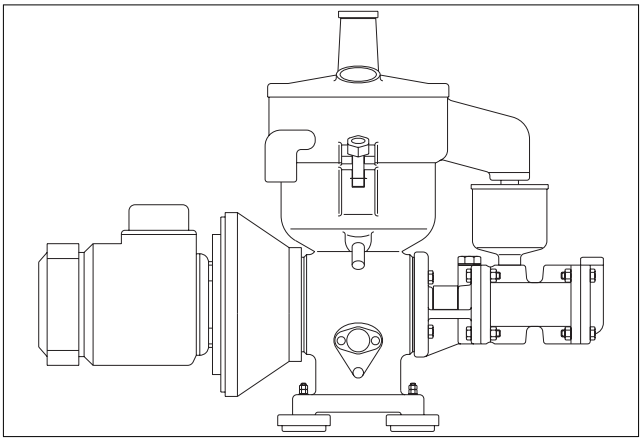


8. Tighten cap nut (B) to a maximum torque of 12 Nm.



B = Max. torque 12 Nm.

9. Fit the connecting hoses if they have been removed. Make sure to fit their gasket rings.



6.6 Feed and discharge pumps

1. Relief/safety valve:

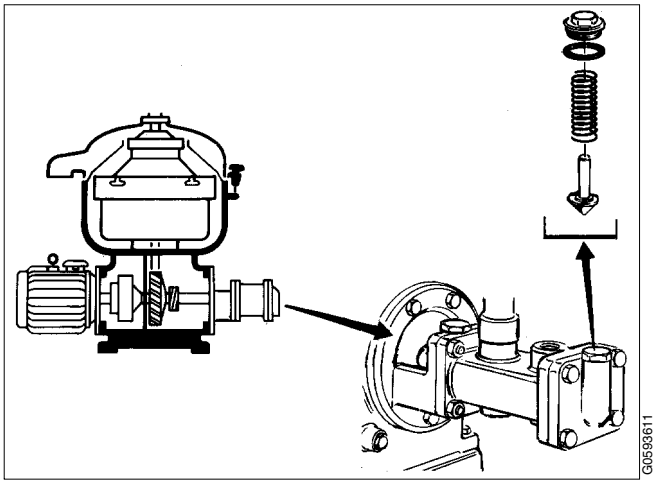
   Examine valve cone and valve seat.

2. Bushings:

   Exchange the bushings if they are scratched or there is a play between shaft and bushing.

3. Wearing seals:

   Replace the seals if the surface is rough crackled or dented by the impeller.



4. Lipseal rings:

   Replace the rings at the annual overhaul. **Important!** Turn the rings the right way round.

5. Shear pin coupling:

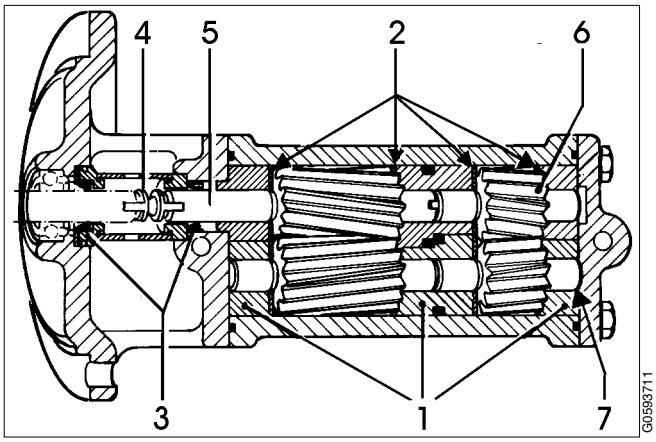
   See “6.6.1 Exchange of shear pin coupling” on page 97.

6. Impeller shaft:

   Check the groove in the impeller shaft.

7. Disengagement:

   The feed pump can be disengaged by turning the impeller (6), thereby placing the driving blade of the impeller in the recess of the shield.

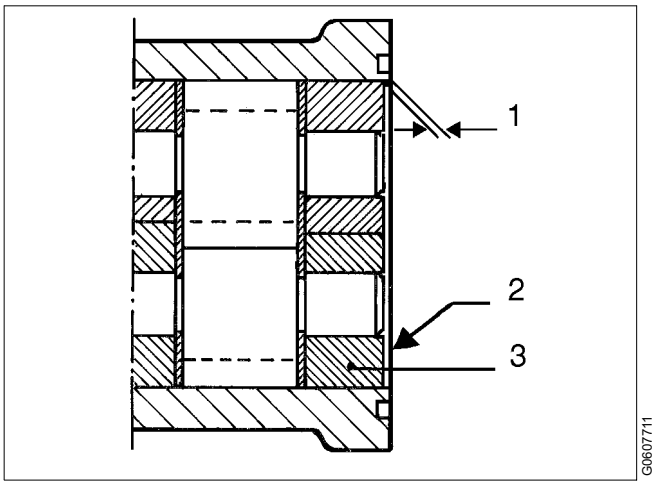


1. *Bushings*
2. *Wearing seals*
3. *Lipseal rings*
4. *Shear pin coupling*
5. *Impeller shaft*
6. *Disengagement*
7. *Axial play*

8. Axial play:

   The total axial play (1) must be 0,1 - 0,3 mm. If the play is too large even though the wearing seals have been renewed, it can be compensated by adding a brass leaf liner.

   Insert the liner at (2). If the play is too small, grind off the bearing holder (3).

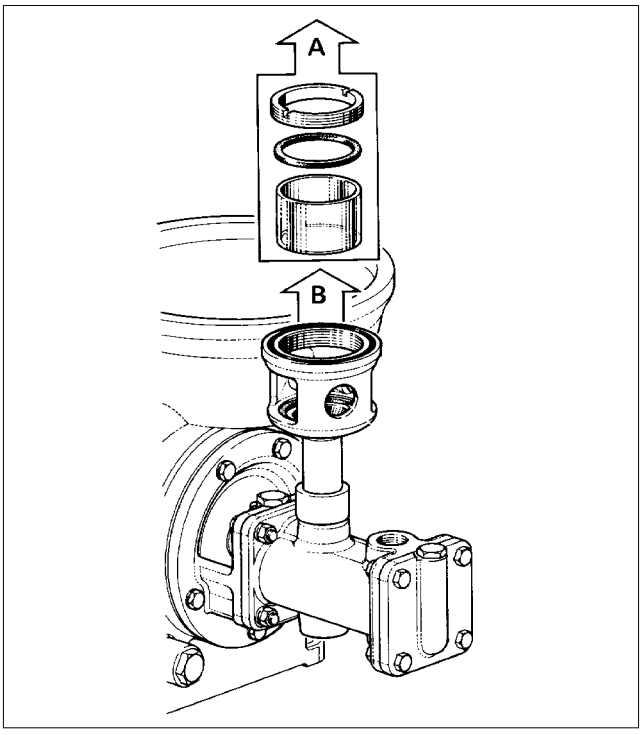


Axial play 0,1 - 0,3 mm

6.6.1 Exchange of shear pin coupling

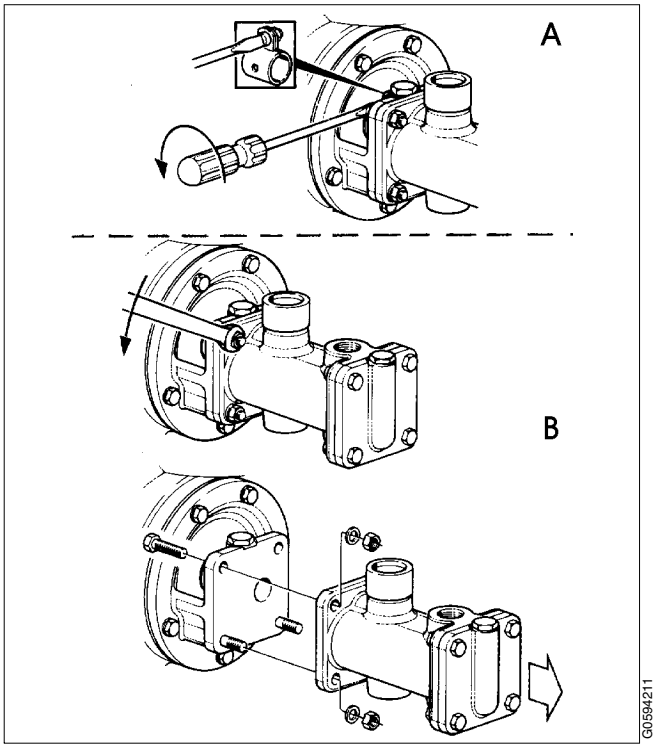
1. Remove the pipe connections of the pump. Screw off the lock ring of the sight glass. Remove the upper gasket and the sight glass.

   Lift the control housing with the lower gasket and the connecting piece.



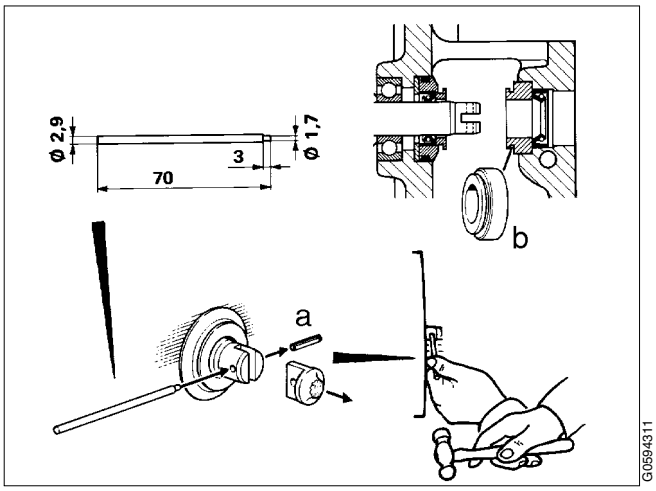
2. Remove the sleeve halves over the shear pin coupling.

   Remove the pump housing with parts.

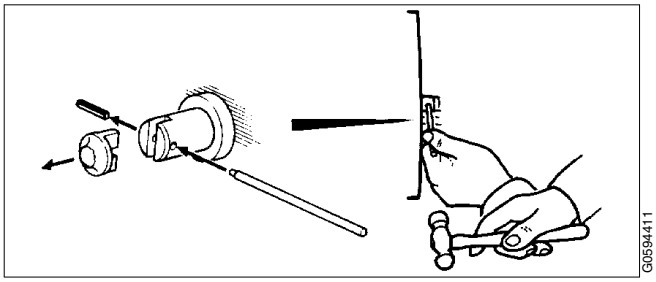


3. Drive out the tubular pin (a) from the worm wheel shaft. Use a counterstop.

   Remove the sleeve (b) from the bearing shield.



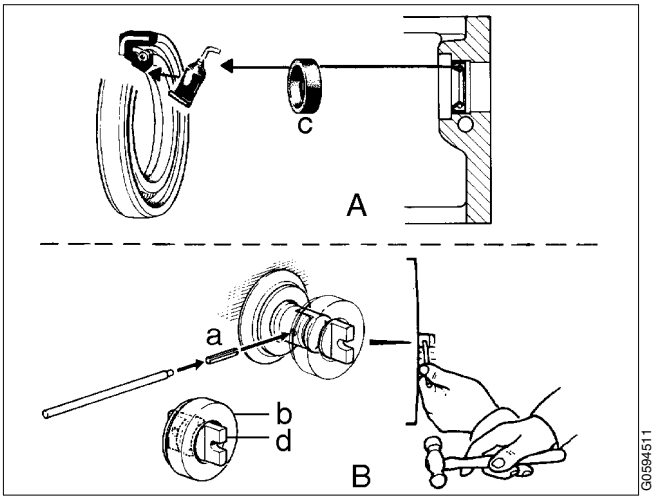
4. If the tubular pin in the impeller shaft is broken: drive out the tubular pin. Use a counterstop.



5. Check that the lipseal ring (c) is faultless.

   Should this not be the case, fit a new ring, turned the right way.

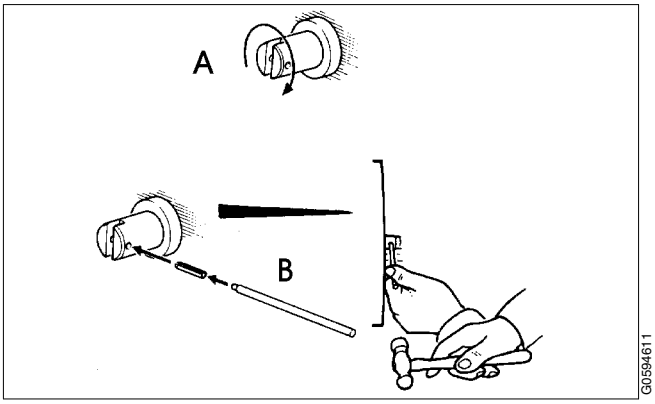
   Fit the new shear pin coupling (d) in the worm wheel shaft together with the sleeve (b). Drive the tubular pin (a) into its position. Use a counterstop.



6. Check that the impeller shaft can be revolved by hand.

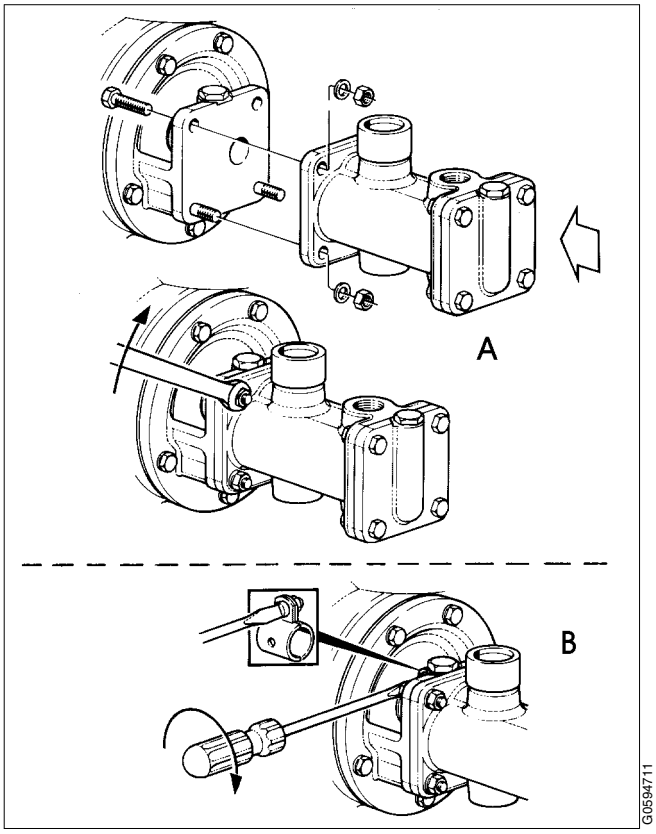
   Should this not be the case: dismantle the pump and check the parts. See “6.6.1 Exchange of shear pin coupling” on page 97.

   Drive in a new tubular pin if the old one is broken. Use a counterstop.



7. Fit the pump housing with parts. Be careful not to damage the lipseal ring.

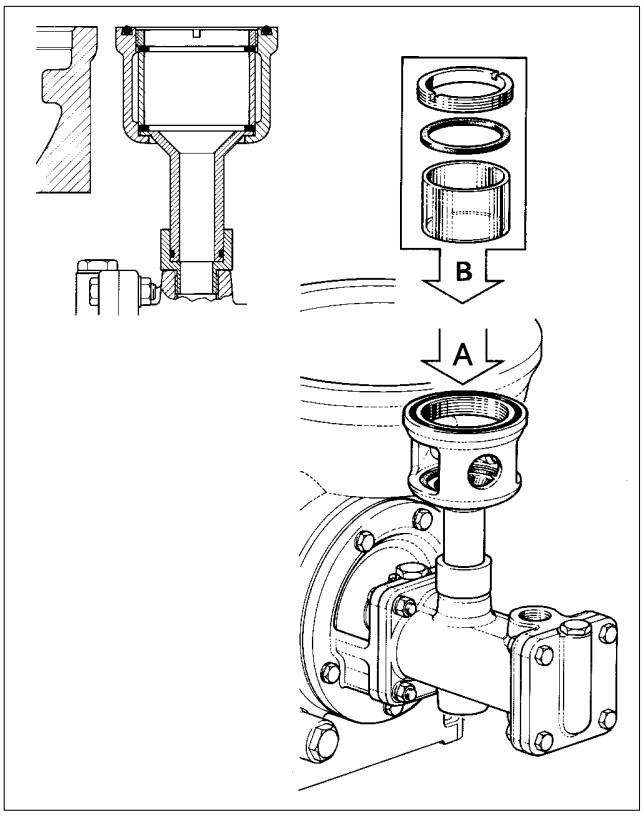
   Fit the sleeve halves over the shear pin coupling.



8. Put down the control housing with connecting piece and the lower gasket.

   Fit the sight glass and the upper gasket. Screw on the lock ring.

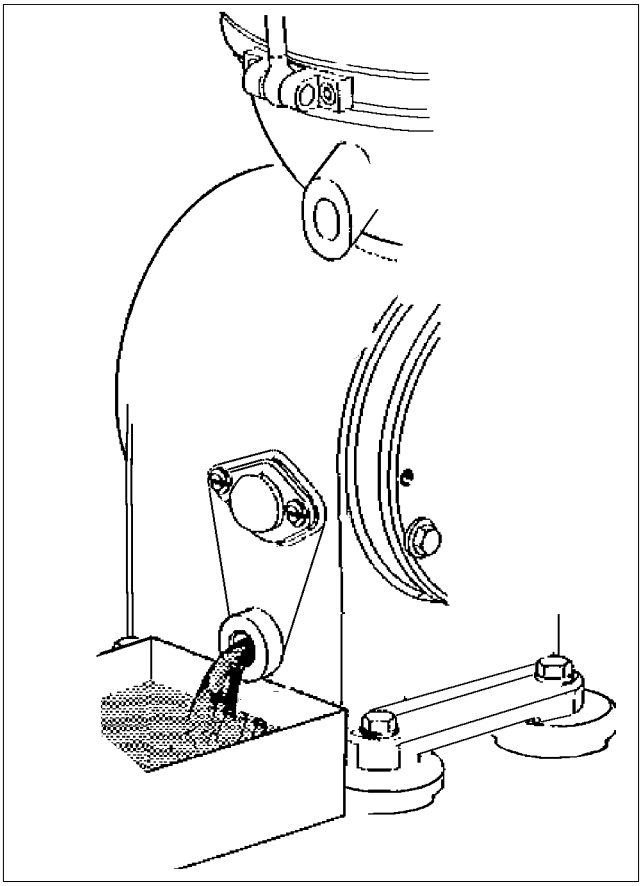
   Fasten the pipe connections of the pump.



6.7 Oil filling

NOTE
Before adding or renewing lubricating oil in the worm gear housing, the information concerning different oil groups, handling of oils, oil change intervals etc. given in chapter “8 Technical Reference” on page 111 must be well known.

1. Place a collecting tray under the drain hole, remove the drain plug to drain off the oil.

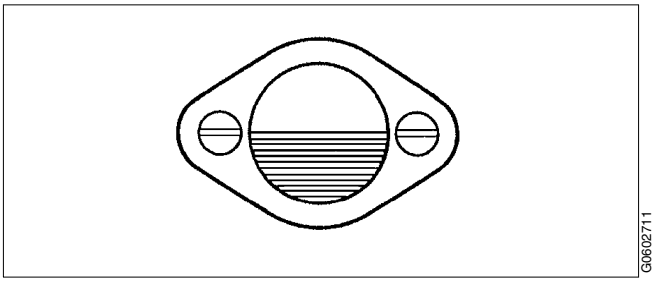


CAUTION

Burn hazards

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

2. Fill new oil in the worm gear housing. The oil level should be slightly above middle of the sight glass. For lubricating oil volume see chapter “8 Technical Reference” on page 111.



6.8 Frame feet

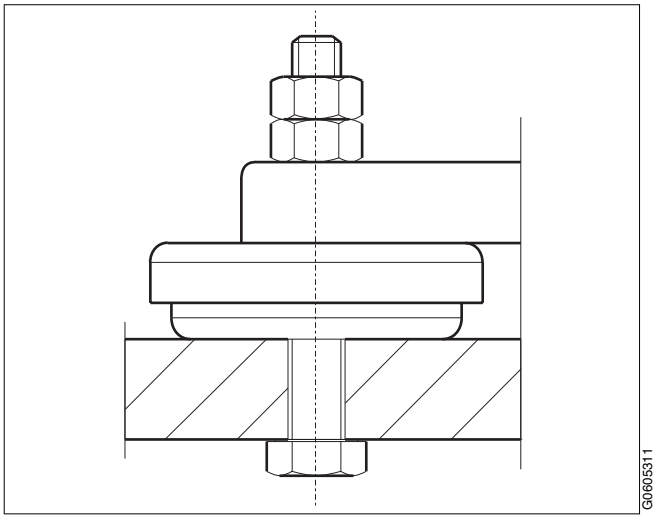
When replacing the frame feet, the separator must be lifted.

See “5.8 Lifting instructions” on page 76.

NOTE

Always remove the bowl before lifting the separator.

When lifting and moving the separator, follow normal safety precautions for lifting large heavy objects.



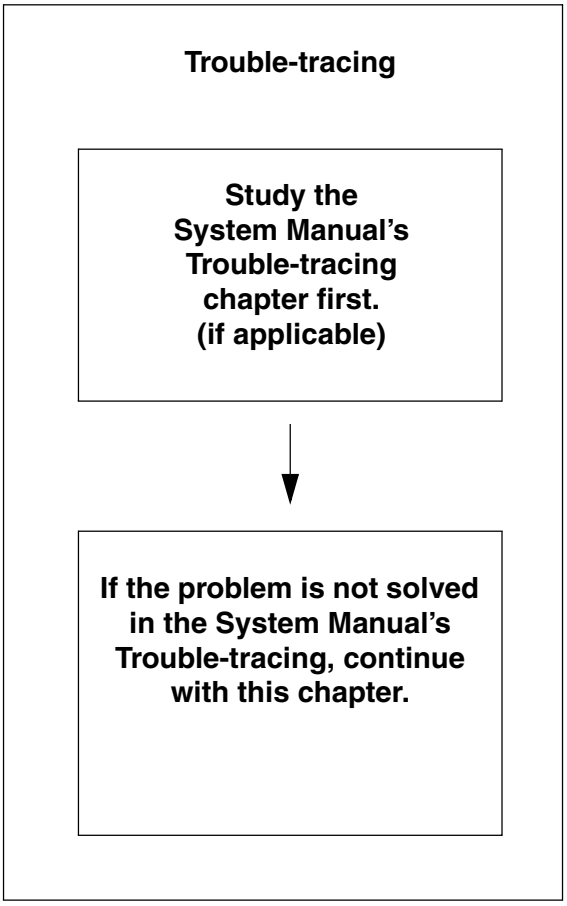
Frame foot with vibration damping

6.8.1 Mounting of new frame feet

1. Remove the existing frame feet.
2. Mount the new feet. Tightening torque 16 Nm. Secure the bolt with the lock-nut.
3. Place the separator in its original position and assemble the separator.
4. Remove the two eye bolts used for lifting.

7 Trouble-tracing

Contents



7.1 Trouble tracing procedure

This chapter applies to trouble-tracing concerning functions of the separator only. It does not include the other equipment in your processing system.

Always start with trouble-tracing instructions in the System Manual, and if required, continue with the instructions below. If the problem still is not solved, contact your Alfa Laval representative.

7.2 MAB mechanical function

7.2.1 The separator does not start

Possible cause	Action
No power supply to motor.	Check power supply.

7.2.2 Start-up time too long

Possible cause	Action
Friction pads worn or oily.	Fit new friction pads.
Motor failure.	Repair.
Incorrect power supply (50 Hz instead of 60 Hz).	Use correct power supply. See machine plate.
Bearings damaged or worn.	Install new bearings.

7.2.3 Starting power too low

Possible cause	Action
Motor failure.	Repair the motor.
Friction pads worn.	Fit new friction pads.
Friction pads oily.	Fit new friction pads.

7.2.4 Starting power too high

Possible cause	Action
Motor failure.	Repair the motor.
Gear worn out.	Replace worm wheel and worm.
Bearing damaged or worn.	Install new bearings.
Incorrect transmission (50 Hz gear and 60 Hz power supply).	⚠ **DANGER: Disintegration hazard** STOP immediately! Install correct transmission. Contact your local Alfa Laval representative. The bowl must be inspected.
Wrong direction of rotation.	STOP. Adjust motor power connection.

7.2.5 Separator vibrates excessively during starting sequence

NOTE Some vibration is normal during starting sequence when the separator passes through its critical speeds.	
Possible cause	**Action**
Bowl out of balance due to:	
poor cleaning	
incorrect assembly	⚠ **WARNING: Disintegration hazard**
too few discs	
insufficiently tightened bowl hood	STOP immediately! Identify and rectify cause.
bowl assembled with parts from other separators.	
Vibration dampers in frame feet worn out.	Fit new vibration dampers.
Bowl spindle bent (max. 0,15 mm).	Fit a new bowl spindle.
Top and/or bottom bearing damaged or worn.	Fit new bearings.
Top bearing springs defective.	Fit new springs.

7.2.6 Separator vibrates excessively during normal running

Possible cause	**Action**
Uneven sludge deposits in sludge space.	STOP and clean bowl.
Bearings damaged or worn.	Fit new bearings.
Vibration-damping rubber washers worn out.	Fit new frame feet washers every four years.
Spindle top bearing spring(s) broken.	Replace all springs.

7.2.7 Smell

Possible cause	Action
Normal occurrence during start as the (new) friction blocks slip.	None.
Top and/or bottom bearing overheated.	Fit new bearings.

7.2.8 Noise

Possible cause	Action
Oil level in oil sump is too low.	STOP and read oil level and add oil.
Top and/or bottom bearing damaged or worn.	Fit new bearings.
Friction pads worn.	Fit new friction pads.

7.2.9 Speed too high

Possible cause	Action
Incorrect transmission (50 Hz gear running on 60 Hz power supply).	⚠ **WARNING: Disintegration hazard** STOP immediately! Install correct transmission. Contact your local Alfa Laval representative. The bowl must be inspected.
Frequency of power supply too high.	Check.

7.2.10 Speed too low

Possible cause	Action
Friction pads worn or oily.	Fit new friction pads or clean the old ones if they are oily.
Motor failure.	Repair the motor.
Top/bottom bearings damaged or worn.	Fit new bearings.
Bearing overheated/damaged.	Fit new bearings.
Incorrect transmission (60 Hz gear running on 50 Hz current).	Make sure that the gear is intended for 50 Hz power supply.

7.2.11 The pump fails

Possible cause	Action
The pump is dry	Charge it with liquid before starting
Suction pipe or packing collar leaks	Replace suction pipe, or packing
Shear pin is broken	Replace shear pin
Strainers and pipelines are obstructed	Clean strainer or pipelines
Relief valve opens at too low pressure	Exchange the valve spring and make sure the valve cone and seat are clean
The delivery head is too large or the liquid is so viscous that the flow resistance becomes too great to overcome.	
The packings of the pump housing are damaged	Replace packings
The gear wheels are worn.	Replace gear wheels

7.2.12 Water in oil sump

Possible cause	Action
Bowl casing drain obstructed.	Clean. Change oil.
Leakage at top bearing.	Fit a new seal ring and change oil.
Condensation.	Clean the oil sump. Change oil.

7.2.13 Liquid flows through bowl casing drain

Possible cause	Action
Broken water seal.	Stop feed and feed water to create water seal.
Too high throughput	Reduce the feed.
The supply of sealing water is not sufficient.	Apply some more water through inlet 206.
Seal ring on gravity/clarifier disc defective.	Fit a new seal ring.
Bowl hood seal ring defective.	Fit a new seal ring.
Bowl speed too low.	Make sure current is on. Inspect motor and power transmission.

7.3 Purification faults

7.3.1 Unsatisfactory separation result

Possible cause	Action
Gravity disc hole too small.	Use a gravity disc with a larger hole.
Incorrect separating temperature.	Adjust temperature.
Throughput too high.	Reduce throughput.
Sludge space in bowl is filled.	Empty the sludge space in the bowl.
Disc stack clogged.	Clean the bowl discs.
Bowl speed too low.	See “7.2.10 Speed too low” on page 108.

7.3.2 Outgoing water contaminated by oil

Possible cause	Action
Gravity disc hole too large.	Use a gravity disc with a smaller hole.
Seal ring under the gravity disc defective.	Fit a new seal ring.

7.3.3 Broken water seal

Possible cause	Action
Gravity disc too large.	Use a gravity disc with a smaller hole.
Separation temperature too low.	Increase temperature.
Throughput too high.	Reduce throughput.
Sealing water volume too small.	Supply more water.
Seal ring under gravity disc defective.	Fit a new seal ring.
Disc stack clogged.	Clean the bowl discs.
Bowl speed too low.	Use correct speed. See “7.2.10 Speed too low” on page 108.
Bowl incorrectly assembled.	Examine and make correct.

8 Technical Reference

Contents

8.1 Product description

Alfa Laval ref. 566865, rev. 2

Separator type designation:	MAB 102B-14	
Product number (separator):	881134-01-03/ 2	
Application:	Cleaning of fuel oil and lubrication oil.	
Technical design:	Intended for marine and land applications.	
	Purifier with solid-wall separator bowl and collecting cover in aluminium.	
	Built on in- and outlet pump.	
	Friction clutch.	
	No brake.	
	Sealing available in nitrile.	
Designed in accordance with directives and standards:	98/37/EC	Directive of the European Parliament and the Council relating to machinery.
	EN 12547	Centrifuges - Common safety requirements.
Operational limits:	Feed temperature: 0 to 100°C.	
	Ambient temperature: +5 to +55°C.	
	Not to be used for liquids with flash points below 60°C.	
	Risk for corrosion and erosion has to be investigated in each case.	

8.2 Technical data

Alfa Laval ref. 566868 rev. 2

GENERAL TECHNICAL DATA:

Motor power:	0,37 kW	
Power consumption, idling / max. capacity:	0,2 kW	0,2 kW
Gear ratio, 50 / 60 Hz:	50:8	47:9
Max. bowl inner diameter:	125 mm	
Jp reduced to motor shaft, 50 / 60 Hz	0,8 kgm^2	0,5 kgm^2
Start time, min. / max. :	2 minutes	4 minutes
Max. density feed / sediment:	1100 kg/m^3	1600 kg/m^3
Min. / Max. feed temperature:	0 °C	100 °C
Max. running time without flow, bowl empty / filled:	180 minutes	180 minutes

OPERATING DATA:

Max. allowed speed	9375 r/minutes	
Motor speed, synchronous, 50 / 60 Hz:	1500 r/minutes	1800 r/minutes
Stop time, max. :	7 minutes	
Sound power / Uncertainty:	7,5 bel(A)	0,5 bel(A)
Sound pressure / Uncertainty:	62 dB(A)	5 dB(A)
Vibrations, separator in use:	9 mm/s (r.m.s.)	

VOLUME AND CAPACITY DATA:

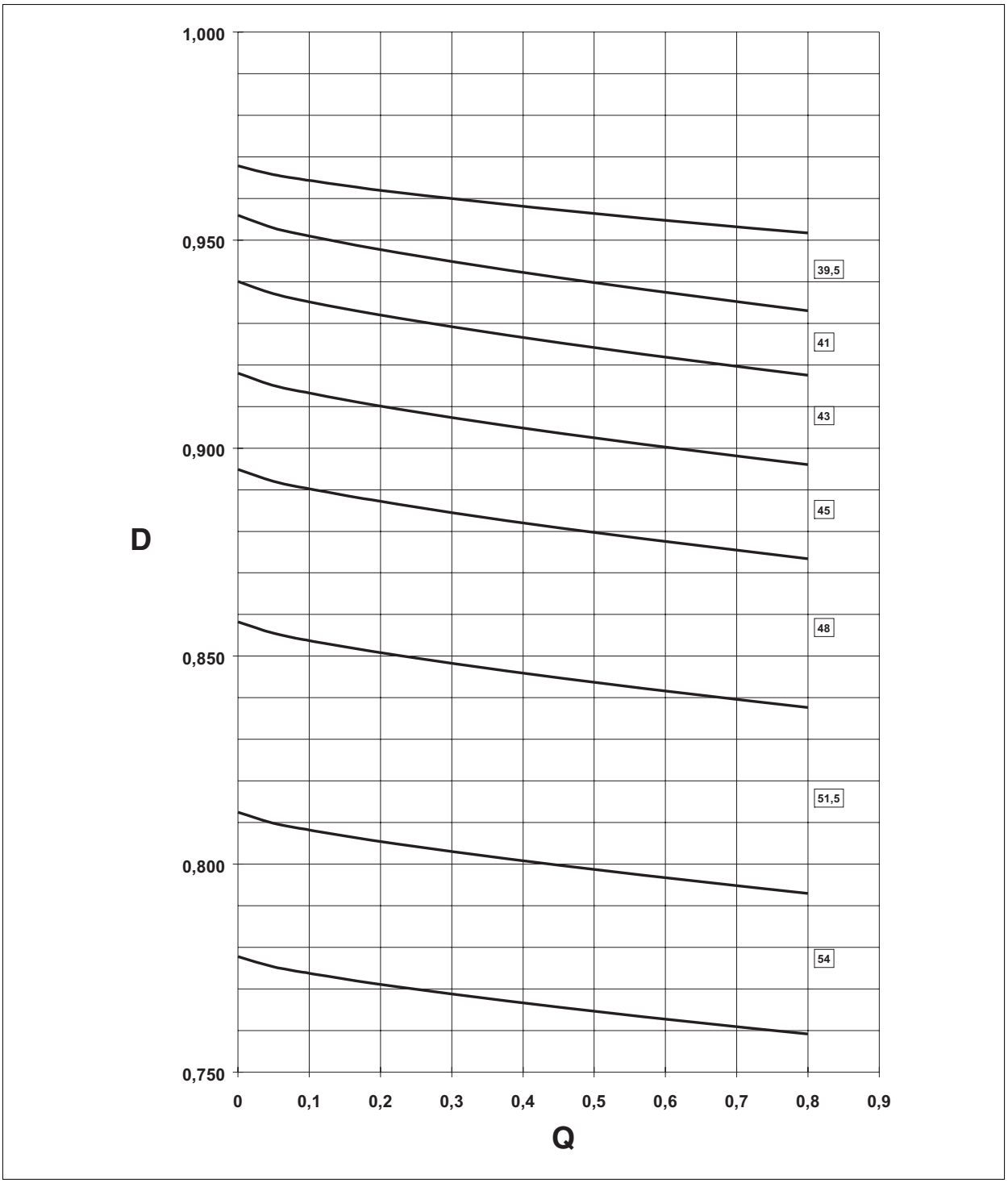
Max. hydraulic capacity, bowl:	0,56 m^3/h	
Bowl liquid volume:	0,6 litres	
Sludge volume, efficient / total:	0,09 litres	0,20 litres
Lubricating oil volume:	0,4 litres	

PUMP DATA:

Max suction lift	4 m
Max delivery head	15 m
WEIGHT INFORMATION:	
Bowl weight:	6,4 kg
Motor weight:	6,5 kg
Weight of separator:	40 kg

8.2.1 Gravity disc nomogram

Alfa Laval ref. 566879 rev. 0



D = Density ratio of oil in kg/m^3
Q = Thoughput in m^3/h

Selection of gravity disc

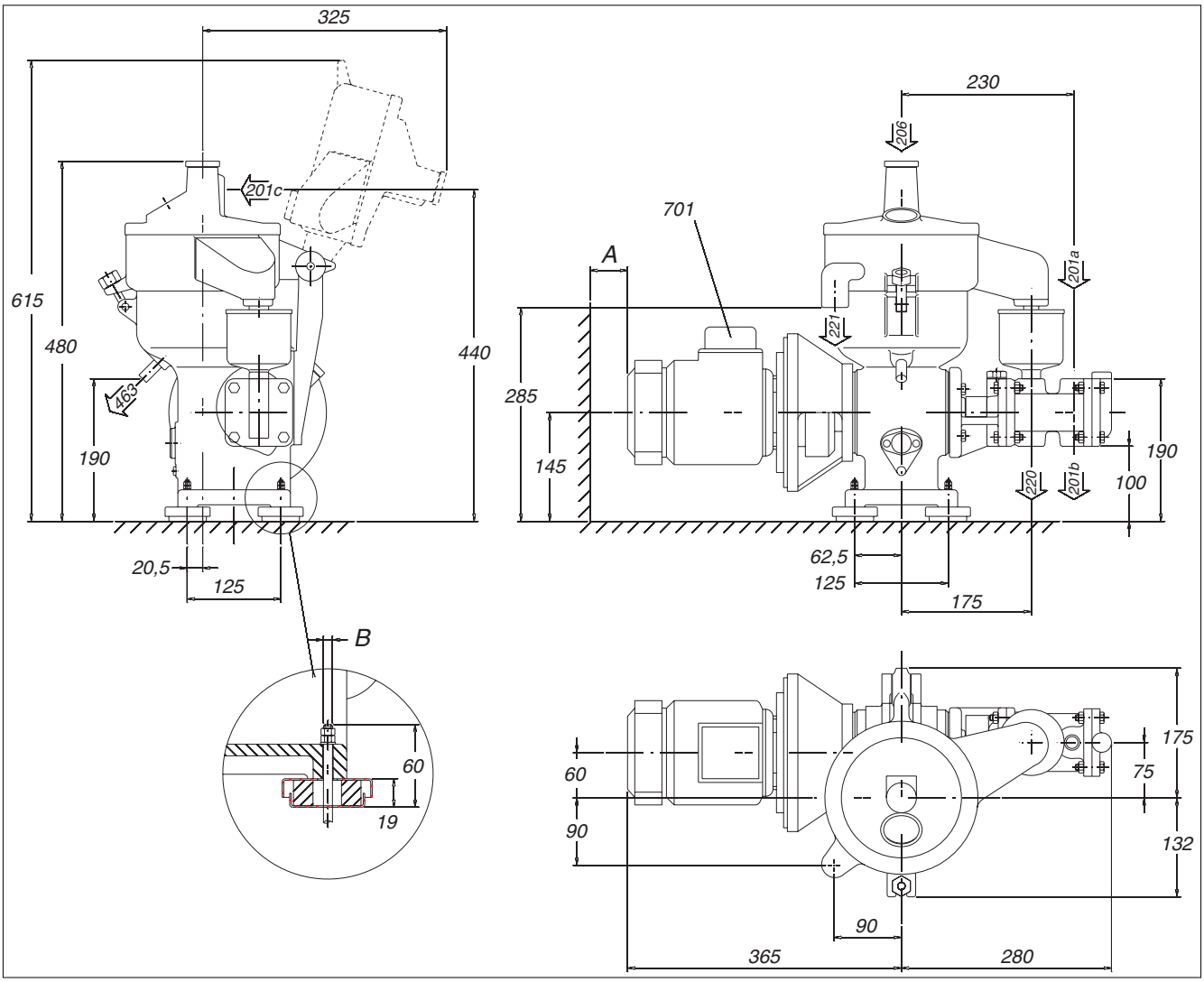
The best separating results are obtained by using a gravity disc with as large a hole as possible, one which will not cause a broken water seal in the bowl or an emulsification in the water outlet.

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

Framed numbers in Nomogram diagram in previous page show size for gravity disc to use for different flow.

8.3 Basic size drawing

Alfa Laval ref. 566873 rev. 0

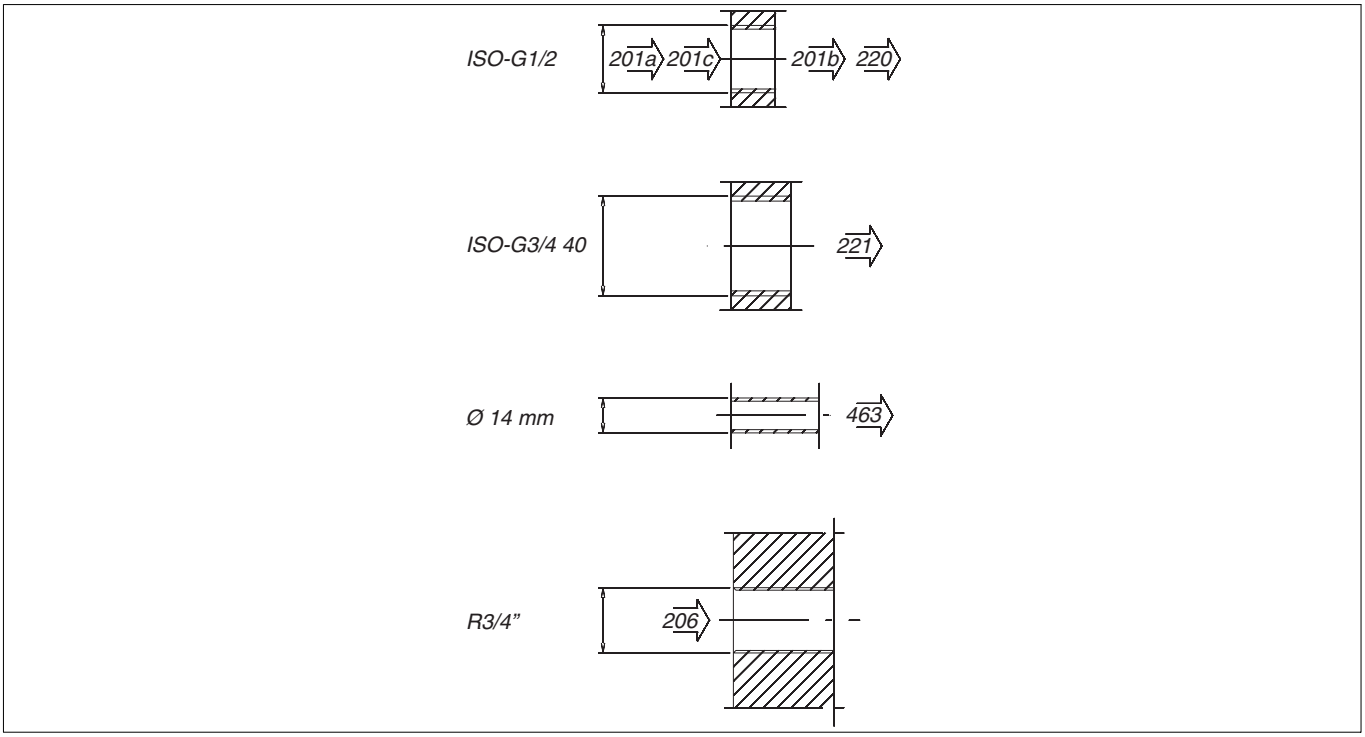


A. min. 50 mm
B. Screw 3/8-16UNC

All dimensions are nominal. Reservation for individual deviations due to tolerances.

Data for connections see “8.4 Connection list” on page 118.

8.3.1 Dimensions of connections



Data for connections, see chapter *"8.4 Connection list" on page 118**.*

All connections to be installed non-loaded and flexible.

8.4 Connection list

Alfa Laval ref. 566881 rev. 0

Connection No.	Description	Requirements/limit
201a	Inlet for process liquid, (to pump)	
201b	Inlet for process liquid, (from inlet pump)	
201c	Inlet for process liquid	
206	Inlet for liquid seal and displacement liquid. - Flow, set value: - Quality requirements:	1litre / minute See "Quality specification for operating water"
220	Outlet for light phase	
221	Outlet for heavy phase	Should be possible to drain liquid by gravity.
463	Drain of frame top part, upper.	Should be possible to drain liquid by gravity.
701	Motor for separator - Allowed frequency variation:	±5% (Momentarily during maximum 5 seconds: ±10%)

8.5 Interface description

Alfa Laval ref. 566884 rev. 0

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 for designing auxiliary equipment and control system for the separator.

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:

- *Connection List*
- *Technical Data*

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

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.

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.

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, Motor Drive Data and Interface Description.
- The separator control system is activated.

If above conditions are not fulfilled the separator will be in SERVICE mode.

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.

6. Handling of connection interfaces

6.1 Electrical connections

701 Separator motor.

The separator is equipped with a 3-phase squirrel-cage induction 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.

6.2 Fluid connections

Complementary information is given in the document “8.4 Connection list”.

8.6 Quality specification for operating water

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

5.1 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 unsatisfactorily purified operating water supplied by the customer.

8.7 Lubricants

8.7.1 Lubrication chart

Alfa Laval ref. 553216-01 rev. 7

Lubricating points	Type of lubricant	Interval
The oil bath: Bowl spindle bearings are lubricated by oil splash from the oil bath.	See “8.7.2 Recommended lubricating oils” on page 126. Volume: see “8.2 Technical data” on page 113.	**Oil Change:** 1. Continuous operation: 2000h 2. Seasonal operation: Before every operating period 3. Short period’s operation: 12 months even if 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 “8.7.6 Lubricants” on page 132.	At assembly.
Rubber seal rings:	Grease as specified in “8.7.6 Lubricants” on page 132.	At assembly.
Friction coupling ball bearings:	The bearings are packed with grease and sealed and need no extra lubrication.	-
Electric moto:r	Follow manufacturer’s instructions.	Follow manufacturer’s instructions.
Threads:	Lubricating oil, if not otherwise stated.	At assembly.

NOTE!

Check and pre-lubricate new spindle bearings and those that have been out of service for one month or longer.

The Lubrication chart can be complemented with more detailed charts, showing the lubricating points in detail and what type of lubricants to use.

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

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

CAUTION

Check the oil level before start.

Top up when necessary.

Do not overfill.

Oil volume = see "8.2 Technical data" on page 113.

8.7.2 Recommended lubricating oils

Alfa Laval ref. 553219-10 rev. 0

Three different groups of lubricating oils are approved for this type of frame.

They are designated as Alfa Laval lubricating oil groups A,B and D.

The numerical value after the letter states the viscosity grade.

The corresponding commercial oil brands according to “ Alfa Laval lubrication oil group A” on page 127.

Ambient temperature °C	Alfa Laval lubricating oil group	Time in operation Oil change interval
between +5 and +45	A/220 B/220	1500 h
between ±2 and +65	D/220	2000 h

Note:

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

8.7.3 Recommended oil brands (01)

Paraffinic mineral lubricating oil for general use

Alfa Laval ref. 553218-01, rev. 3

NOTE

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

Alfa Laval lubrication oil group A	
Viscosity grade VG (ISO 3448/3104) Viscosity index VI (ISO 2909)	VG 220 VI >90
Manufacturer	**Designation**
BP	Bartran 220 Bartran HV 220
Castrol	Alpha ZN 220 Ultra 220
ChevronTexaco	Rando HD 220 Paper Machine Oil Premium 220
ExxonMobil	Mobil DTE oil BB
Q8/Kuwait Petroleum	Wagner 220
Shell	Morlina 220
Statoil	LubeWay XA 220
Total	Cirkan ZS 220

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

Standard	Designation
ISO 12925-1, (ISO 6743/6)	ISO-L-CKC or CKE 220
ISO 11158, (ISO 6743/4)	ISO-L-HM or HV 220
DIN 51517 part 3	DIN 51517 - CLP 220
DIN 51524 part 2 or 3 (German standard)	DIN 51524 - HLP or HVLP 220

8.7.4 Recommended oil brands (02)

Alfa Laval ref. 553218-02 rev. 4

Paraffinic mineral lubricating oil, category (ISO-L-) CKE 220.

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

Alfa Laval lubrication oil group B	
Viscosity grade VG (ISO 3448/3104) Viscosity index VI (ISO 2909)	VG 220 VI 90
Manufacturer	**Designation**
Bel-Ray	100 Gear Oil 90
BP	Energol GR-XP 220
Castrol	Alpha SP 220 (Former Optimol) Optigear BM 220
ChevronTexaco	Gear Compound EP 220 (H2) Ultra Gear 220 (H2) Texaco/Caltex Meropa 220
ExxonMobil	Spartan EP 220 Mobilgear 630 Mobilgear SHC (XMP)220, Synthetic *
Q8/Kuwait Petroleum	Goya 220
Shell	Omala 220 Omala RL 220, Synthetic *
Statoil	LoadWay EP 220 Mereta 220, Synthetic *
Total	Carter EP 220 Elf Epona Z 220 Carter SH 220, Synthetic *

***** These oils must be used when the frame temperature is above 80 °C.

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

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

Standard	**Designation**
ISO 12925-1, (ISO 6743/6)	ISO-L-CKC/CKD/CKE/CKT 220
DIN 51517 part 3	DIN 51517 - CLP 220

8.7.5 Recommended oil brands (03)

Alfa Laval ref. 553218-03 rev. 5

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, contact your local oil supplier for more information.

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

Alfa Laval lubrication oil group D	
Manufacturer	**Designation**
Alfa Laval	542690-84 20 litres replacement for 542690-80 542690-85 4 litres replacement for 542690-81
BP	Enersyn HTX 220 Enersyn EP-XF 220
Castrol	Alphasyn EP 220 Alphasyn HG 220 Optigear Synthetic A 220
Chevron	Tegra Synthetic Gear Lubricant 220 (H2) Texaco/Caltex Pinnacle EP 220 FAMM Pinnacle Marine Gear 220
ExxonMobil	Mobil SHC 630
Q8/Kuwait Petroleum	Schumann 220
Shell	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/)

8.7.6 Lubricants

Alfa Laval ref. 553217-01, rev. 11

NOTE

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

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

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

Pastes:

Manufacturer	Designation	Alfa Laval No	
Dow Corning	Molykote 1000 (Paste) Molykote 1000 (Paste) Molykote G-rapid plus (Paste)	537086-02 (1000 g) 537086-03 (100 g) 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	
Dow Corning	Molykote D321R (Spray)	535586-01 (375 g)	
Fuchs Lubritech	Gleitmo 900 (Varnish or spray)		

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

Manufacturer	Designation	Hygienic comment	Alfa Laval No	
Dow Corning	Molykote P1900 Molykote TP 42 Molykote D	**NSF Registered H1** (7 Jan 2004)		
Bremer & Leguil, Fuchs Lubritech	Geralyn F.L.A. Geralyn 2 Gleitmo 805 Gleitmo 1809	**NSF Registered H1** (2 April 2003) German § 5 Absatz 1 LMBG approved **NSF Registered H1** (3 Sep 2004) DVGW (KTW) approval for drinking water (TZW prüfzeugnis)	561764-01 (50g) 554336-01	
Klüber	Klüberpaste UH1 96-402 Klüberpaste UH1 84-201 Klüberpaste 46 MR 401	**NSF Registered H1** (25 Feb 2004) **NSF Registered H1** (26 Aug 2005) White; contains no lead, cadmium, nickel, sulphur nor halogens.		
Rocol	Foodlube Multi Paste	**NSF Registered H1** (13 Apr 2001)		

Silicone grease for rubber rings:

Manufacturer	Designation	Hygienic comment	Alfa Laval No.	
Dow Corning	(Molykote) 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** (June 3 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	Unisilkon 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 H**1 (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)		

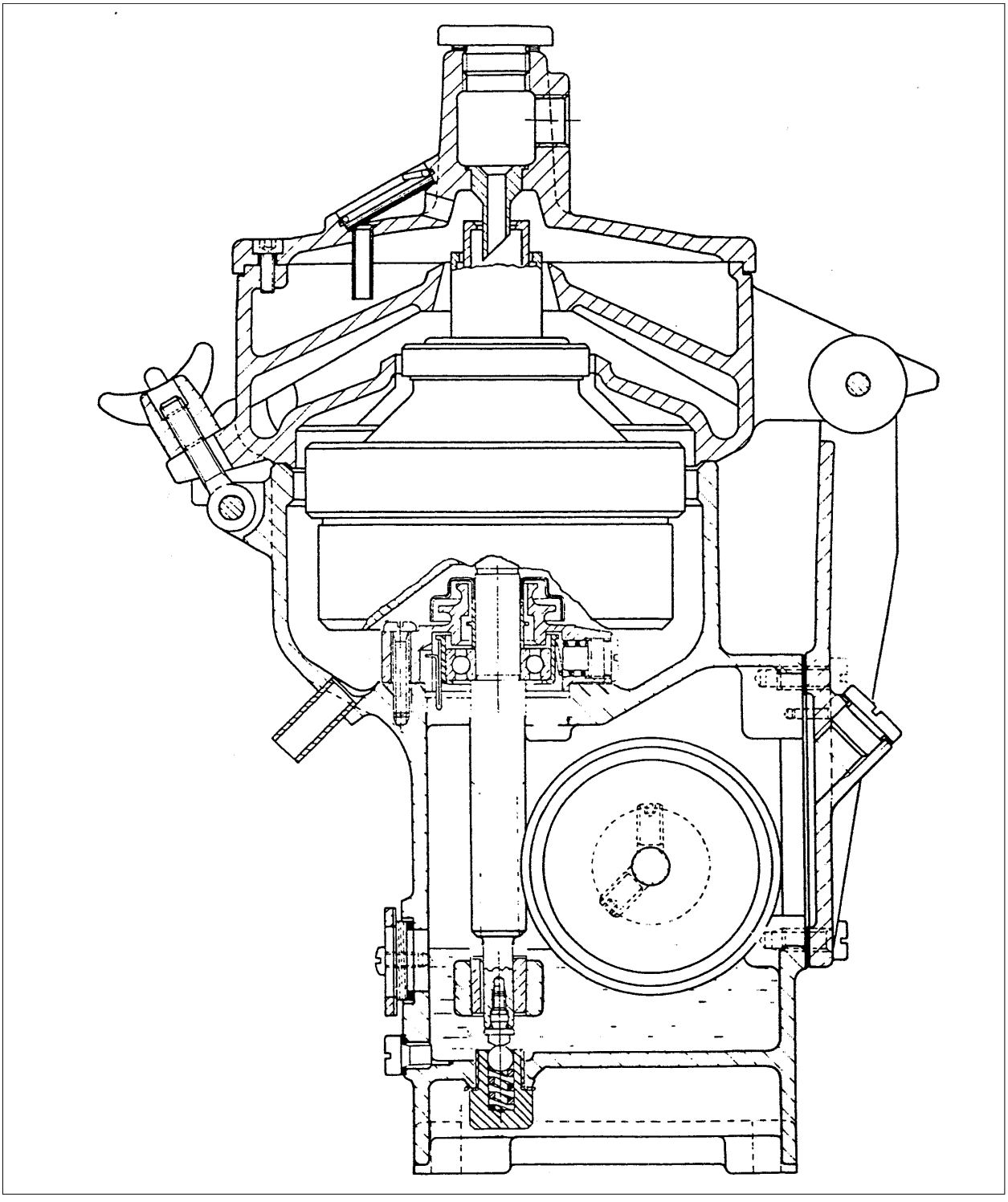
Greases for ball and roller bearings:

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	

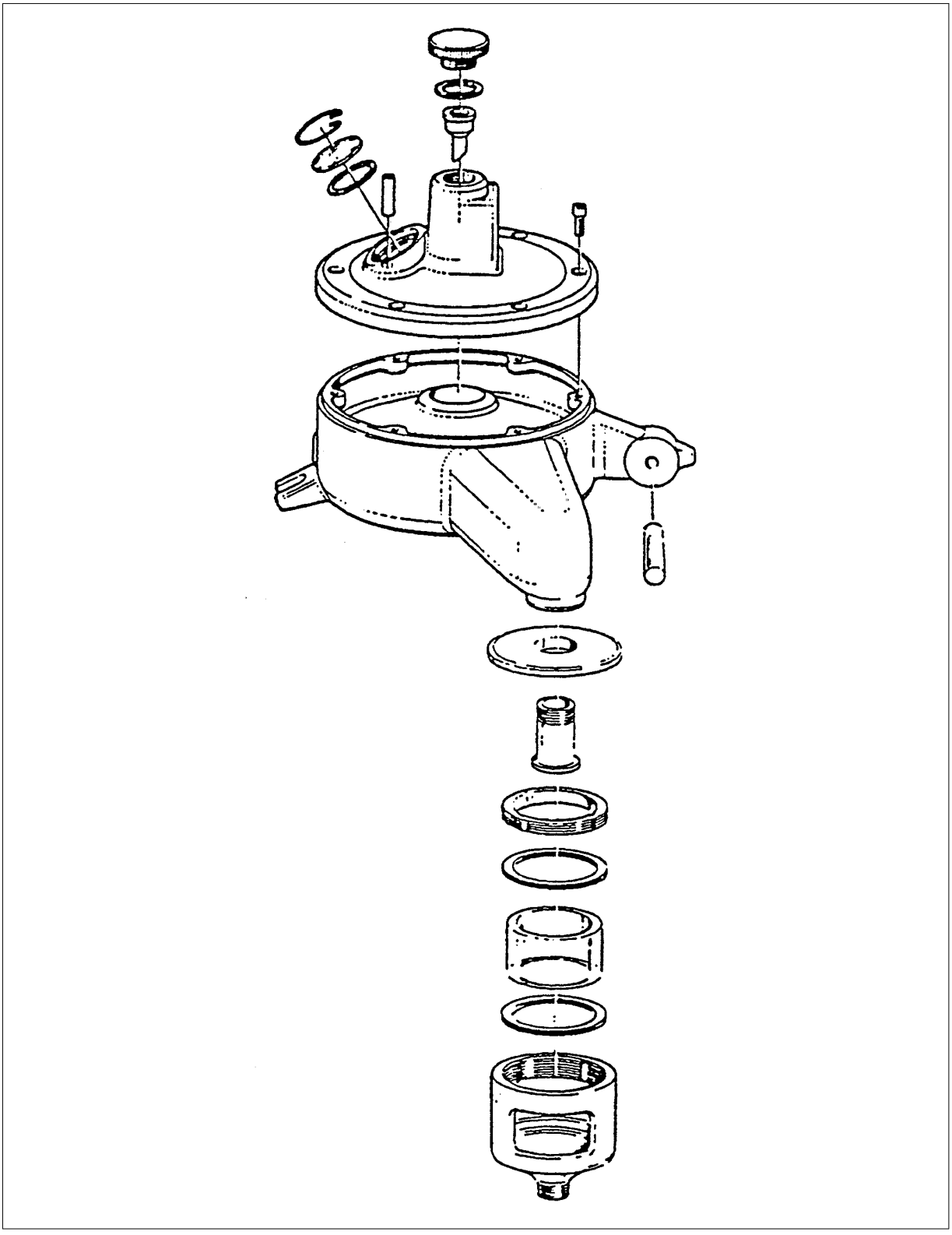
8.8 Drawings

8.8.1 Cross-section



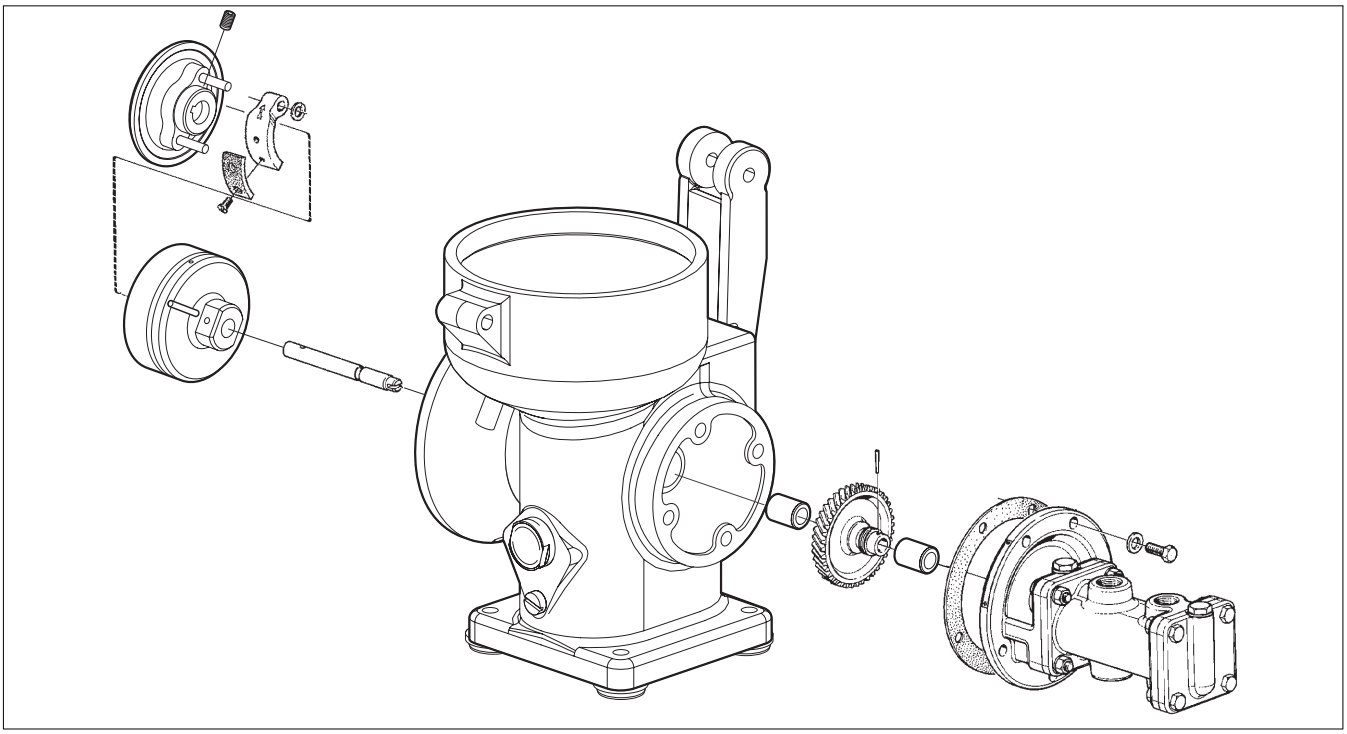
Cross-section of separator

8.8.2 Exploded view

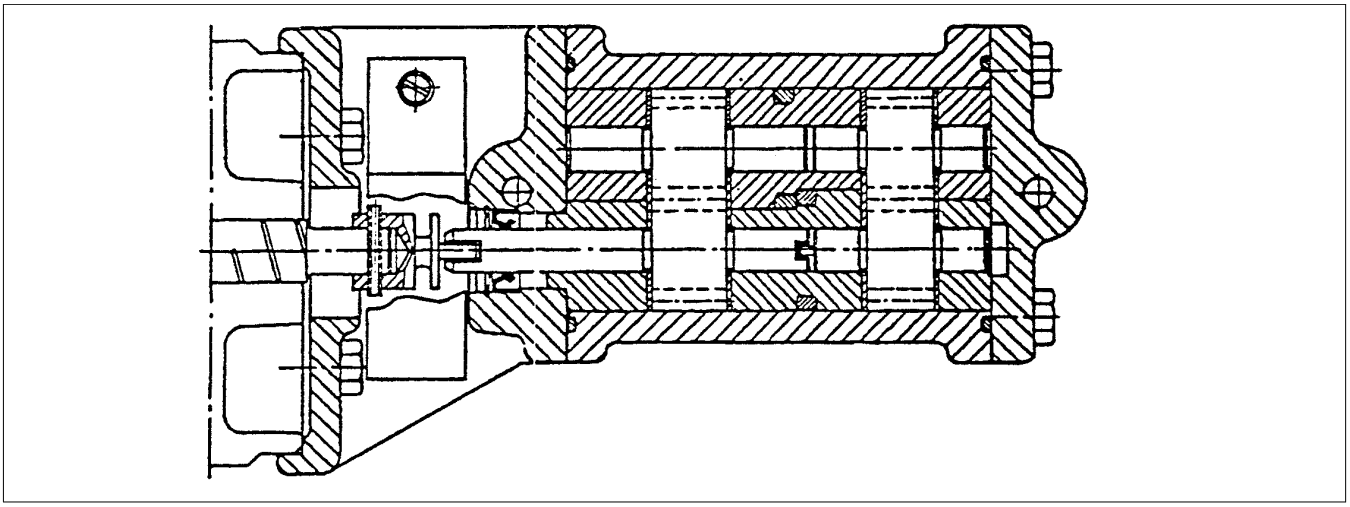


Exploded view of separator frame hood

8.8.3 Pump



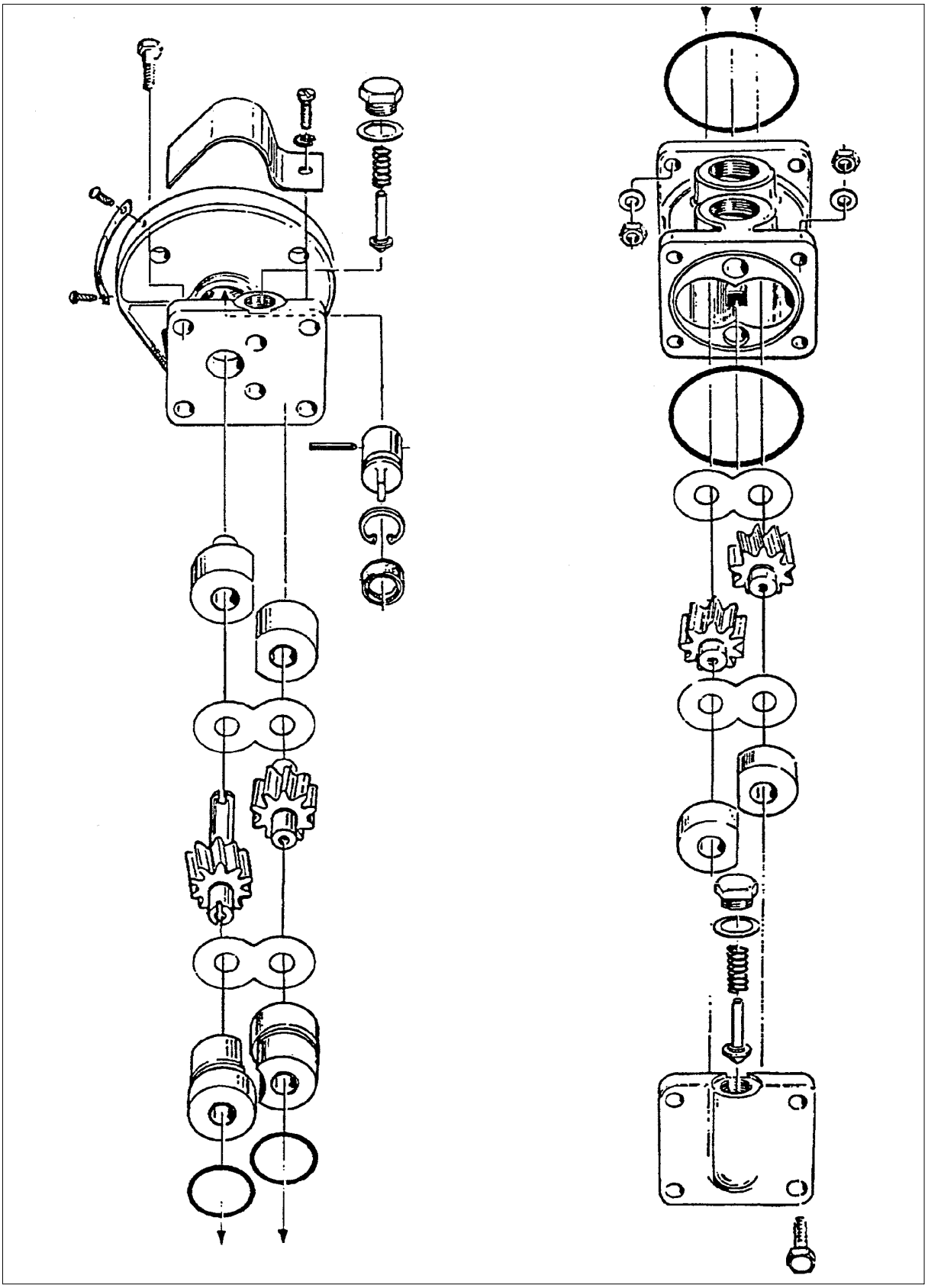
Inlet and outlet pump, exploded view



Inlet and outlet pump, cross-section

Alfa Laval ref. 547994

The worm wheel shaft works the pump direct via the coupling sleeve and the number of revolutions is synchronous with the revolutions of the worm wheel shaft and the motor. As overload guard serves partly the cylindrical pin (shearing pin) driving the coupling sleeve, partly the relief valve. The pump needs no special lubrication, as for the actual purpose, the pumped liquid is considered to be sufficiently lubricative. The pump must however never be permitted to run dry.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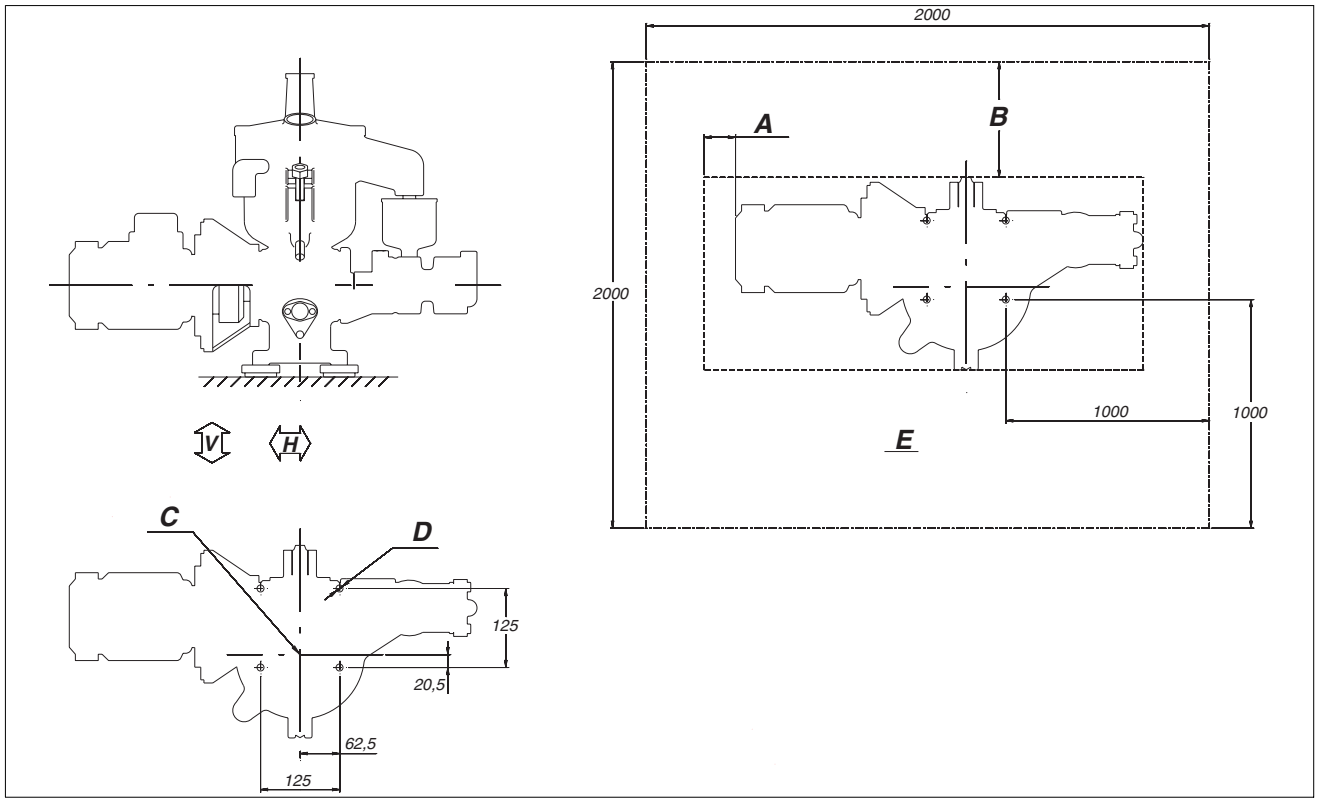
8.8.4 Foundation drawing

Alfa Laval ref. 566930 rev. 0



A Minimum distance 50 mm
B Minimum distance 200 mm
C Center of separator bowl
D 4 holes Ø 11 for anchorage
E Service side

Recommended free floor space for unloading when doing service

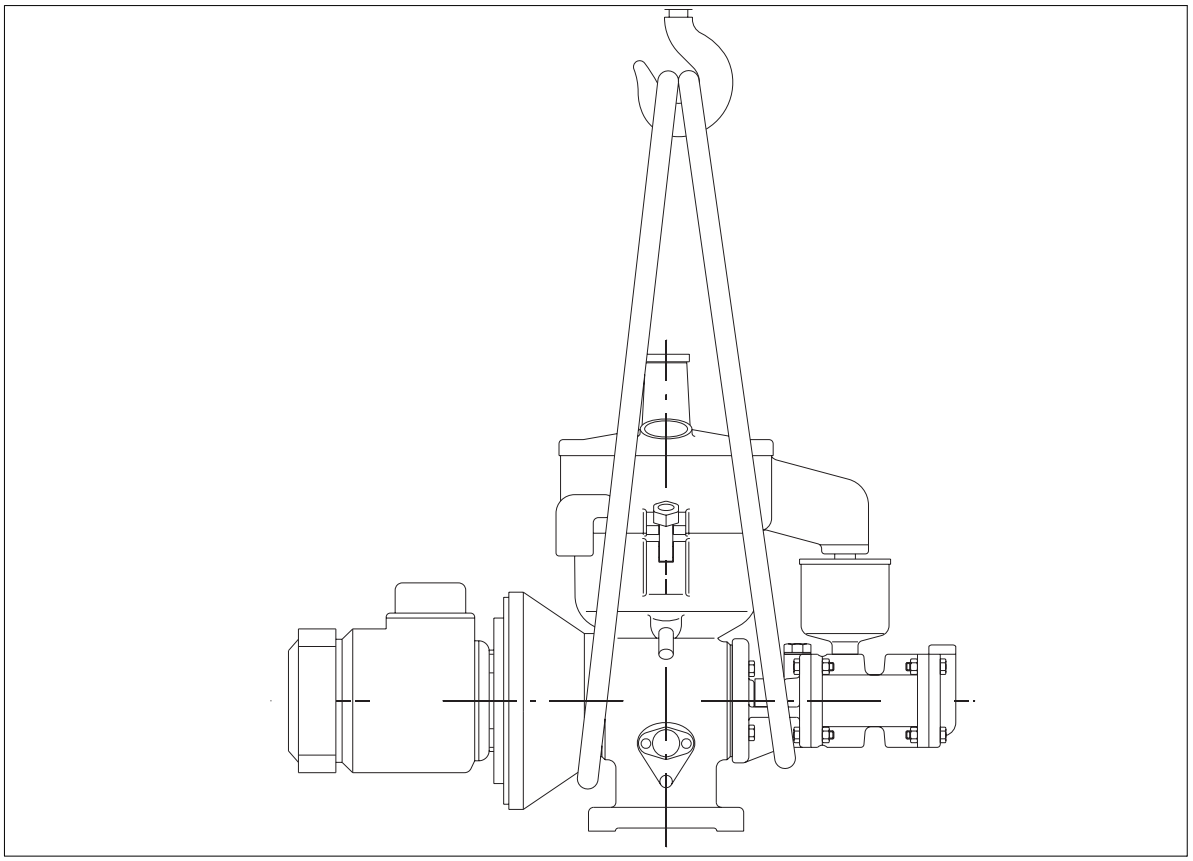
No fixed installation within this area

Vertical force not exceeding 6 kN/foot

Horizontal force not exceeding 6 kN/foot

8.8.5 Lifting instruction

Alfa Laval ref. 575889 rev. 0



Weight to lift 34 kg

NOTE

Never lift the separator with the separator bowl inside.

Lifting the separator
1. Remove cap nut on hinged bolt
2. Remove separator bowl

NOTE

Never lift the separator in any other way.

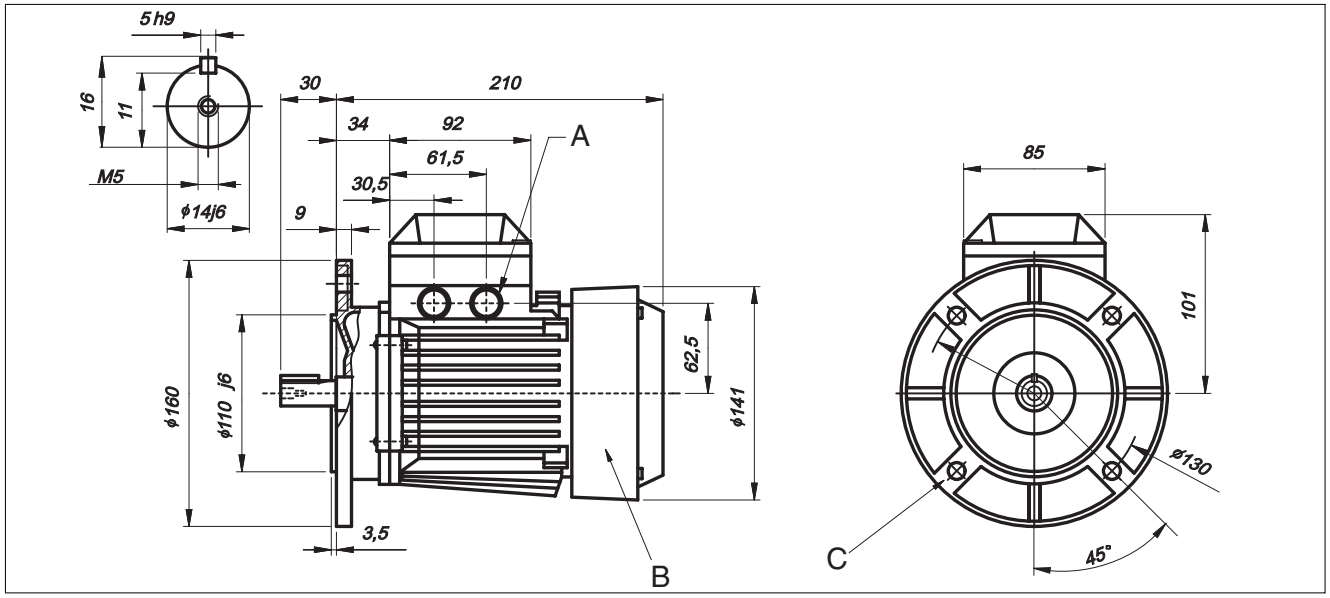
WARNING

Crush hazard

Use correct lifting tools and follow lifting instructions.
Do **not** work under a hanging load.

8.8.6 Electric motor

Alfa Laval ref. 551586 rev. 3



A Knockout opening for cable glands on both sides, 2xØ23 mm
B Sheet-steel fan hood
C 4 holes Ø10 mm

Manufacturer	ABB Motors)
Manufacture drawing	CAT. BA/marine motor GB98-05
Standards	IEC 34-series, 72, 79 and 85.
Size	IEC 71B
Type	M2AA 71B
Weight	6 kg
Poles	4
Insulation class	F
Bearings	D-end 6203-2Z/C3
	N-end 6202-2Z/C3
Method of cooling	IC 41 (IEC 34-6)

Totally enclosed 3-phase motor for marine service [3)]

Type of mounting IEC 34-7		Degree of protection IEC 34-5
	IM 3001	IP 55
	IM 3011	
	IM 3031	

Motor bearings are permanently lubricated.

1) Ist /I=starting current / rated current at direct on-line starting (DOL).

2) Thermistors tripping temperature if applicable.

[3] The motors can be designed to fulfill requirements of following Classification Societies:
(Essential Service if required)

Lloyds Register of shipping	(LR)
Det Norske Veritas	(DnV)
Germanischer Lloyd	(GL)
Bureau Veritas	(BV)
American Bureau of shipping	(ABS)
Registro Italiano Navale	(RINA)
Nippon Kaiji Kyokai	(NK)
Korean register of shipping	(KR)
Polski Rejester statkow	(PRS)
China Classification Society	(CCS)
Indian Register of Shipping	(IRS)
Maritime Register of Shipping	(RMS)

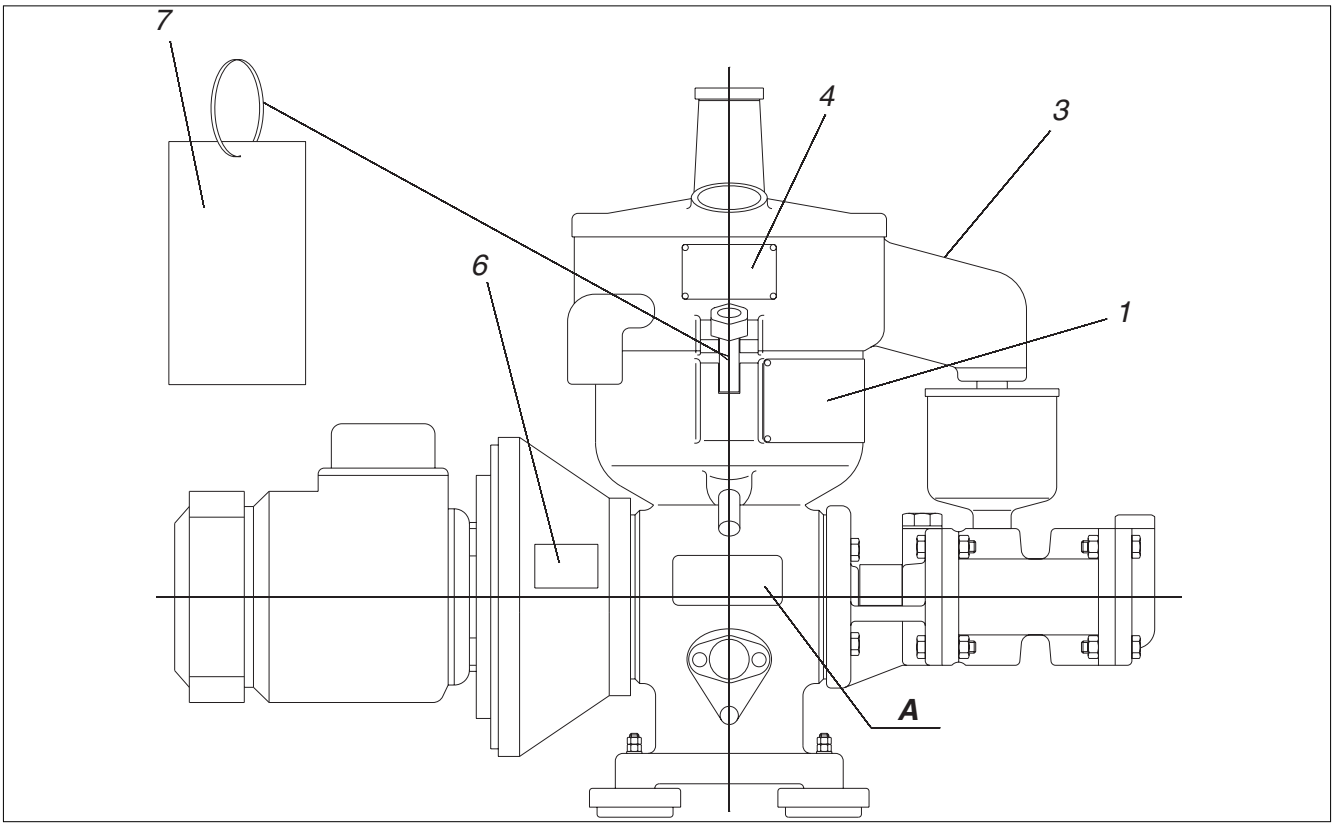
Required classification society must always be specified when ordering. Factory test certificate to be enclosed at the delivery. Rated output (kW) valid for temp-rise max. 90 °C.

NOTE

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

8.8.7 Machine plates and safety labels

Alfa Laval ref. 547595 rev. 2

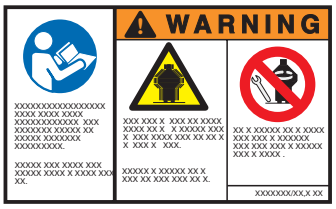


A Space for label indicating representative

1. Machine plate

Separator
Manufacturing serial No / Year
Product No
Frame
Bowl
Max. speed (bowl)
Direction of rotation (bowl)
Speed motor shaft
El. current frequency
Recommended motor power
Max. density of feed
Max. density of sediment
Process temperature min./max.

3. Safety label



S00690N1

Text on label:

WARNING

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

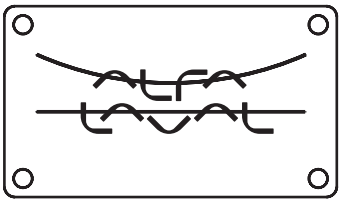
Failure to strictly follow instructions can lead to fatal injury.

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

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

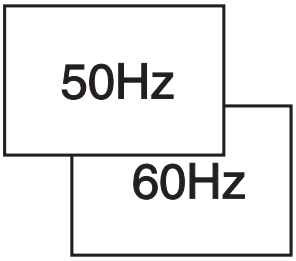
Separator must **stop rotating** before **any** dismantling work is started.

4. Name plate



S0063211

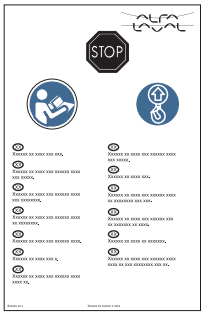
6. Power supply frequency



S0063111

7. Stop, follow lifting instruction

This transport label is not permanently fixed to the separator.



S0069111

8.9 Storage and installation

8.9.1 Storage and transport of goods

Storage

Specification

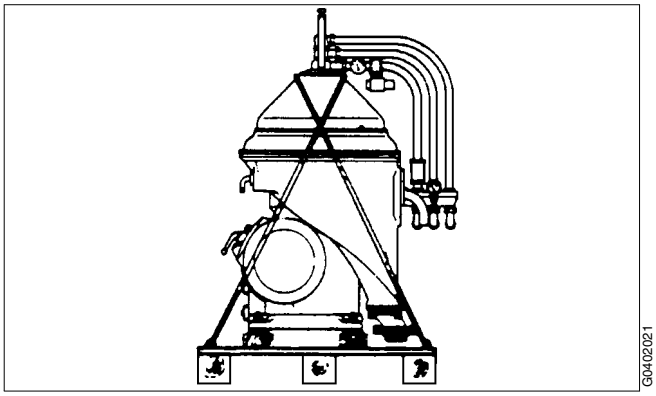
Upon arrival to the store, **check all components and keep them:**

1. Well stored and protected from mechanical damage and theft.
2. Dry and protected from rain and humidity.
3. 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.

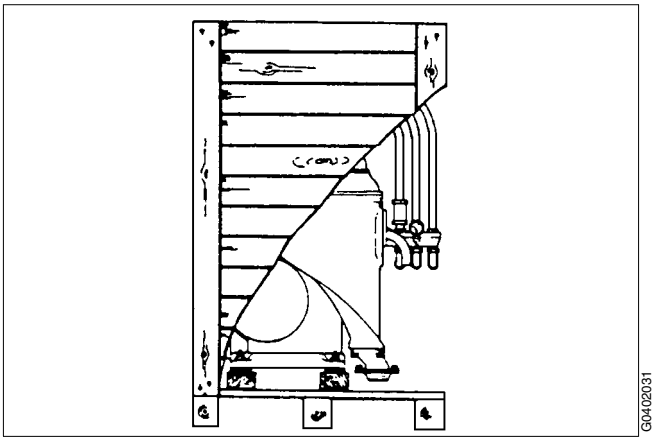
  The separator must be stored in a storage room well protected from mechanical damage and also dry and protected from rain and humidity.



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.

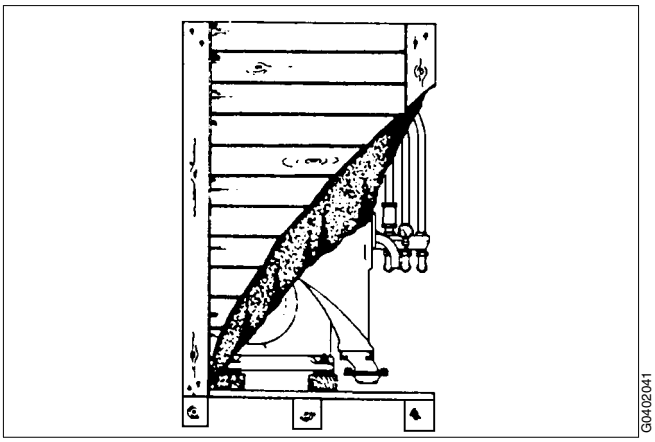


In a wooden box which is not water tight

- 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.



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 “5.8 Lifting instructions” on page 76.

WARNING

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.

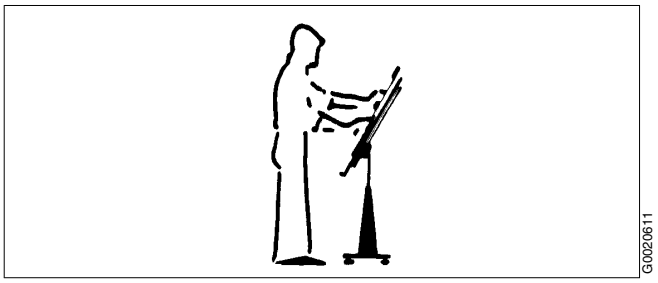
8.9.2 Planning and installation

Introduction

The requirements for one or more separators can be established by consulting the following documents.

- Basic size drawing
- Connection list
- Interface description
- Interconnection drawing
- Foundation drawing
- Lifting drawing

These are included in this chapter “8 Technical Reference” on page 111.

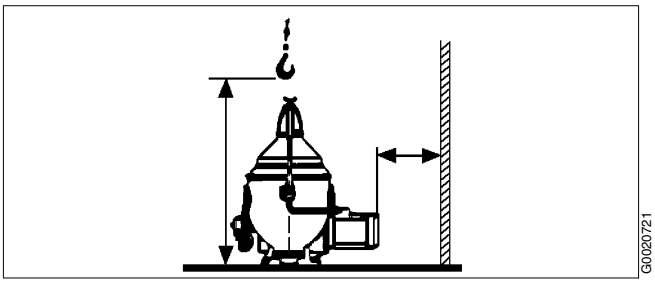


Check the drawings when planning the installation

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.



Suitable space must be obtained for the maintenance work

Space for separator

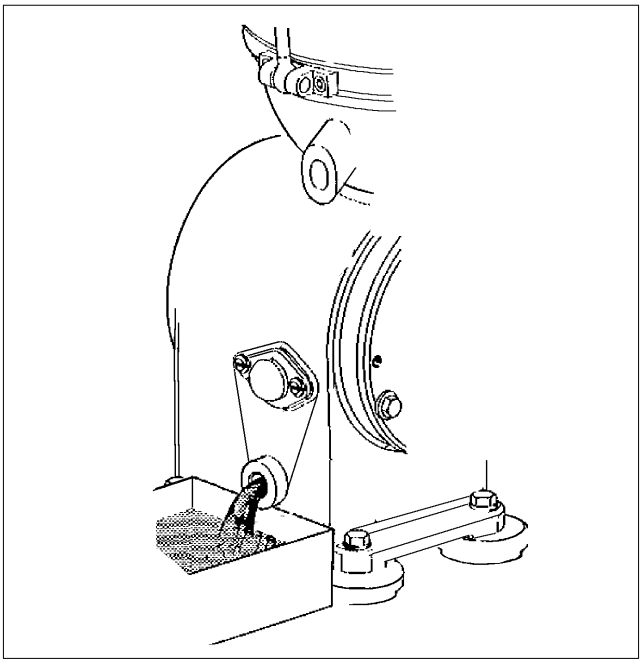
The separator shall be placed in such a way that suitable space for maintenance and repair is obtained.

Specification

- See “8.8.4 Foundation drawing” on page 140 for the service space required with the separator installed.

Recommendation

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



Place the separator in such way that makes the oil change easy

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.

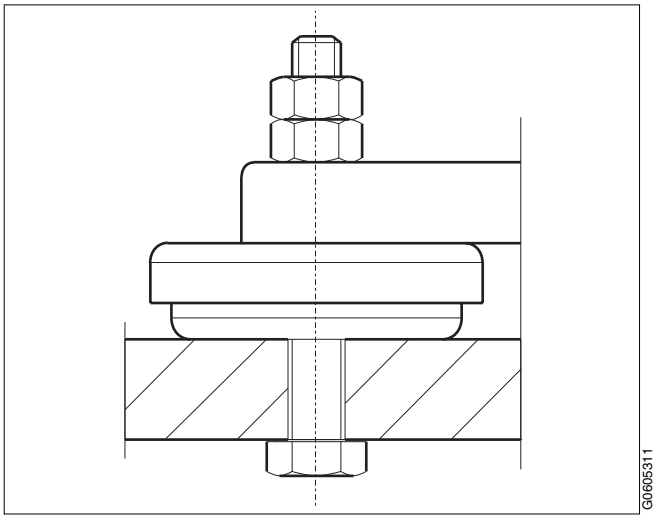
8.9.3 Foundations

Specification

- The separator should be installed at floor level, see “8.8.4 Foundation drawing” on page 140.
- 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:

1. Place the separator frame without cushions in position.
2. 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.
3. Check that the separator frame is horizontal and that all feet rest on the foundation.
4. Fit height adjusting washers required.
5. Lift the separator frame, fit the vibration dampers, lower and check that the bolts do not press against the edges of the holes.
6. Tighten nut with 16 Nm. Hold firmly and secure with the lock nut. Repeat for the other frame feet.



Foundation foot

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Index

U

V

W