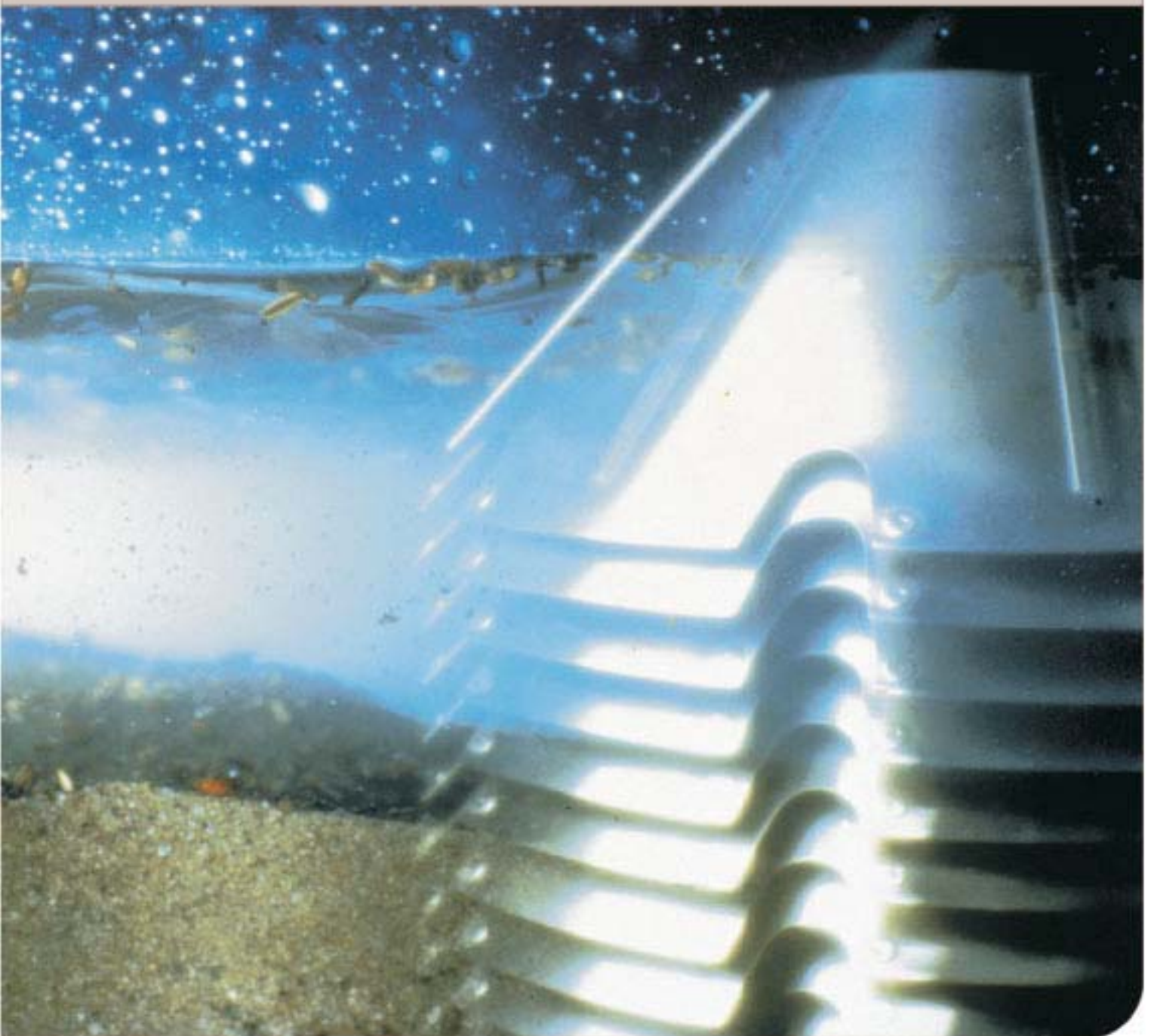




Separator Manual
High Speed Separator

MAB 103B-24



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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 103B-24.

For information concerning the function of the separator, see “[3 Separator Basics](#)” on page 17, and “[4 Operating Instructions](#)” on page 31.

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



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:

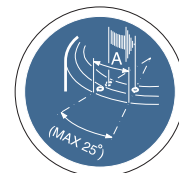
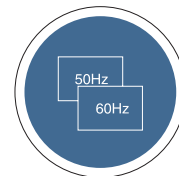
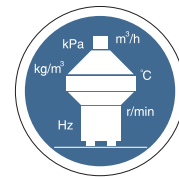
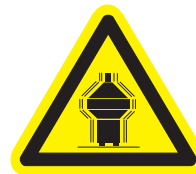
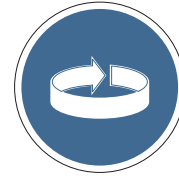
- **Use the separator only for the purpose and parameter range specified by Alfa Laval.**
- **Strictly follow the instructions for installation, operation and maintenance.**
- **Ensure that personnel are competent and have sufficient knowledge of maintenance and operation, especially concerning emergency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





Disintegration hazards

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



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S01512N1

S01512P1

S01512L1

S0151241

S01512G1

S01512H1



Entrapment hazards

- Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.
- To avoid accidental start, switch off and lock power supply before starting **any** dismantling work.

Assemble the machine **completely** before start. **All** covers and guards must be in place.



S0151201

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.

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



S01512M1

S01512Y1



Noise hazards

- Use ear protection in noisy environments.



S0151281



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.

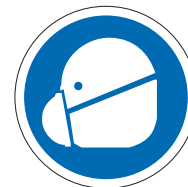


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Health hazard

- 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

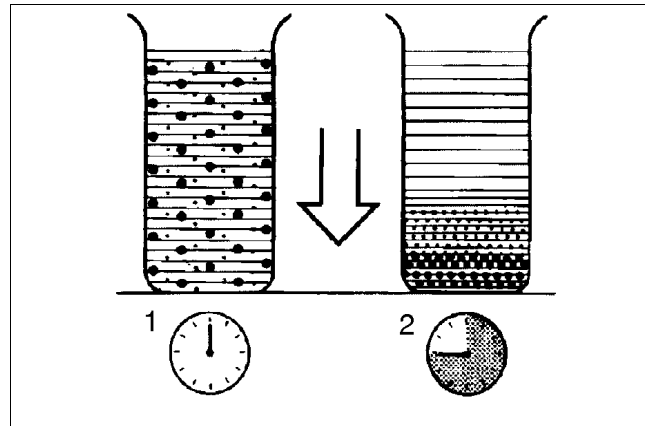
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3.1 Basic principles of separation

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

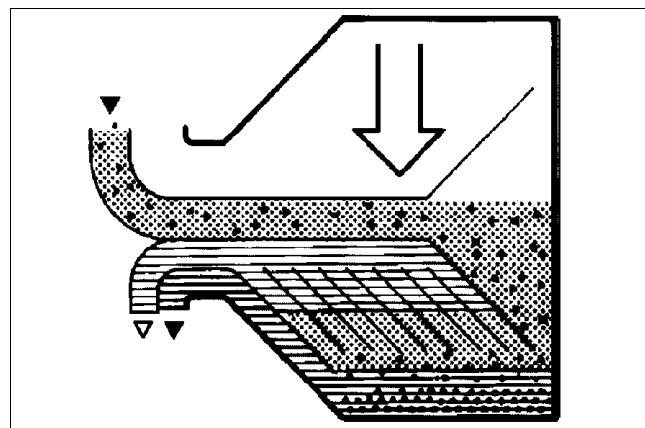
Separation by gravity

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



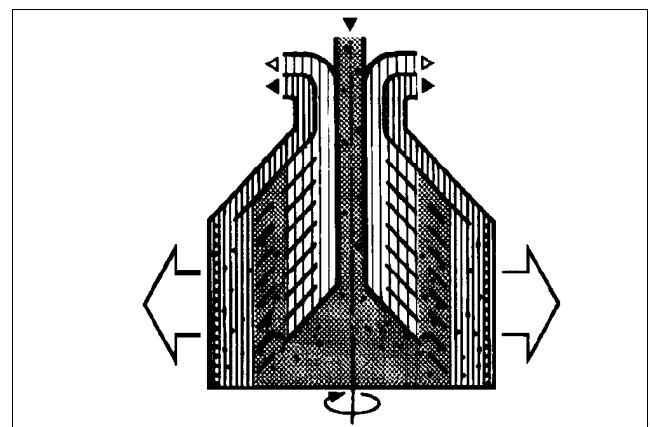
Sedimentation in a settling tank, with outlets making it possible to separate the lighter liquid parts from the heavier

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.

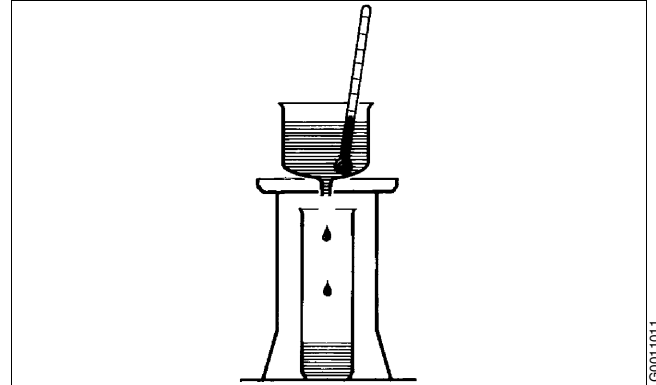


The centrifugal solution

3.1.1 Factors influencing the separation result

Separating temperature

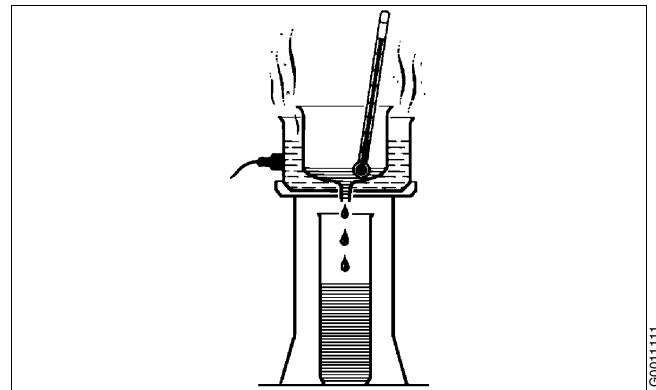
For some types of process liquids (e.g. mineral oils) a high separating temperature will normally increase the separation capacity. The temperature influences oil viscosity and density and should be kept constant throughout the separation.



High viscosity (with low temperature)

Viscosity

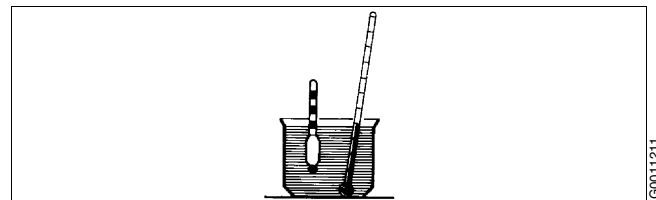
Low viscosity facilitates separation. Viscosity can be reduced by heating.



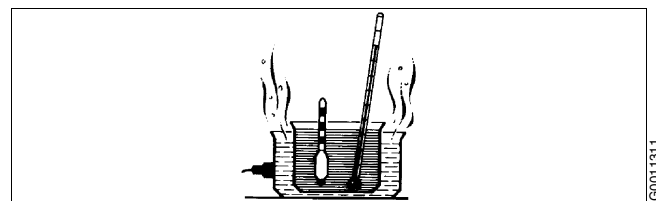
Low viscosity (with high temperature)

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

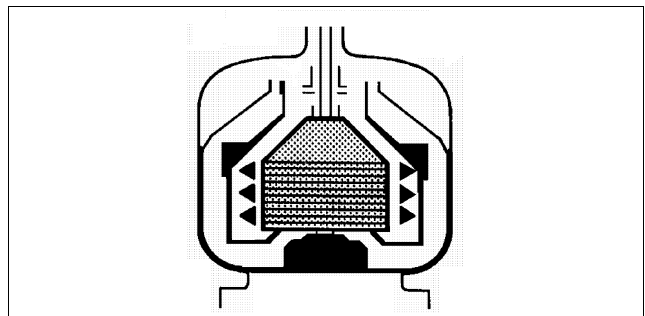
The throughput sets the time allowed for the separation of water and sediment from the oil. A better separation result can often be achieved by reducing the throughput, i.e. by increasing the settling time.

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.

Disc stack

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



Sludge accumulation

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.

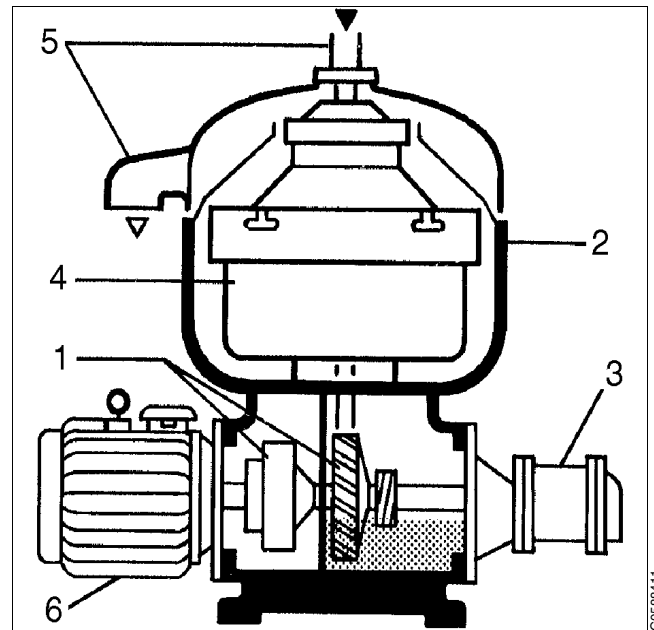
The bottom part also contains an oil bath for the worm gear, a brake and a revolution counter, indicating speed.

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.

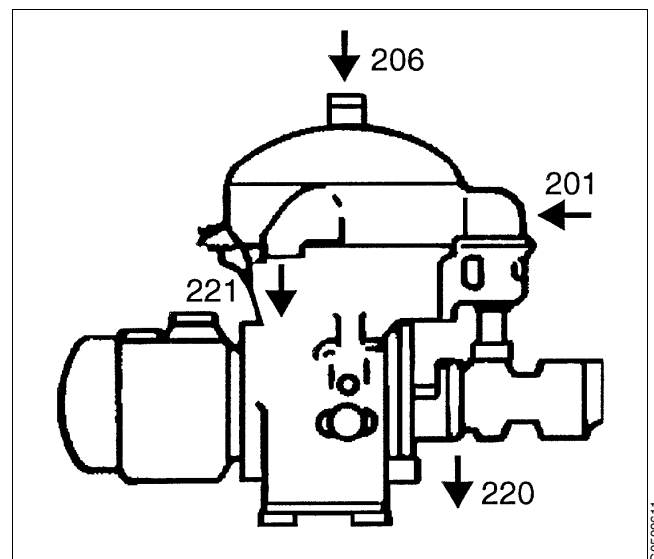
The frame top part and the collecting cover contain the processing parts of the separator, the inlet and outlets and piping.

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 119.



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

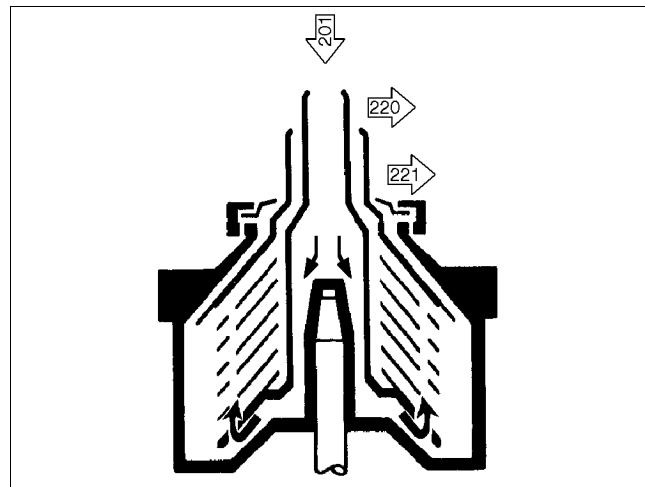
3.3 Separating function

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

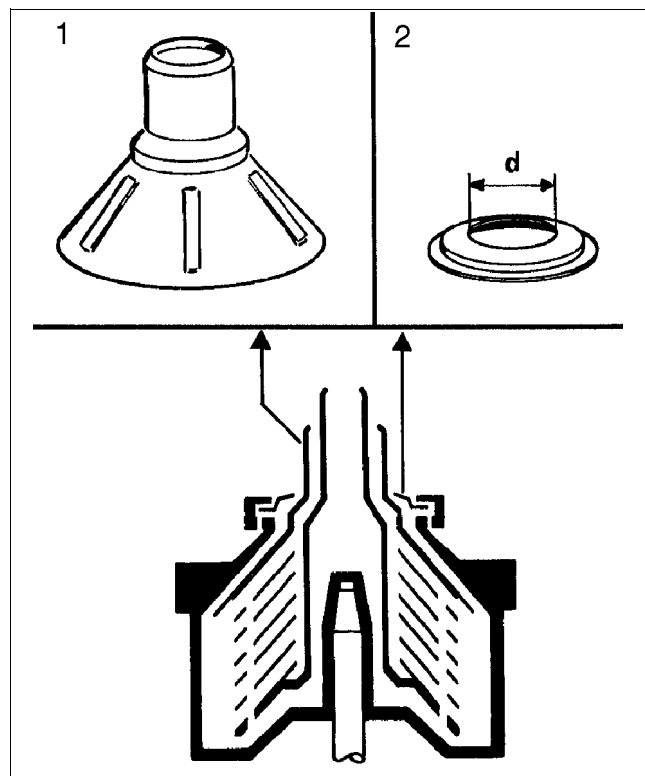
The illustration shows characteristic parts of the purifier bowl:

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 32.

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.

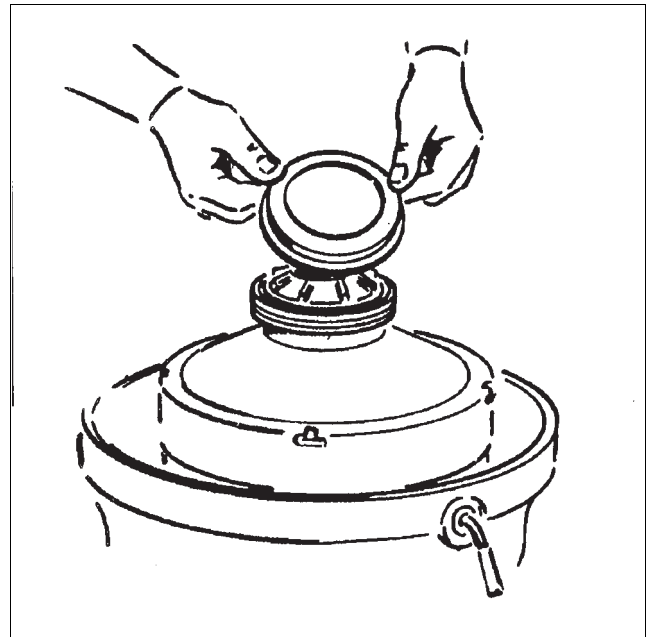
Selection of gravity disc

For selection of gravity disc, see nomogram in chapter “8.2.1 Gravity disc nomogram” on page 124.

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.



Gravity disc

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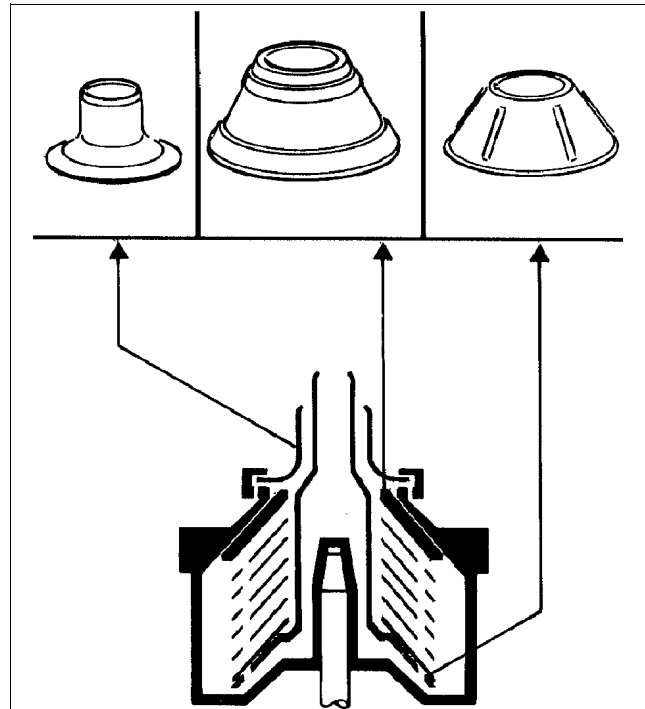
3.3.3 Clarifier bowl

The illustration shows characteristic parts of the clarifier bowl:

1. Discharge collar
2. Top disc without neck

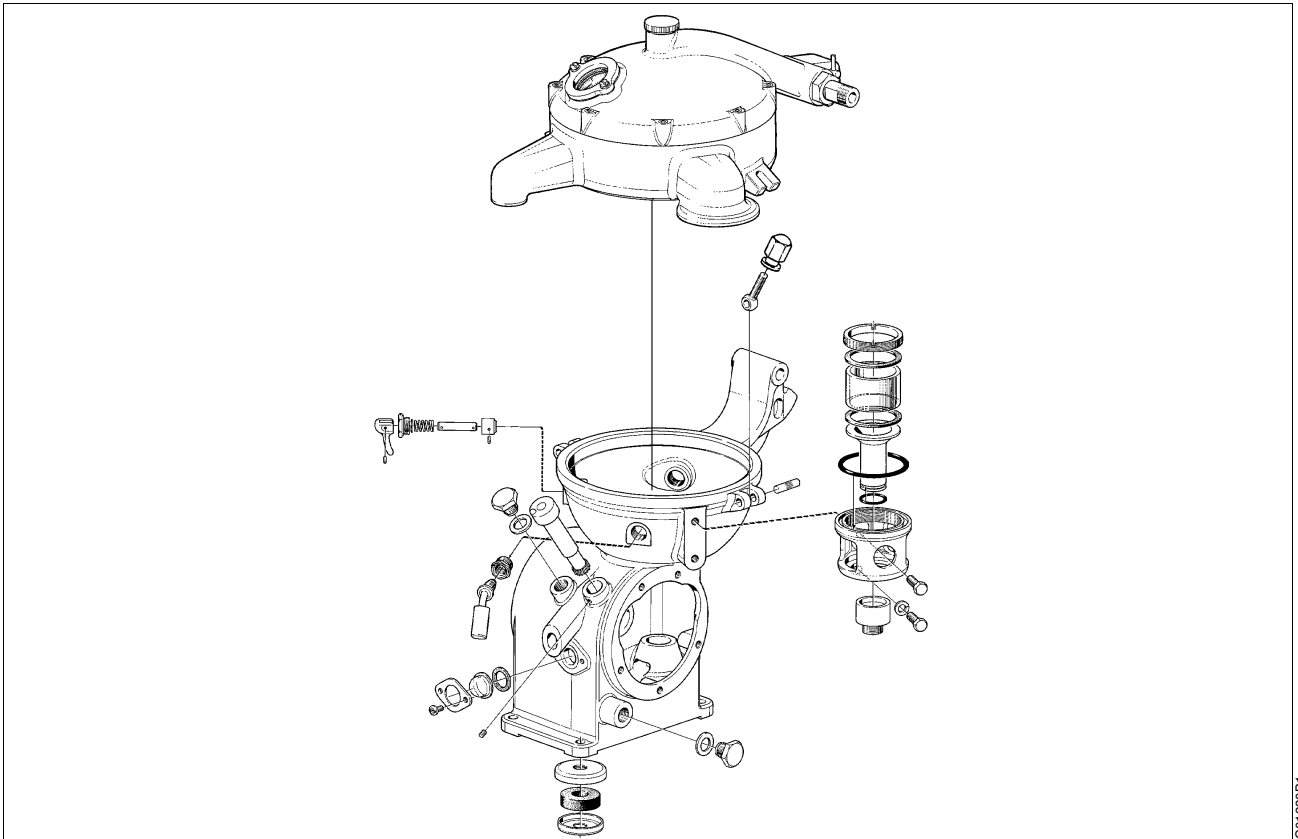
This bowl has one liquid outlet. The process liquid flows through the distributor to the interspaces between the bowl discs. Through the action of the centrifugal force the heavy particles move along the underside of the discs towards the bowl periphery, where they settle on the bowl wall. The liquid proceeds towards the bowl centre and discharges through the bowl hood.

The separation is influenced by changes in the viscosity (rise in separating temperature) or in the throughput.



Clarifier bowl

3.4 Mechanical function



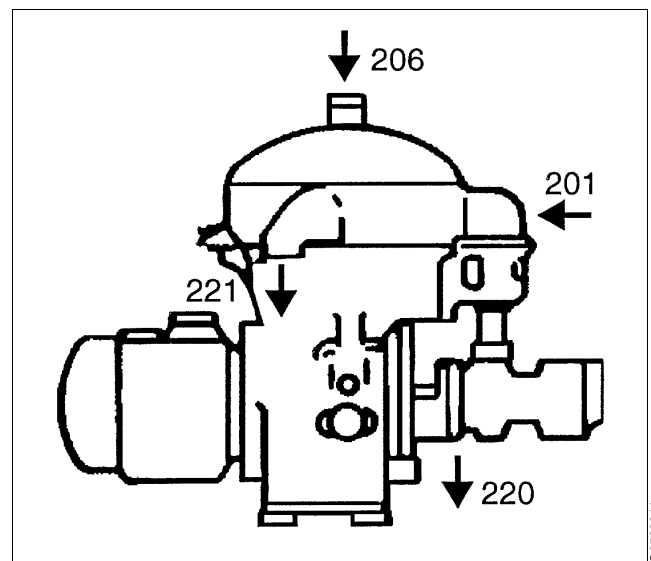
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Exploded view

3.4.1 Inlet and outlet

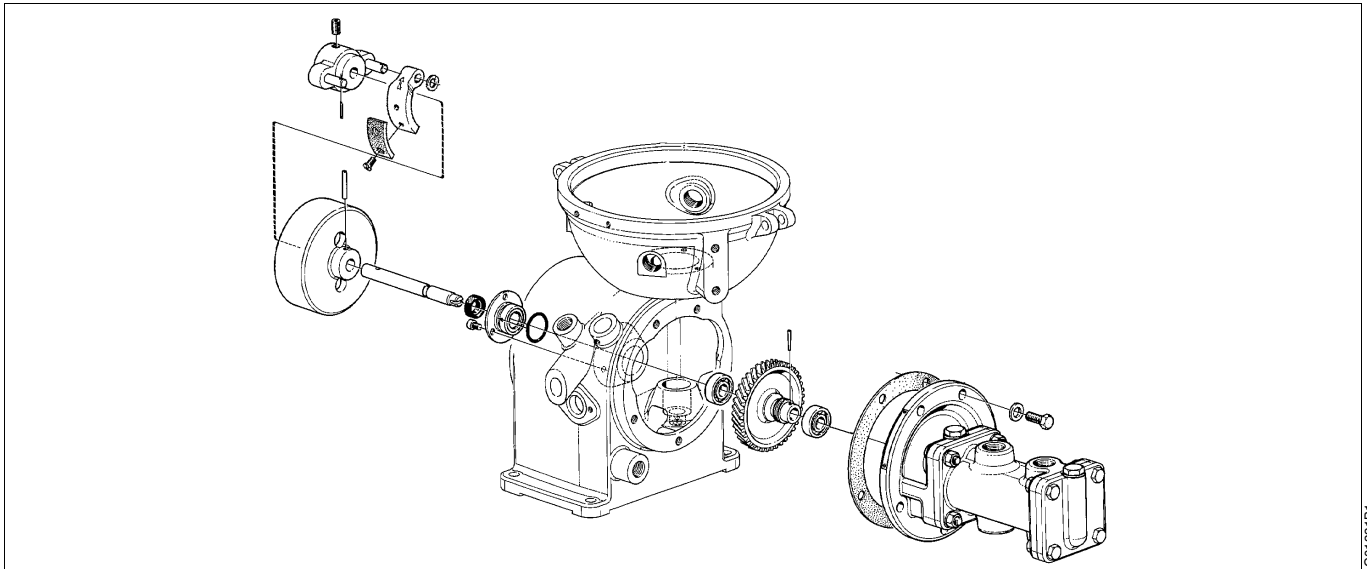
The inlet and outlets consists of the following parts:

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



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3.4.2 Mechanical power transmission



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Horizontal drive

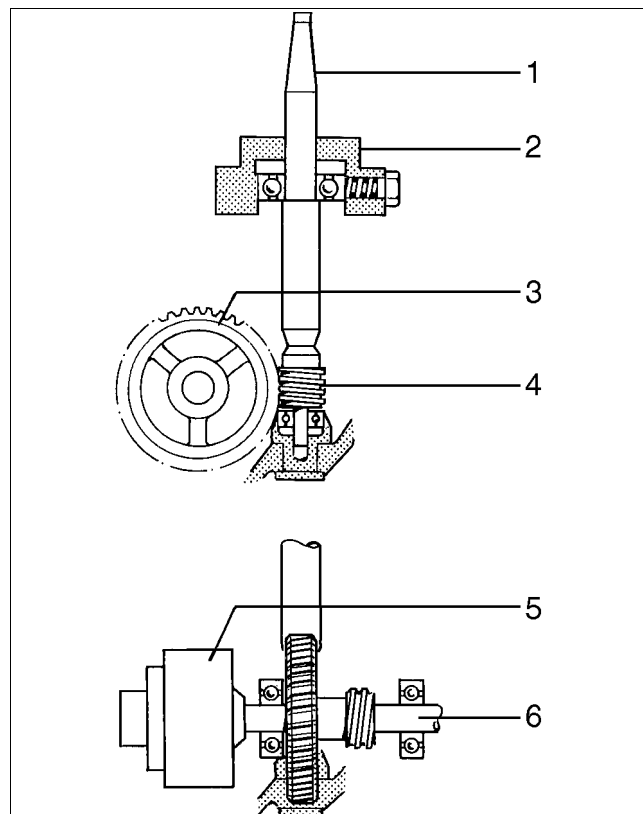
The main parts of the power transmission between motor and bowl are illustrated in the figure.

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 119.

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.



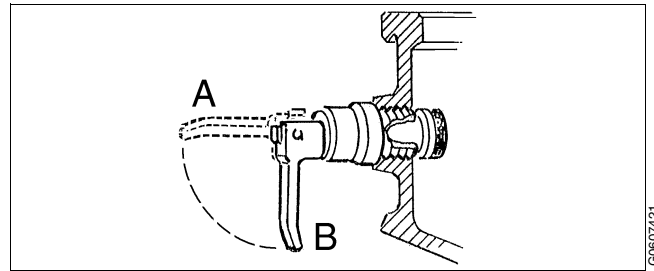
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1. Bowl spindle
2. Top bearing and spring casing
3. Worm wheel
4. Worm
5. Friction coupling
6. Worm wheel shaft

3.4.3 Brake

The separator is equipped with a hand operated brake to be used when stopping the separator. The use of the brake reduces the retardation time of the bowl and critical speeds will therefore be quickly passed.

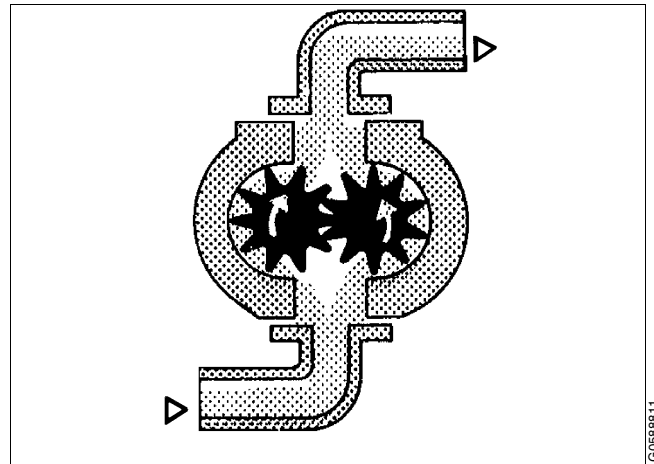
The brake lining acts on the outside of the bowl body.



Applying (A) and releasing (B) of brake

3.4.4 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.

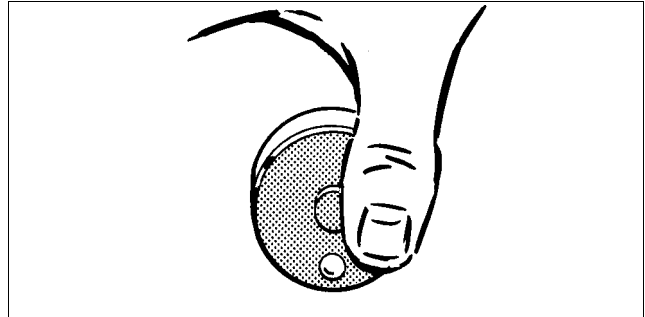


Gear pump

3.4.5 Sensors and indicators

Revolution counter

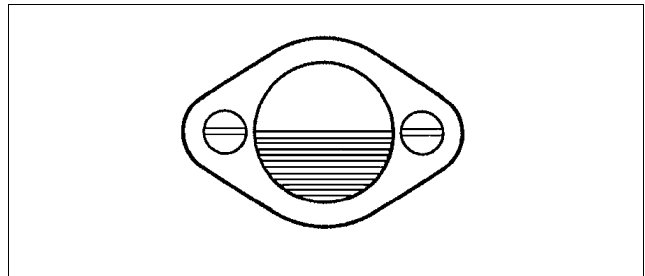
A revolution counter indicates the speed of the separator and is driven from the worm wheel shaft. The correct speed is needed to achieve the best separating results and for reasons of safety. The number of revolutions on the revolution counter for correct speed is shown in chapter “[8 Technical Reference](#)” on page 119. Refer to name plate for speed particulars.



Revolution counter

Sight glass

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



Sight glass - oil level

Cover interlocking switch (Option)

When required, the cover interlocking switch should be connected to the starter equipment so that starting of the motor is prevented when the separator collecting cover is not (completely) closed.

The switch is described in “[8.10.2 Machine plates and safety labels](#)” on page 162.

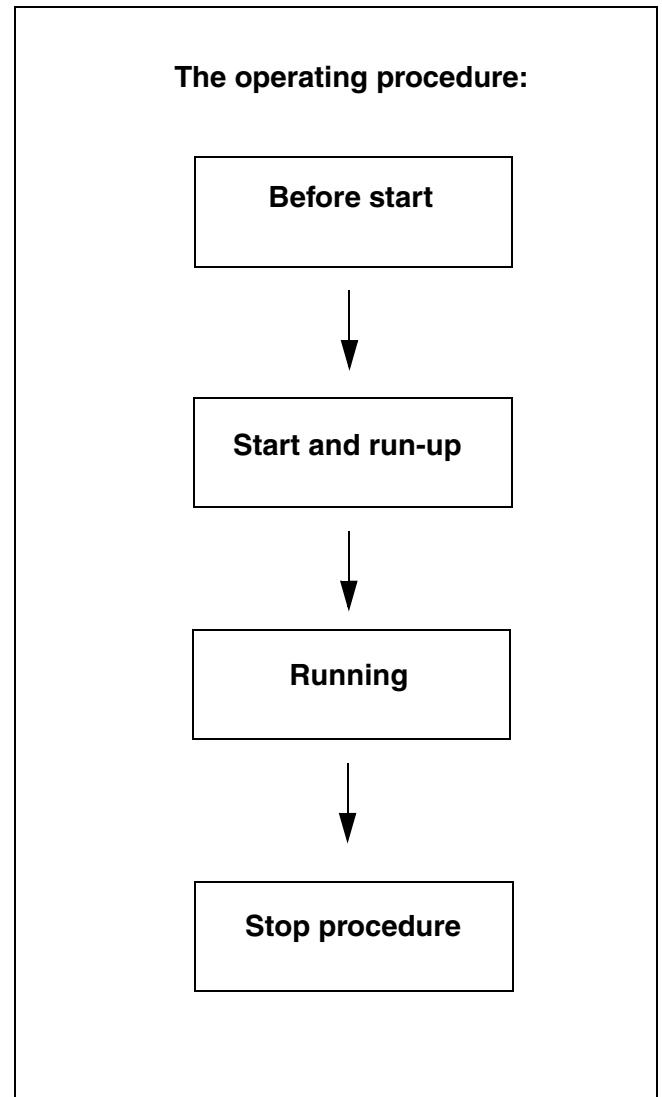
3.5 Definitions

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

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4.2.4 Assembling the bowl	42



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.

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 119 in the documents:

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

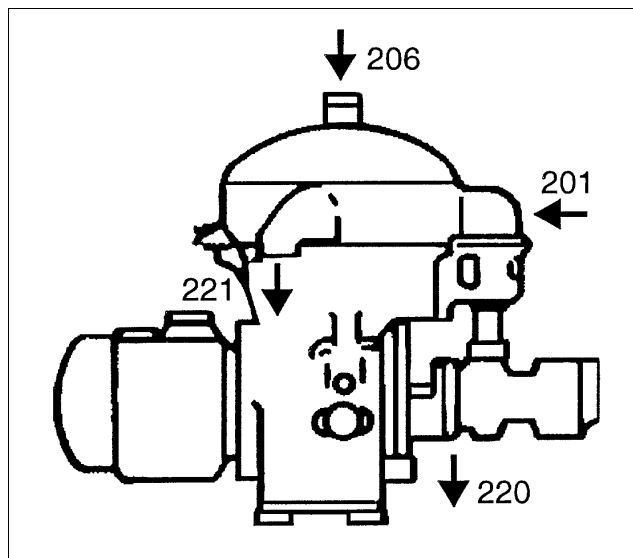
Before first start the following checkpoint shall be checked:

- 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 sightglass. Use the correct grade of oil. The separator is delivered without oil in the worm gear housing. For grade and quality, see "8.8 Lubricants" on page 135.

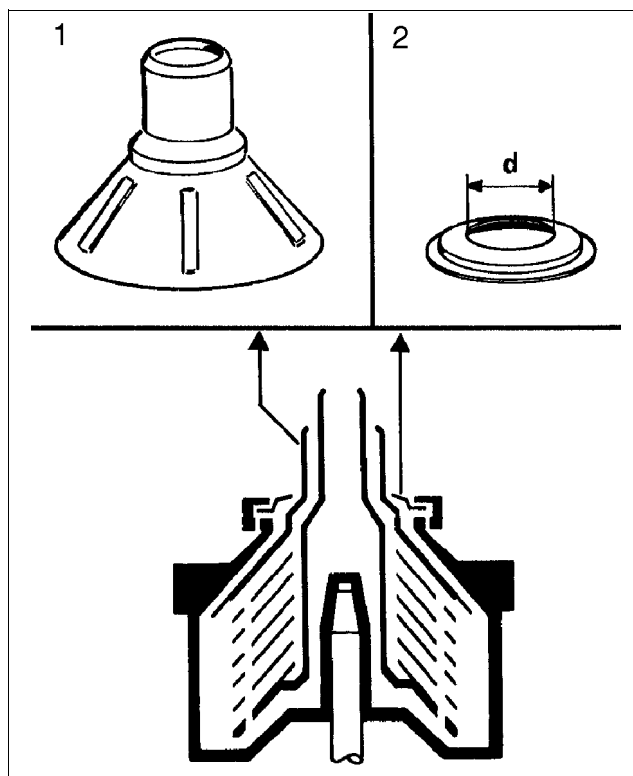
4.1.2 Selection of gravity disc

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 124 can be used.



An explanation of the separator connections is given in "8.5 Connection list" on page 130

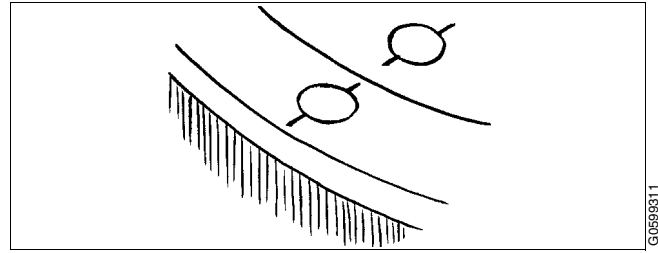


The gravity disc sets the position of oil-water interface

4.1.3 Before normal start

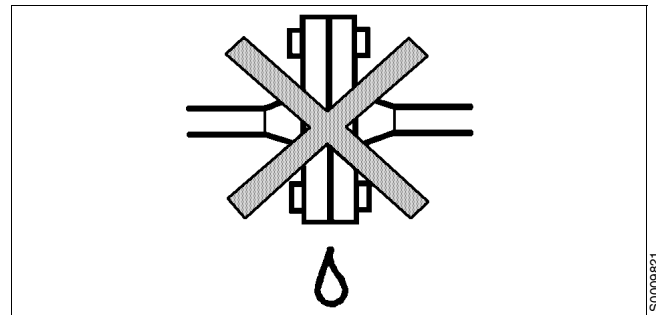
Check these points before every start.

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



G0099311

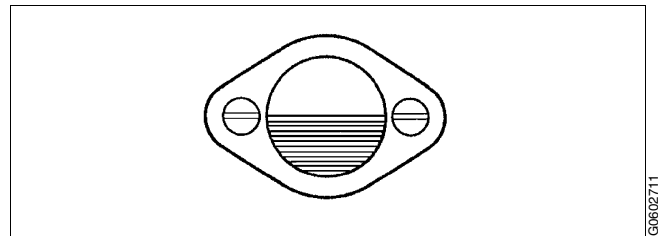
2. Make sure that all inlet and outlet couplings and connections have been correctly made and are properly tightened to prevent leakage.



S0009821

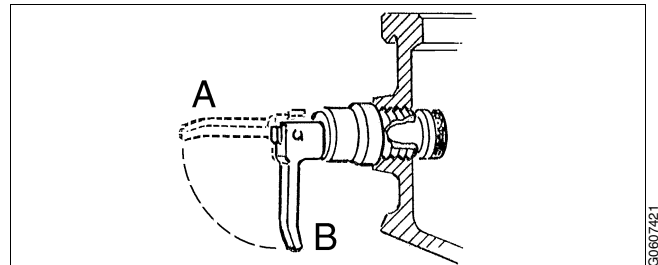
3. Check that the bolts of the outlet cover and the hooks and screws for the frame hood are tightened.

4. Read the oil level. The middle of the sight glass indicates the **minimum** level. Refill if necessary. For grade and quality, see ["8.8 Lubricants" on page 135](#).



G00602711

5. Release the brake (B).

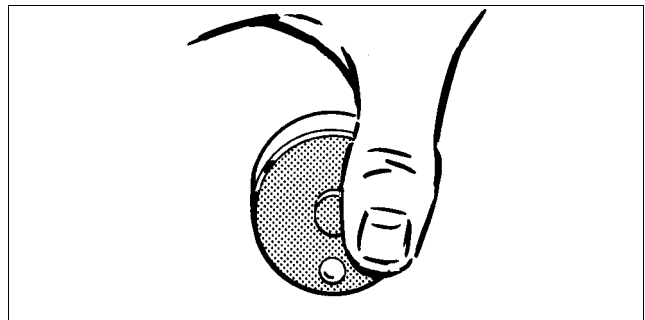


G00807421

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

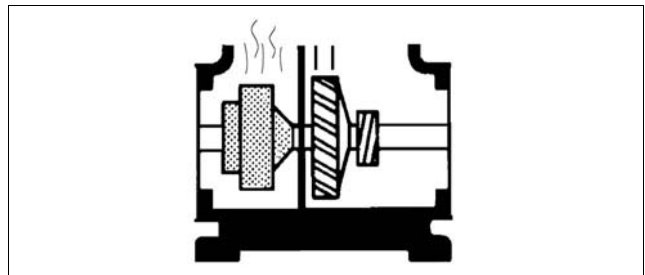
4.1.4 Starting and running-up procedure

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 revolution counter should run clockwise.



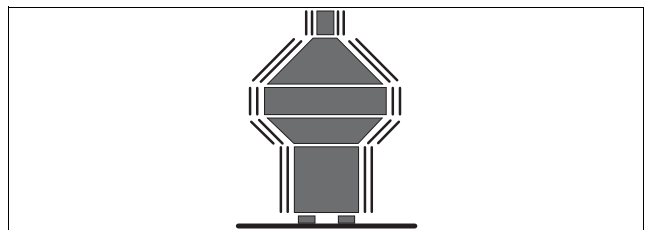
Revolution counter

3. Be alert for unusual noises or conditions. Smoke and odour may occur at the start when friction pads are new.



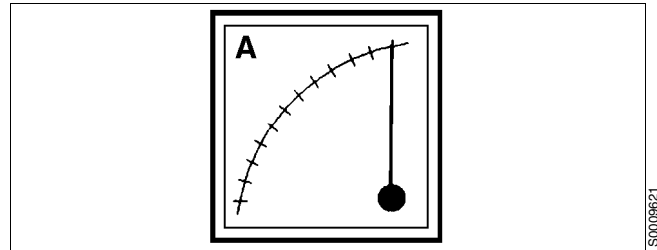
Smell

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



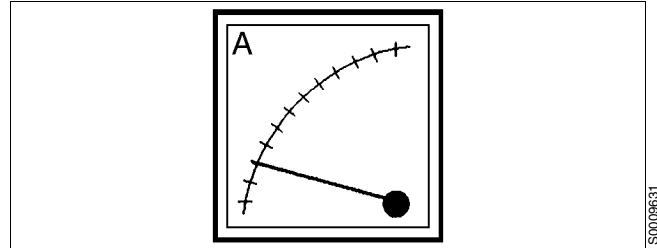
Vibration

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 121](#).



.... 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. 1 liter (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.

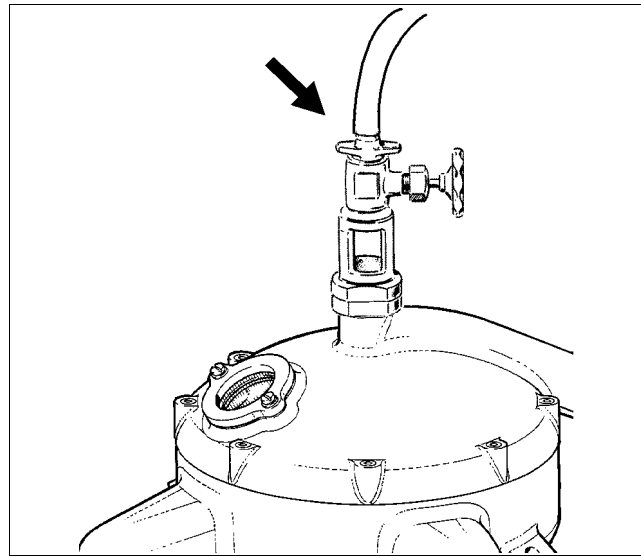
2. For **clarification** mode:
 - a. Start the oil feed with full flow. Fill the bowl as quickly as possible.

3. For both **purification** and **clarification** mode:

Check the separator inlet and outlet pressures.

Adjust the oil outlet pressure to 1,5-2 bar.
For permissible pressures, see section [“8.2 Technical data”](#) on page 121.

4. Adjust to desired throughput.



Using water adding device, see [“8.9.3 Water adding device \(option\)”](#) on page 150

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.

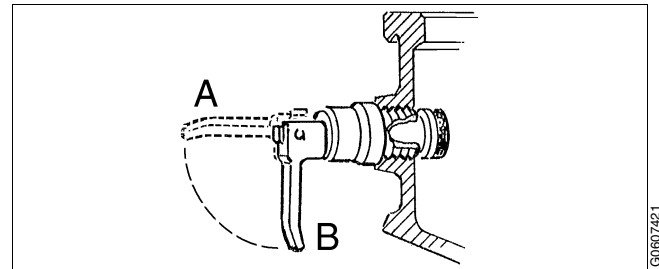
4.1.7 Stopping procedure

1. Feed sealing water.
2. Turn off the oil feed.
3. Stop the separator.
4. Pull the brake. (A)

Wait until the separator has come to a complete standstill (2-5 minutes).

Release the brake when the separator is at standstill. (B)

5. Manual cleaning should be carried out before next start up. See [“4.2.1 Removal of separated sludge”](#) on page 39.



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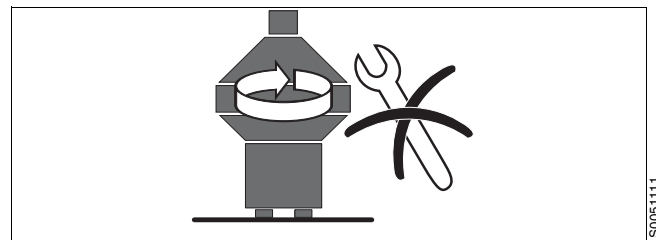


WARNING

Entrapment hazards

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

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



S0051111

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.

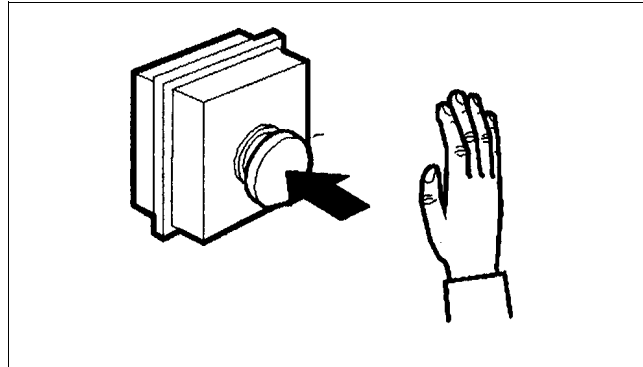
The following should happen automatically:

- 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

50009911

4.2 Cleaning the bowl

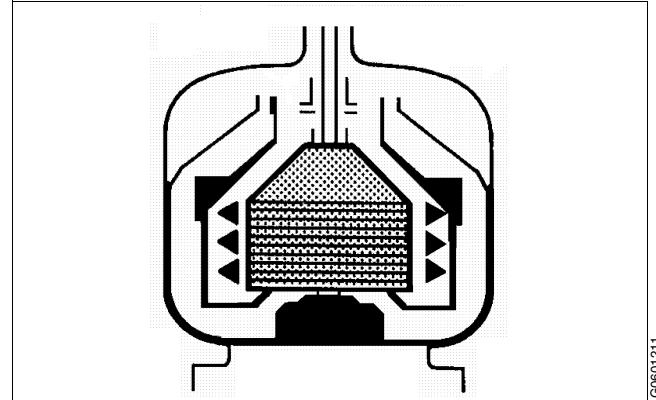
The separated sludge is accumulating on the inside surface of the separator bowl. How often the separator needs to be cleaned, depends on the amount of sediment entering the separator. High solids content or high throughput has the consequence that the cleaning need to be done more often.

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.

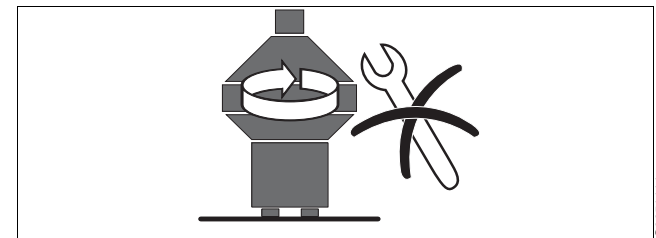


WARNING

Entrapment hazards

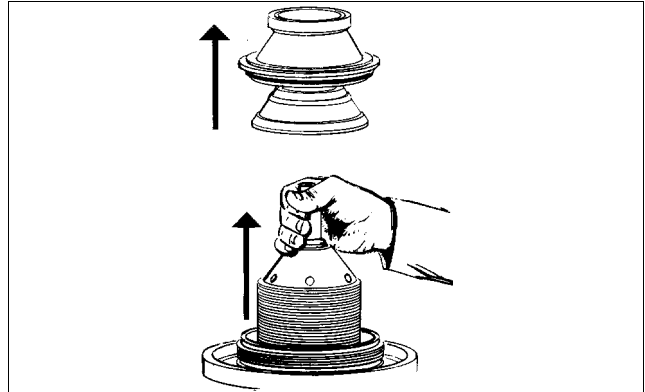
Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.

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



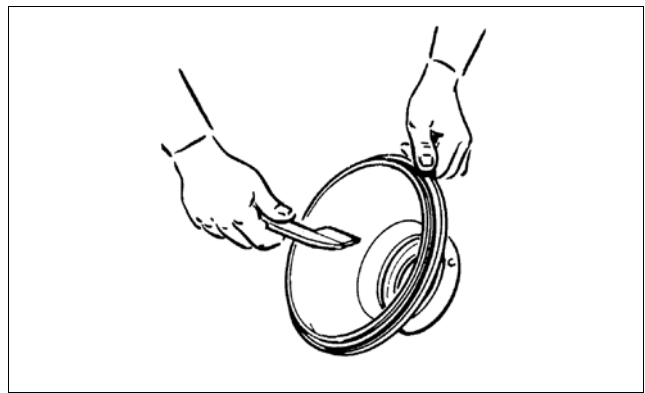
2. Raise the collecting cover open. For instructions, see chapter [“6 Dismantling/ Assembly”](#) on page 81.

3. Lock the bowl from rotating with the two lock screws.
4. Open the separator bowl.



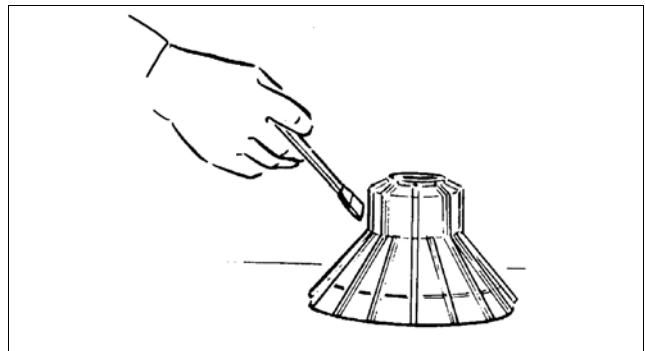
G0609311

5. Clean the bowl hood.



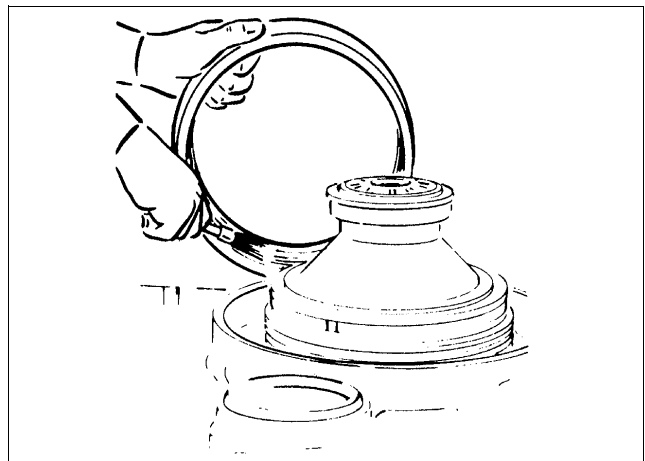
G0601011

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



G0600811

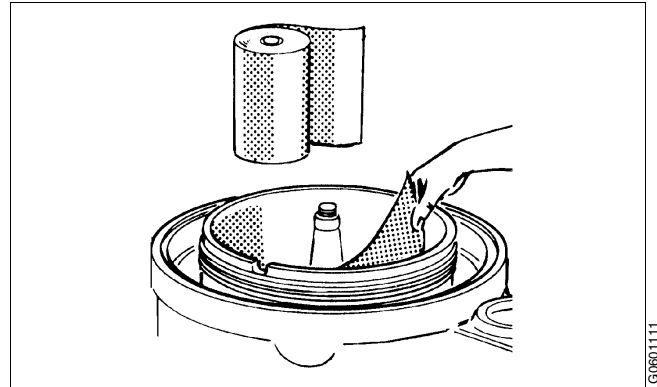
7. Remove sediment from the bowl body, clean and lubricate lock ring.



G0600911

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

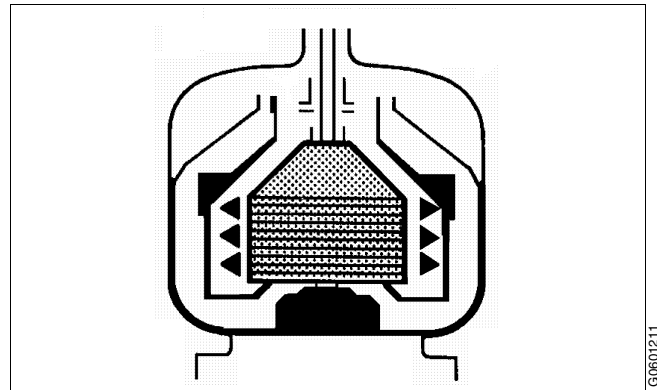
4.2.3 Disc stack

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 Assembling 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.

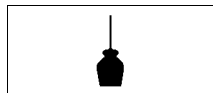
NOTE

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

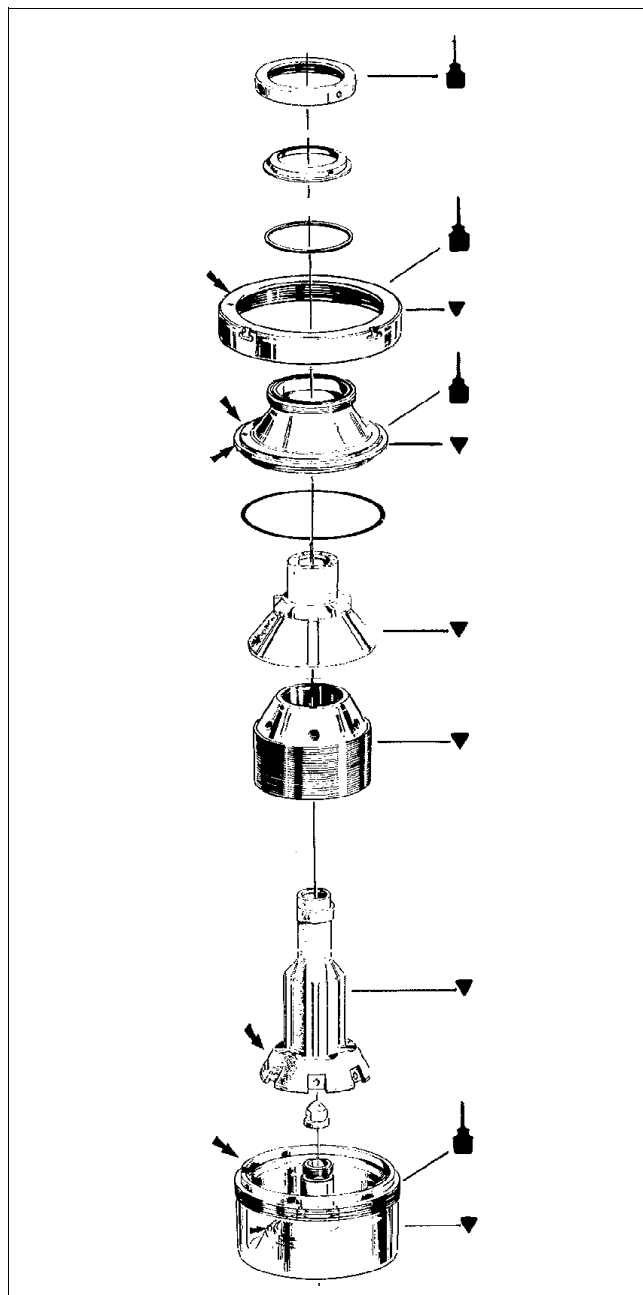


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Balanced parts.
Exchange necessitates
rebalancing of bowl.



S0068511



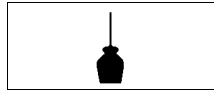
G0600311

Purifier bowl, exploded view

Clarifier bowl

The arrows indicate positions of guides on the bowl parts.

Lubrication needed

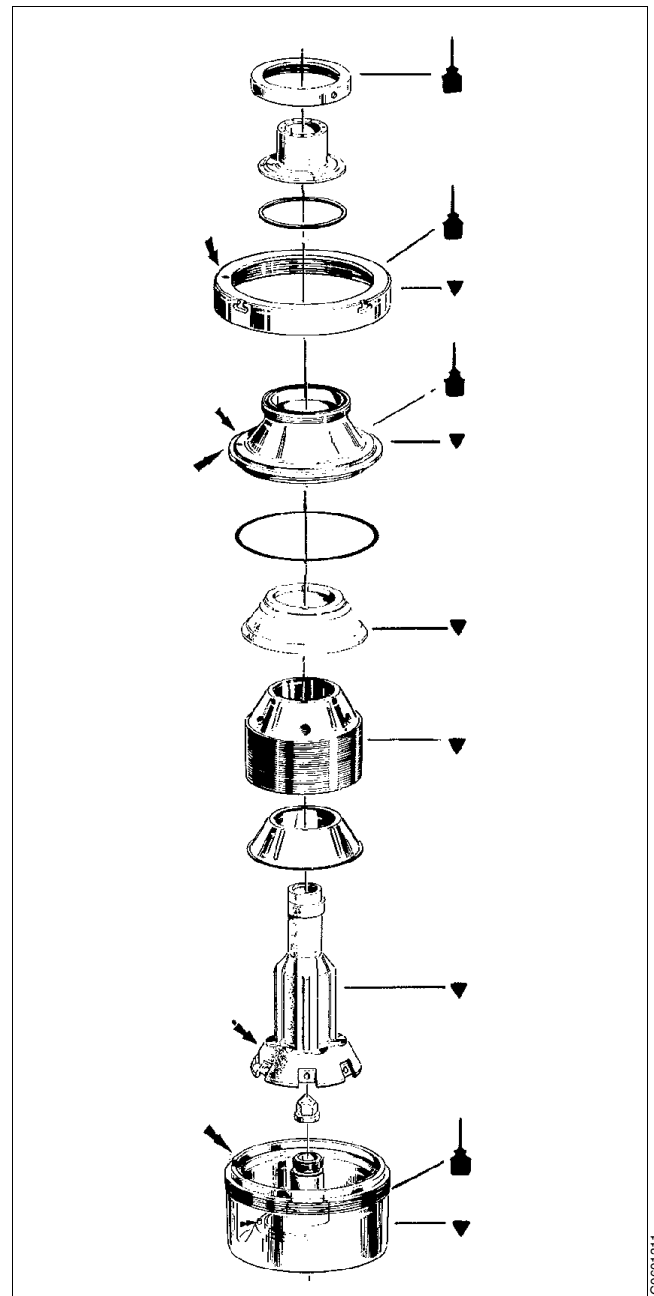


S0000711

Balanced parts.
Exchange necessitates
rebalancing of bowl.



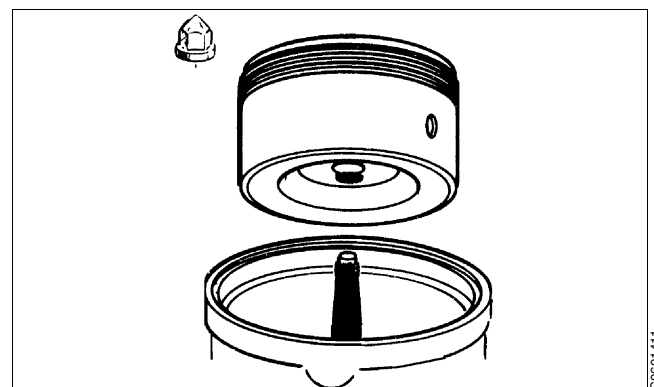
S0068511



G0601311

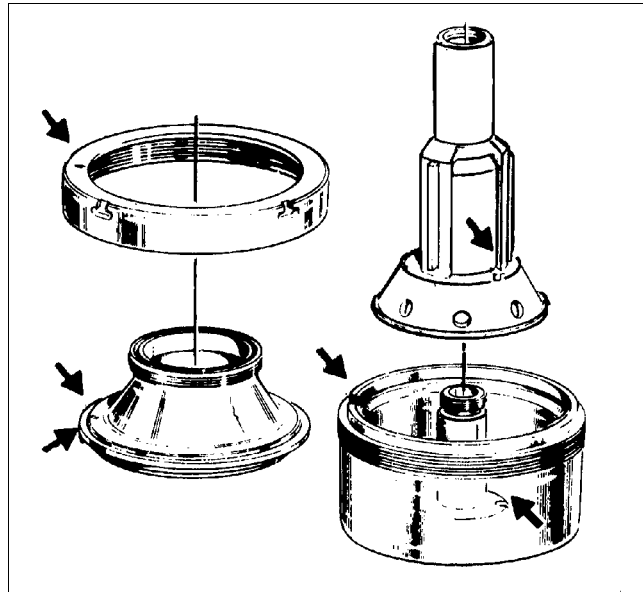
Clarifier bowl, exploded view

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



G0601411

- Bring bowl parts into positions defined by the guides.

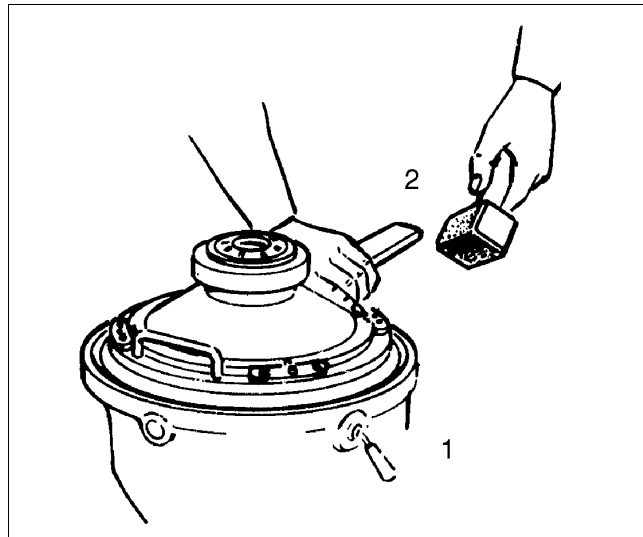


G0588911

- Screw in both lock screws. Screw large lock ring anti-clockwise until bowl hood lies tightly against bowl body.
Slacken the two lock screws.

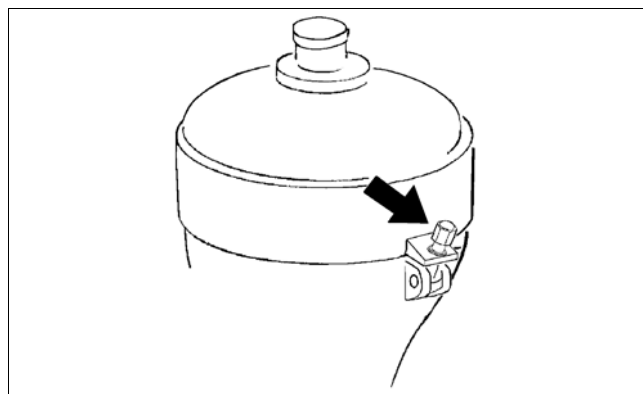
NOTE

The two lock screws must be fully released to prevent risk for damage to bowl body.



G0601511

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



G0600211

Max. torque = 12 Nm.

5 *Service Instructions*

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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.

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.

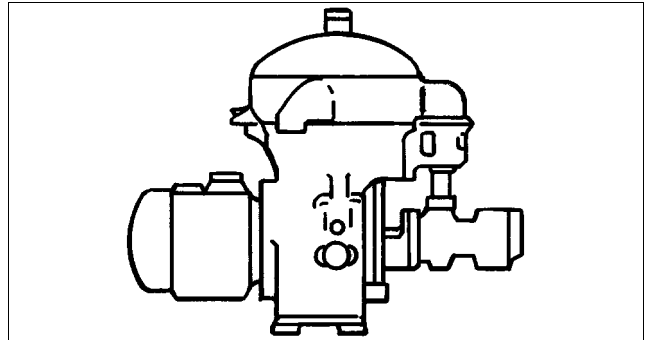
Daily checks consist of minor check points to carry out for detecting abnormal operating conditions.

After a standstill for more than six months the spindle bearings should be prelubricated before restart. See also “5.6.4 Shutdowns” on page 78.

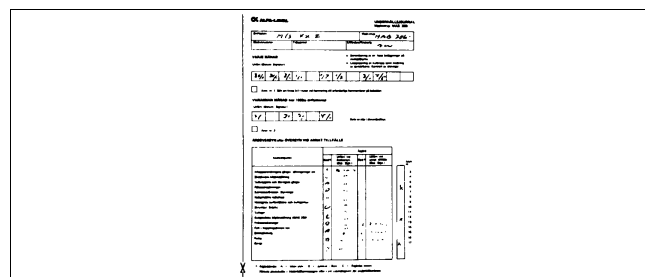
Oil change

The oil change interval is every 1500 hours or at least once every year if the total number of operating hours is less than 1500 hours.

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



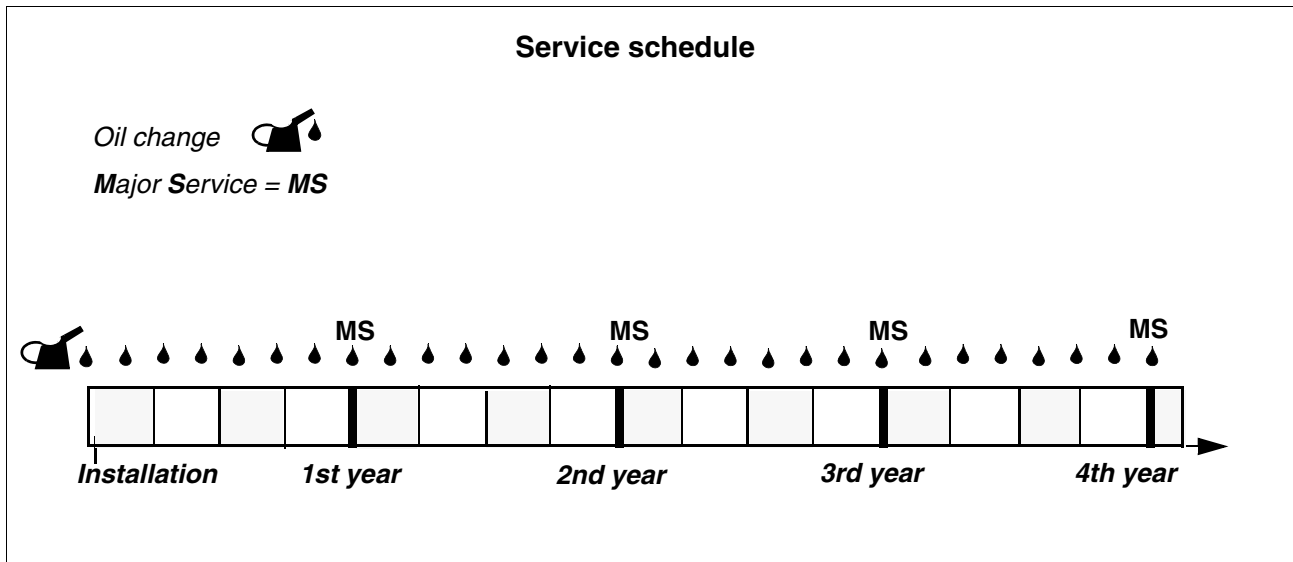
Periodic maintenance prevent stoppages



Maintenance log

MS - Major Service

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” on page 83](#).

Place the separator parts on clean, soft surfaces such as pallets.
2. Inspect and clean the dismantled separator parts according to the Service Log.
3. Fit all the parts delivered in the Service kit while assembling the separator as described in [“6.3 Assembly” on page 93](#). 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 Major Service (MS).

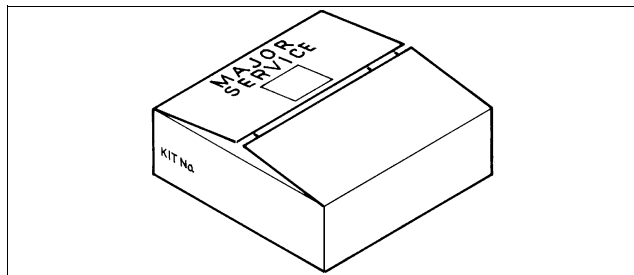
For other services the spare parts have to be ordered separately.

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.



Major service kit

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		74	
Worm wheel shaft and gear casing Check for vibration and noise Check	Oil level in gear housing	50	
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 1500 * hours of operation.

Main component and activity	Part	Page	Notes
Worm wheel shaft and gear housing			
Check	Worm wheel and worm	65	
Renew	Oil * in gear housing	50	

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

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

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

See chapter [“8 Technical Reference”](#) on page [119](#) for further information.

5.2.3 MS-Major Service

Name of plant:

Local identification:

Separator: MAB 103B-24

Manufacture No./Year:

Total running hours:

Product No:

881145-09-01/7

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	58	
	Bowl hood	39	
	Top disc	-	
	Gravity disc	-	
	Bowl discs	-	
	Distributor	-	
	Bowl body	-	
	Corrosion	54	
	Erosion	56	
	Cracks	57	
	Disc stack pressure	58	
Renew	O-rings and sealings	-	

Name of plant: _____ Local identification: _____
 Separator: MAB 103B-24 Manufacture No./Year: _____
 Total running hours: _____ Product No: 881145-09-01/7
 Date: _____ Signature: _____

Main component and activity	Part	Page	Notes
Worm wheel shaft and gear housing			
Check	Worm wheel and worm	65	
	Radial wobble of worm wheel shaft	-	
	Axial play of coupling disc	62	
Renew	Oil in gear housing	50	
Vertical driving device			
Clean and check	Bowl spindle	61	
	Wear of driver and of groove in worm	65	
	Buffers	60	
	Ball bearing housing indentations	64	
	Radial wobble of bowl spindle	60	
Renew	Ball bearings and top bearing springs	61	
Brake			
Clean and check	Spring and brake shoe	-	
Renew	Brake plug	63	
Pump			
Clean and check	Bushings, wearing seals, shear pin coupling and impeller shaft.	102	
Renew	Lipseal ring	102	

Name of plant:

Local identification:

Separator: MAB 103B-24

Manufacture No./Year:

Total running hours:

Product No:

881145-09-01/7

Date:

Signature:

Main component and activity	Part	Page	Notes
Friction coupling			
Clean and check	Friction coupling	77	
Renew	Friction pads		
Renew	Lipseal ring		
Frame feet			
Renew	Rubber cushions	108	
Electrical motor			
Clean and check	Position of coupling disc	62	
Lubrication (if nipples are fitted)	-	-	
Signs and labels on separator			
Check attachment and readability, replace if needed	Safety label on collecting cover	162	
Monitoring equipment (option)			
Function check	Cover interlocking switch	67	

NOTE

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

5.3 MS - Check points

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

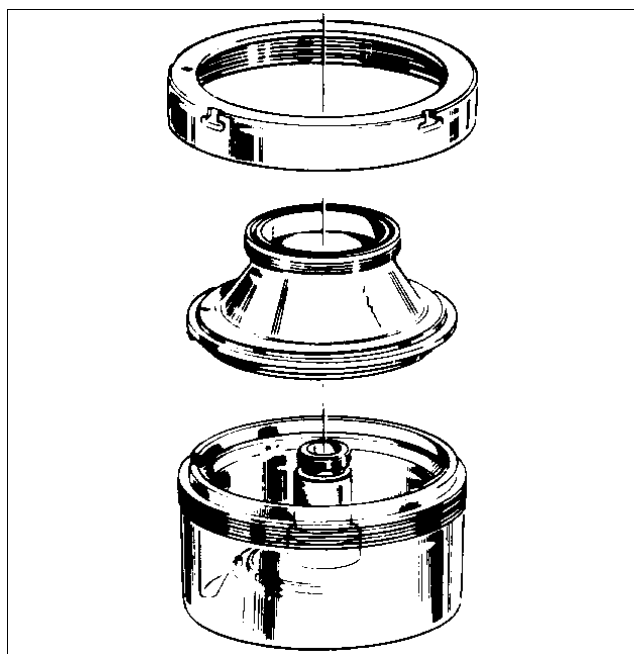
Inspect regularly for corrosion damage.
Inspect frequently if the process liquid is corrosive.

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.

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.



Main bowl parts

G0589811

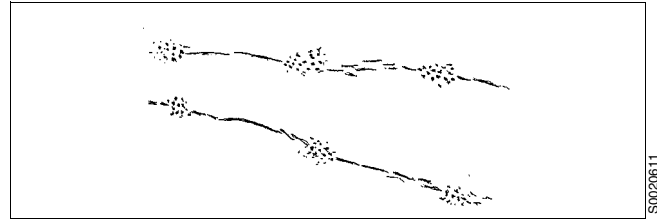
Stainless steel

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:

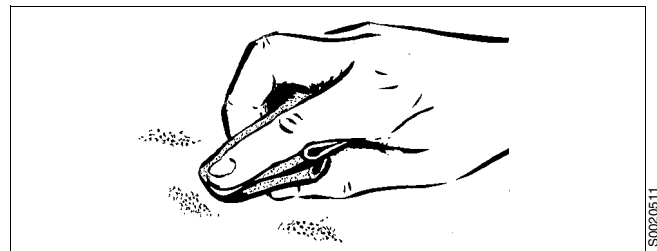
- Exposed to a stationary solution.
- In a crevice.
- Covered by deposits.
- Exposed to a solution that has a low pH 7.5
- value.

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

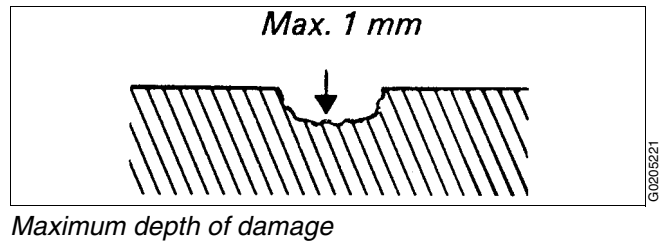
Erosion can occur when particles suspended in the process liquid slide along or strike against a surface. Erosion can become intensified locally by flows of higher velocity.



WARNING

Disintegration hazard

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



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.

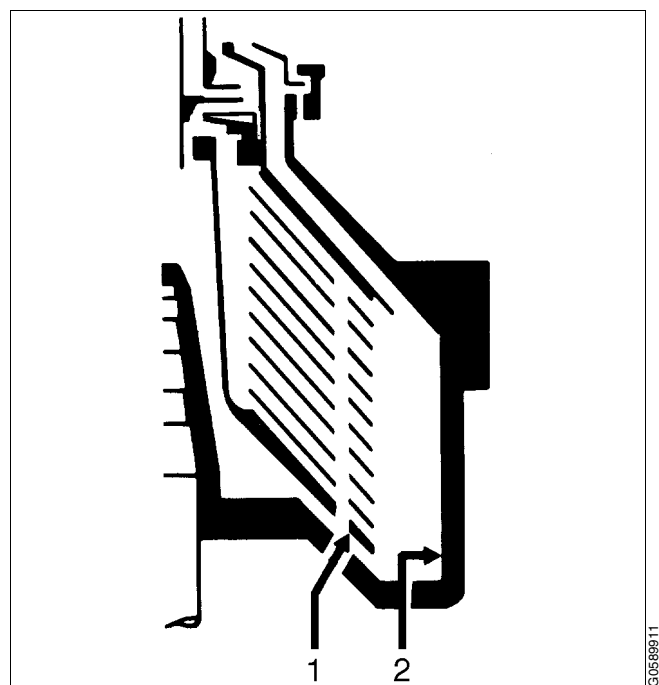
Look carefully for any signs of erosion damage. Erosion damage can deepen rapidly and consequently weaken parts by reducing the thickness of the metal.



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
<p>All forms of cracks are potentially dangerous as they reduce the strength and functional ability of components.</p>	
<p>Always replace a part if cracks are present.</p>	

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

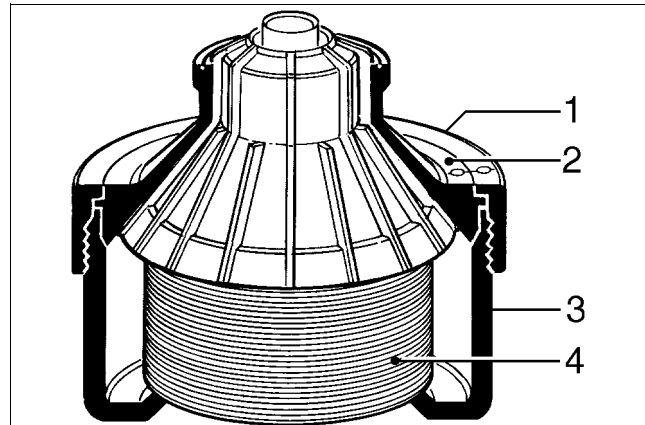
Always contact your Alfa Laval representative if you suspect that the largest depth of the damage exceeds 1,0 mm. Do not continue to use the separator until it has been inspected and cleared for operation by Alfa Laval.

5.3.4 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.



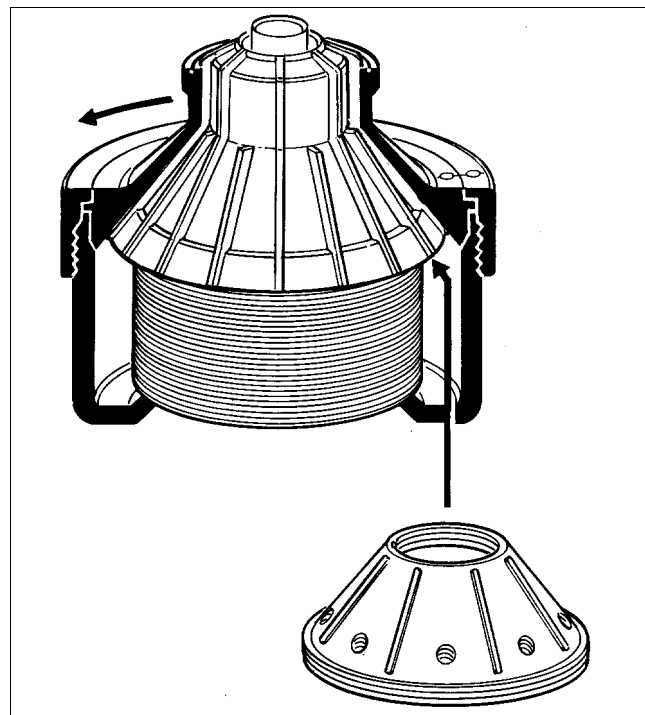
Disc stack pressure check

Compress the disc stack by tightening the lock ring, see chapter "6.3.3 Bowl" on page 98.

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.

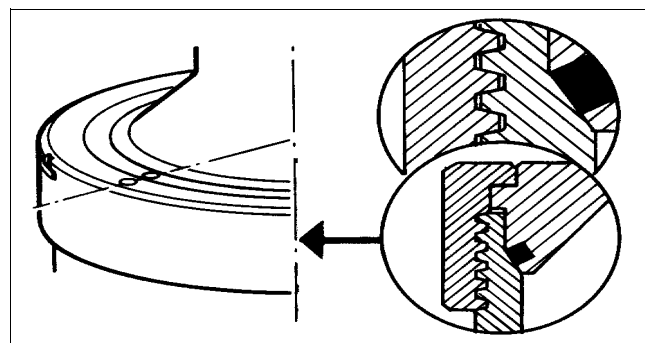


Add discs to achieve disc stack pressure


5.3.5 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.

Damage

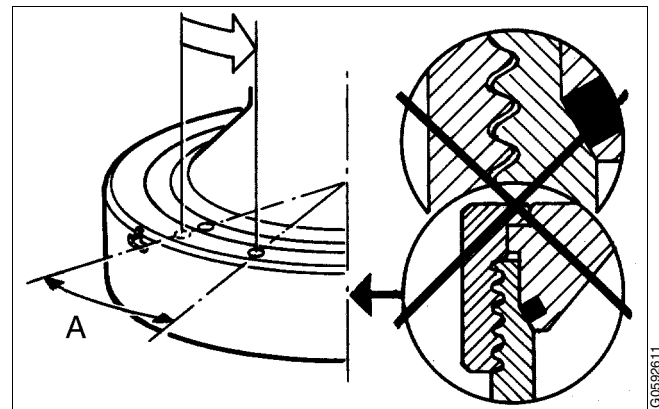
The position of the threads, contact and guide surfaces are indicated by arrows in the illustration.

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.



Maximum wear $A=25^\circ$ (or 25 mm)

5.3.6 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

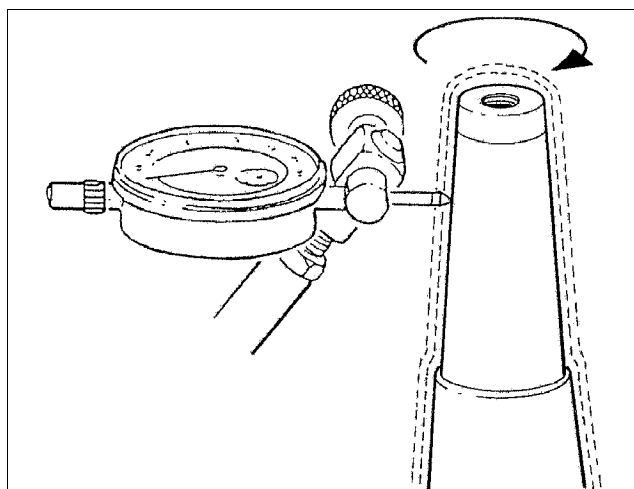
Spindle wobble will cause rough bowl run. This leads to vibration and reduces lifetime of ball bearings.

Check the wobble before mounting the bowl.

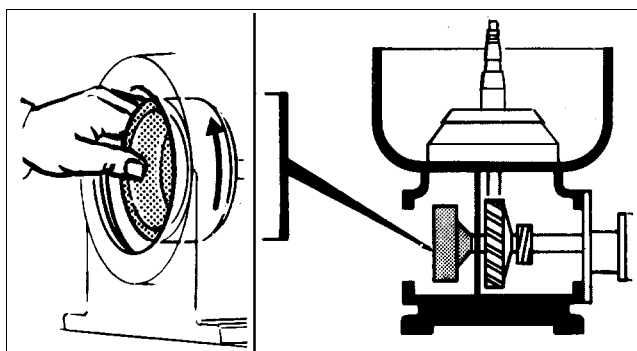
Before measuring, make sure that the buffer plugs are properly tightened.

- 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.



Maximum spindle wobble 0,15 mm



Rotate spindle by hand

5.3.7 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.

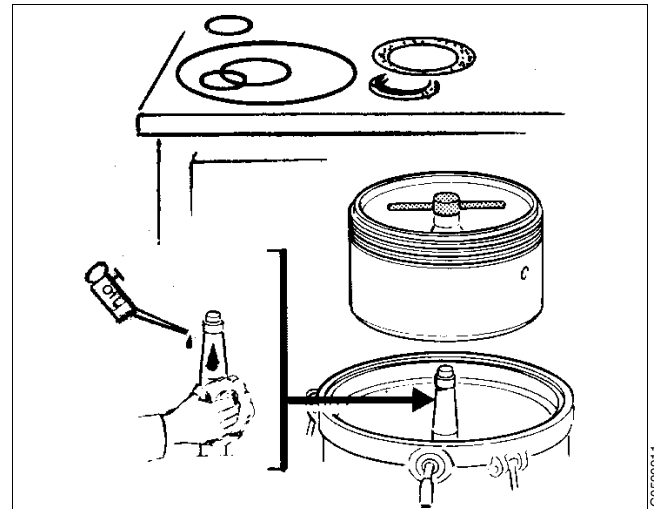
Rust can be removed by using a fine-grain emery cloth (e.g. No 320).

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 assembling.

NOTE

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



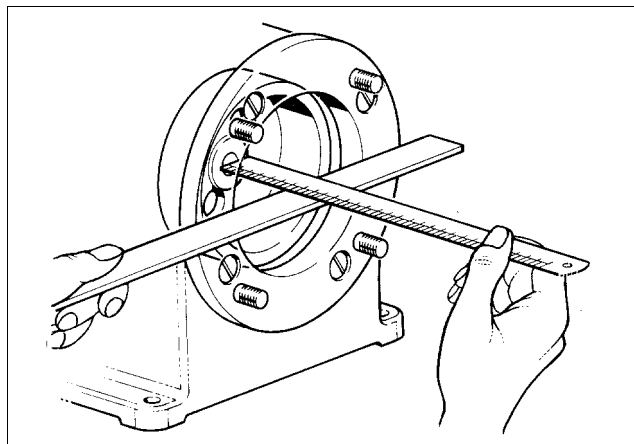
Put a little oil on the bowl spindle and wipe it of with a clean cloth to prevent corrosion

5.3.8 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.

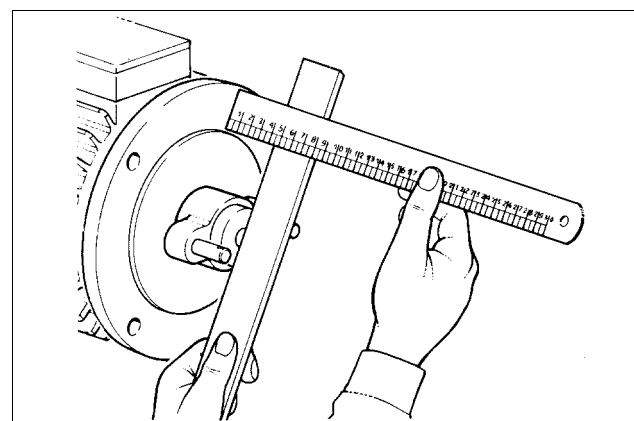
If the coupling disc is loosened without first marking its position on the motor shaft, the correct position must be determined again.

1. Measure the distance on the frame.



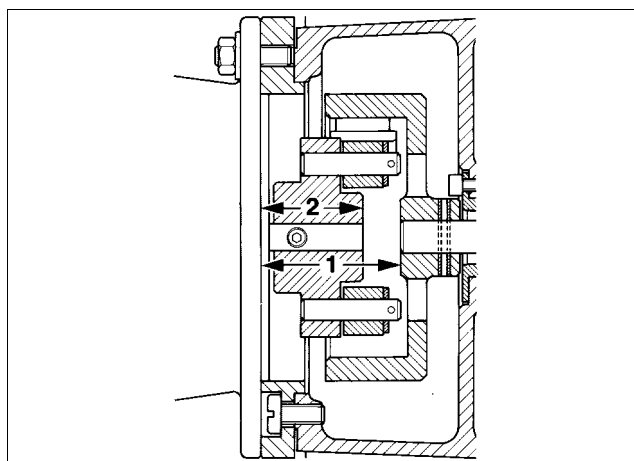
Frame distance

2. Measure the distance on the motor.



Motor distance

3. The coupling disc is in correct position when frame distance (1) is 16-17 mm larger than motor distance (2). See fig.



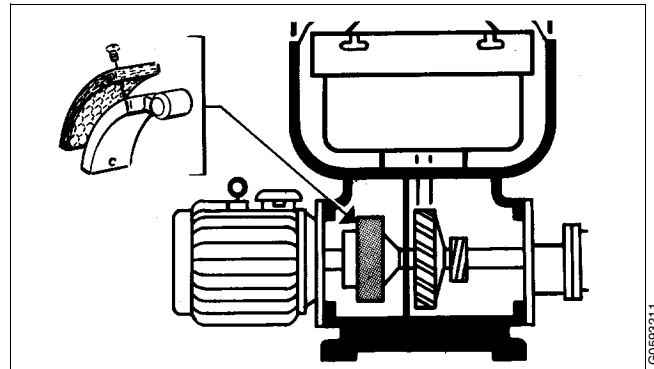
Position of coupling disc

5.3.9 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.

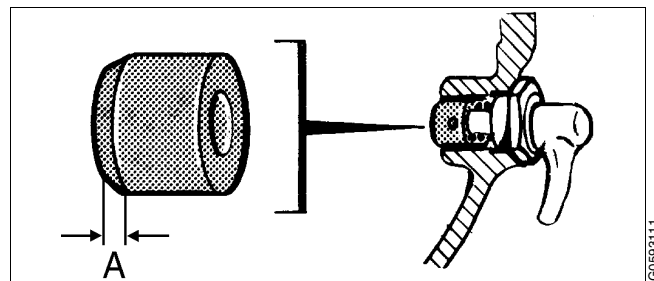


Friction coupling

5.3.10 Brake plug

A worn brake plug will cause a long stopping period.

Replace the plug when the friction material is worn. If the thickness A of the friction material is less than 0,5 mm the brake plug need to be replaced.



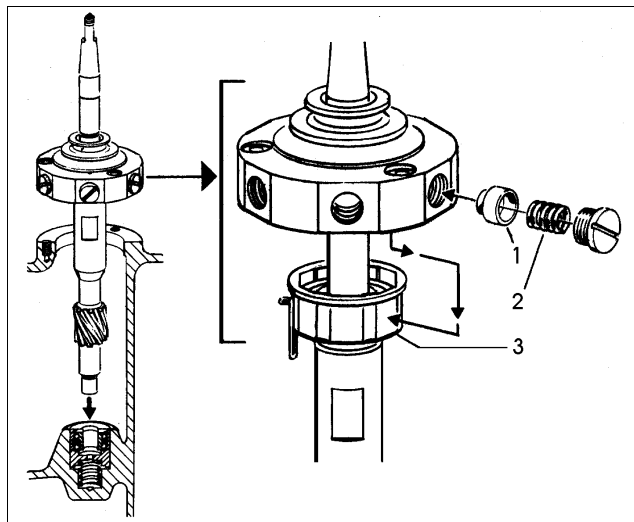
Maximum wear of brake plug when $A=0,5$ mm

5.3.11 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

5.3.12 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.

5.3.13 Worm wheel and worm; wear of teeth

Check the teeth of worm wheel and worm for wear.

See “5.3.14 Tooth appearance examples” on page 66.

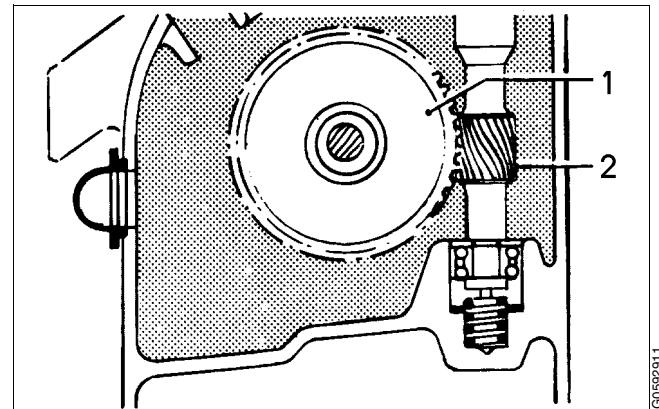
Examine the contact surfaces and compare the tooth profiles. The gear may operate satisfactorily even when worn to some degree.

NOTE

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

NOTE

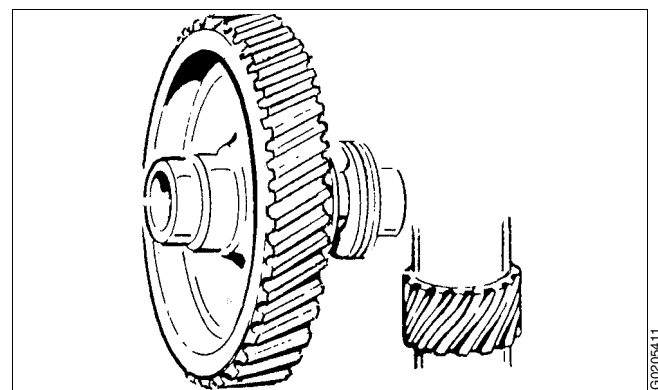
Presence of metal chips in the oil bath is an indication that the gear is wearing abnormally.



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

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 “8.8 Lubricants” on page 135.



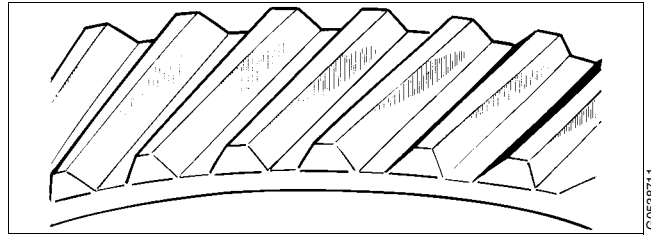
Inspect the gear for deposits and pits

5.3.14 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.

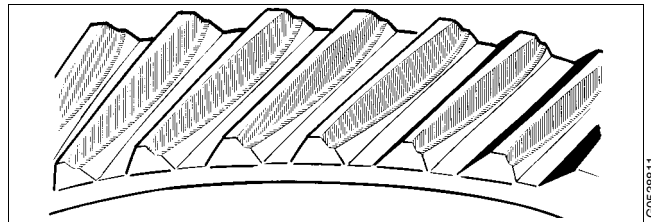


Satisfactory teeth

Worn teeth:

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

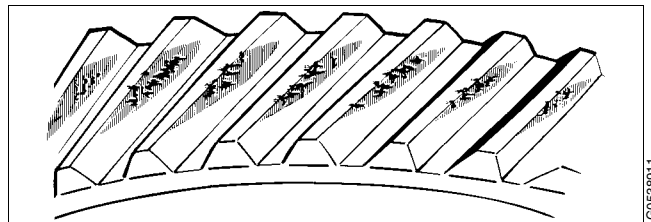
- the wear is uniform over the whole of the flank of a tooth
- and all teeth are worn in the same way.



Worn teeth

Spalling:

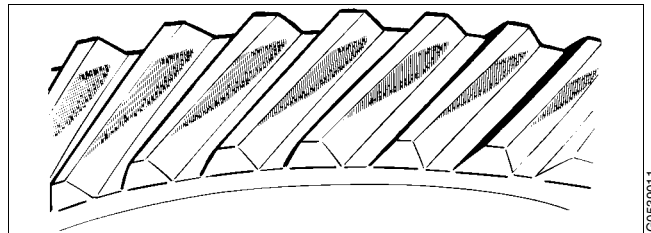
Small bits of the teeth have broken off, so-called spalling. This is generally due to excessive load or improper lubrication. Damage of this type need not necessitate immediate replacement, but careful checking at short intervals is imperative.



Spalling

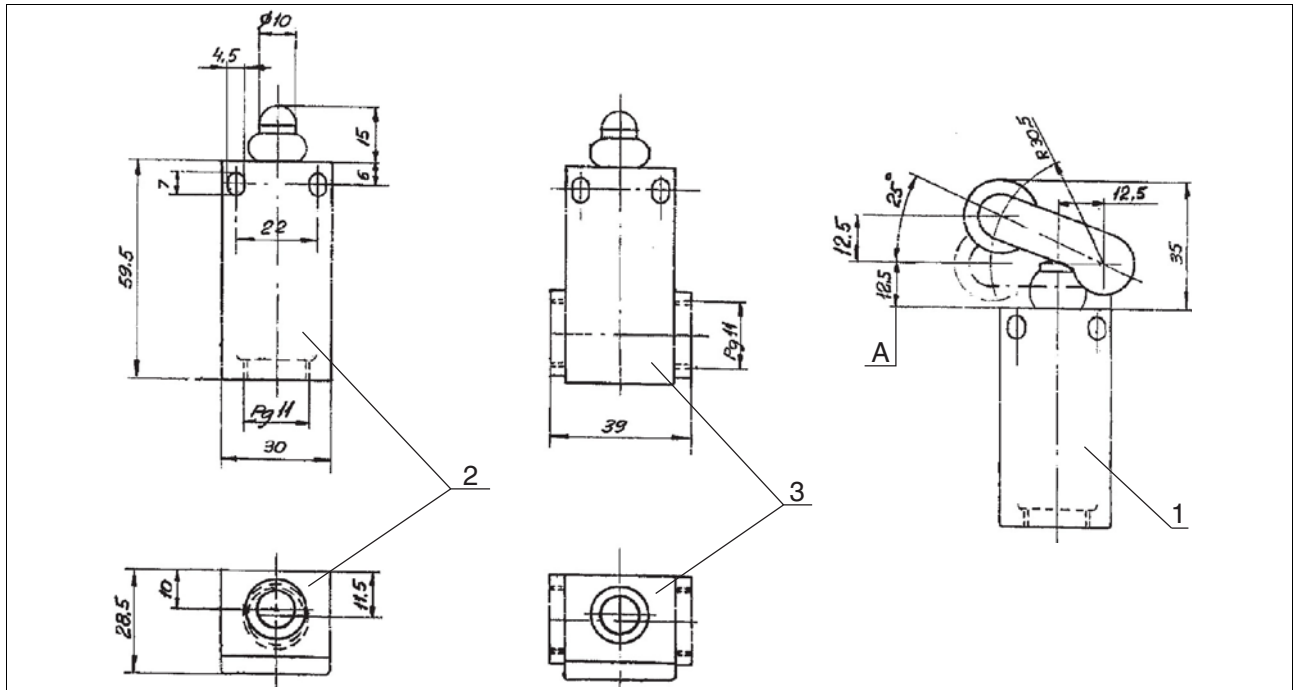
Pitting:

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

5.3.15 Cover interlocking switch, (Option)

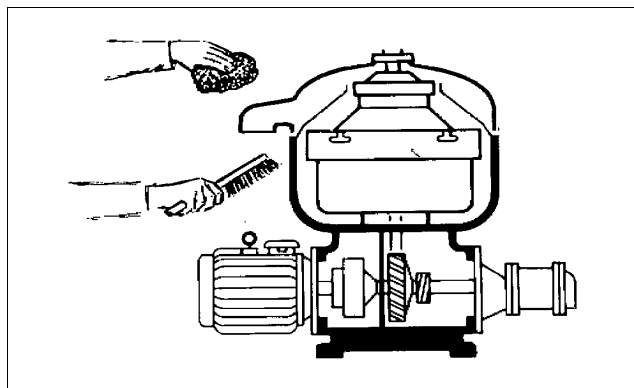


Make sure that the switch is connection perfectly and mounted in the correct manner in order to obtain the appropriate safety that is required.

5.4 Cleaning

5.4.1 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.



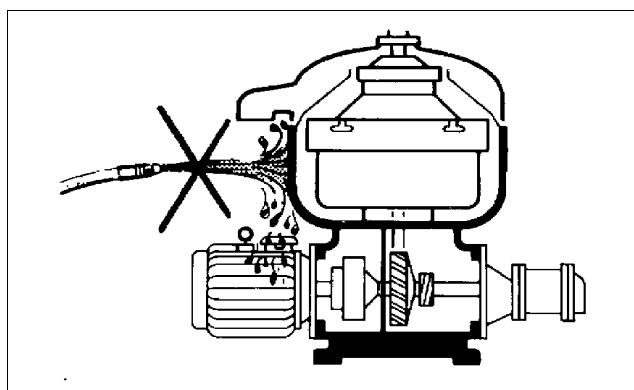
Use a sponge or cloth and a brush when cleaning

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

5.4.2 Cleaning agents

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

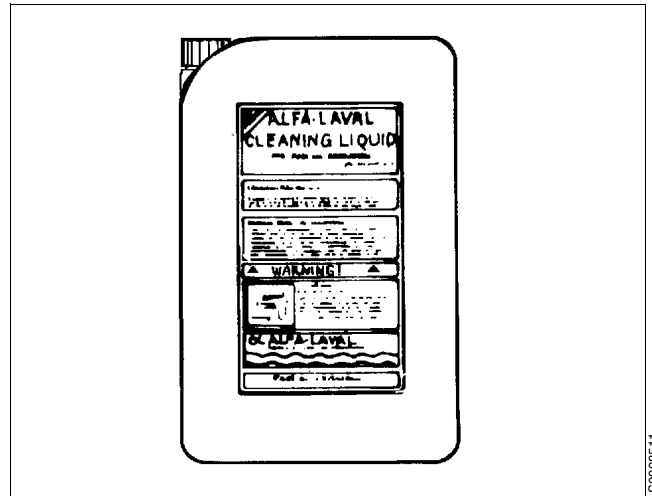
For separator bowl, inlet and outlet

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.



*Alfa Laval cleaning liquid for lube oil separators is available in 25-litre plastic containers.
Part No. 1762852-01.*

*Alfa Laval cleaning liquid for fuel oil separators is available in 5-litre plastic containers.
Part No. 1763500-01.*



CAUTION

Skin irritation hazard

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

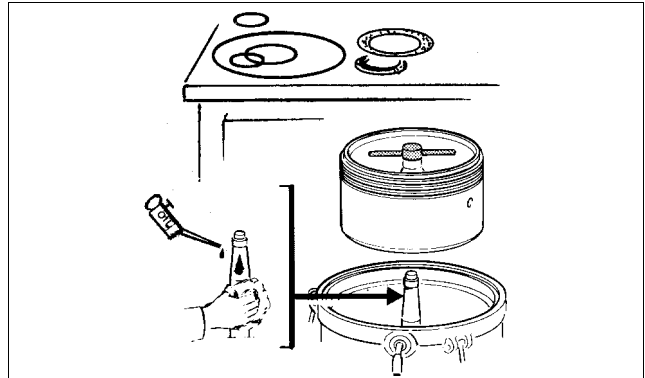
Always wear safety goggles, gloves and protective clothing as the liquid is alkaline and dangerous to skin and eyes.

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

5.4.3 Cleaning of bowl discs

Bowl discs

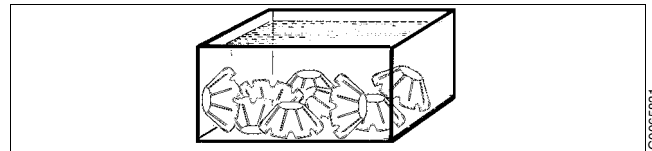
Handle the bowl discs carefully so as to avoid damage to the surfaces during cleaning.

NOTE

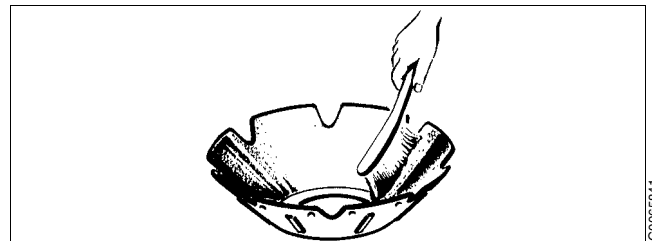
Mechanical cleaning is likely to scratch the disc surfaces causing deposits to form quicker and adhere more firmly.

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.



Put the discs one by one into the cleaning agent



Clean the discs with a soft brush



CAUTION

Cut hazard

The discs have sharp edges.

5.5 When changing oil

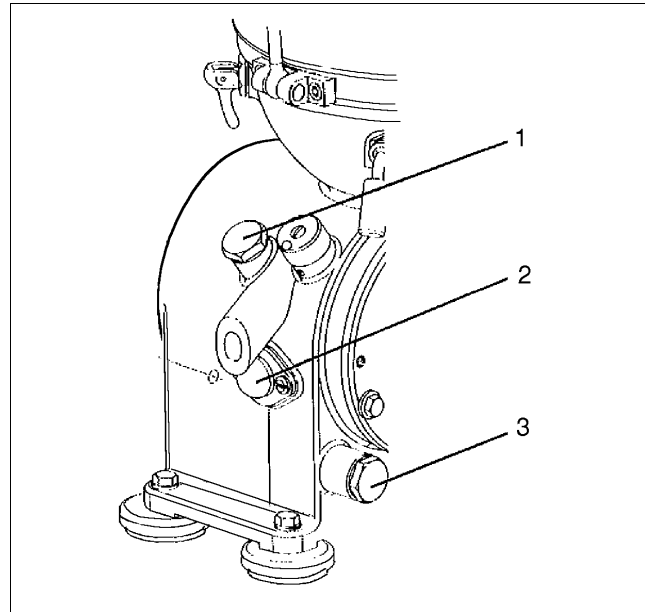
Check at each oil change

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

5.5.1 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 119 must be well known.



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

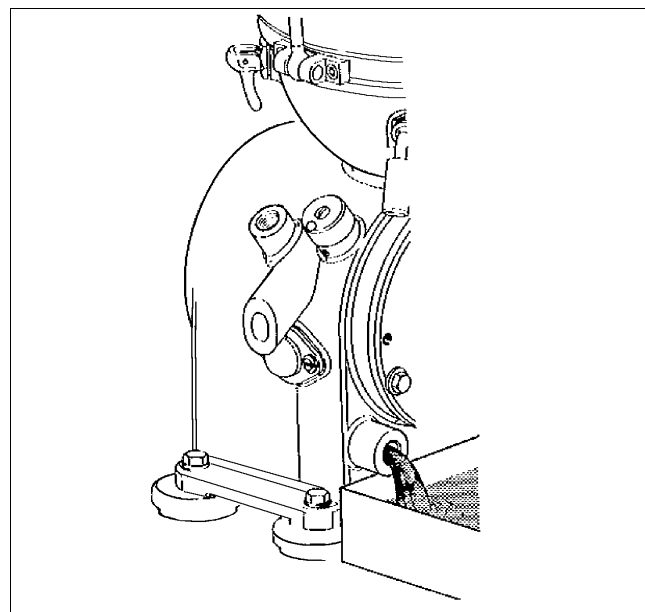
1. Place a collecting tray under the drain hole, remove the drain plug and drain off the oil.



CAUTION

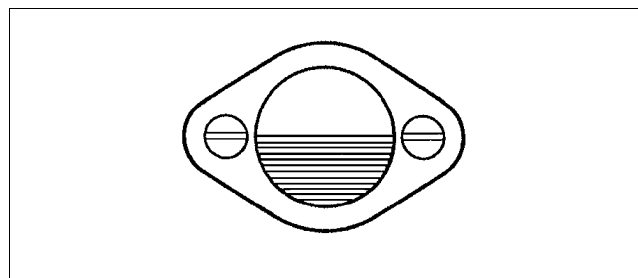
Burn hazards

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 121.



Oil level in sight glass

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5.6 Common maintenance directions

5.6.1 Vibration

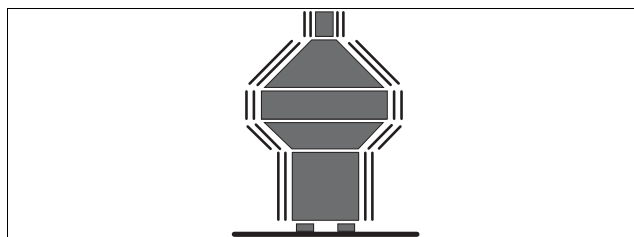
A separator normally vibrates and make noises, when it passes its critical speeds, during the start and stop periods.

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 (7,1 mm/s).



Vibration

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 **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.

5.6.2 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.

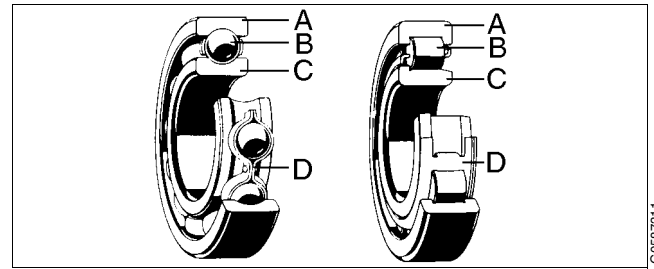
Do not use other bearings than those stated in the Spare Parts Catalogue.

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.

NOTE

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

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



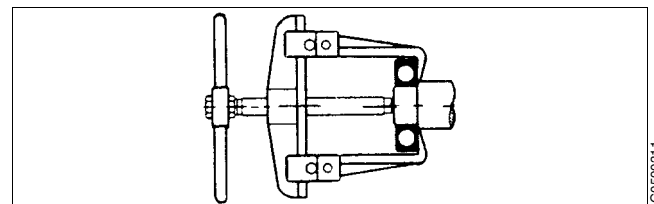
- A Outer race
- B Ball/Roller
- C Inner race
- D Cage

Dismounting

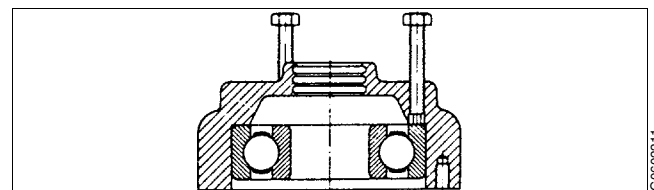
Detach the bearing from its seat by pressing against the race having the tightest fit. Use a puller or a special tool to apply the pressure to the inner race when the bearing sits tightly on the shaft, and to the outer race when the bearing is tightly fitted in the housing respectively.

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

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



Use puller tool to dismount bearing



Check bearing seat

NOTE

Do not strike with a hammer directly on the bearing.

Fitting

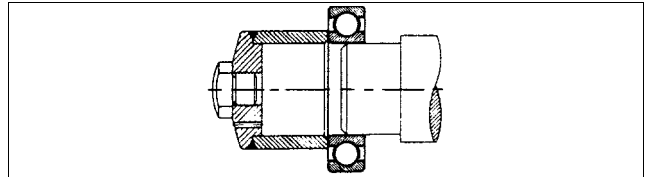
Leave new bearings in original wrapping until ready to fit. The anti-rust agent protecting a new bearing need not to be removed.

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

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

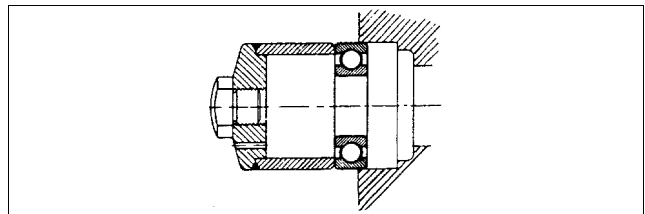
Angular contact ball bearings

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



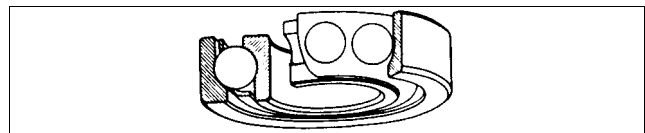
Use assembly tools

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Use assembly tool

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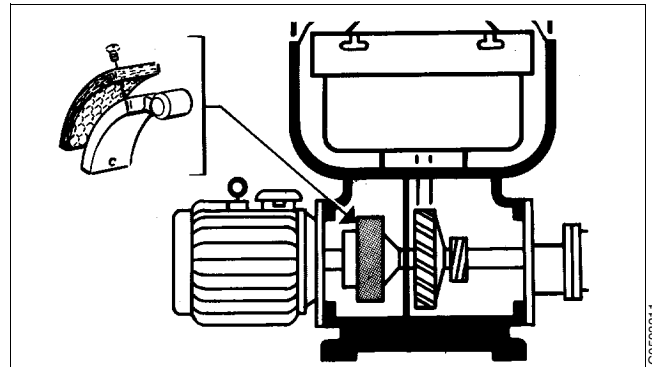
Angular contact bearing must be assembled correctly

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5.6.3 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



CAUTION

Inhalation hazard

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

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5.6.4 Shutdowns

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

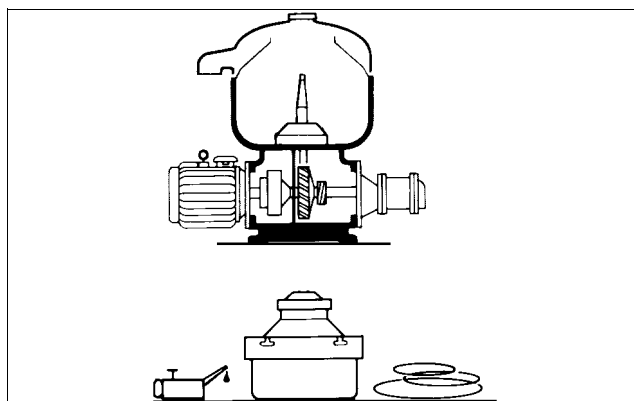
- Remove the bowl, according to instructions in chapter “6 Dismantling/Assembly” on page 81.

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.



Preparation for shutdown

- 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.

5.7 Lifting instructions

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

Lifting the separator

1. Remove the cap nut on the hinged bolt.
2. Remove the separator bowl.
3. Assemble the lifting eye on hinged bolts (the screws must be tightened with spanner).
4. Attach endless slings or cables to the lifting eyes.
5. Lift and handle with care.

NOTE

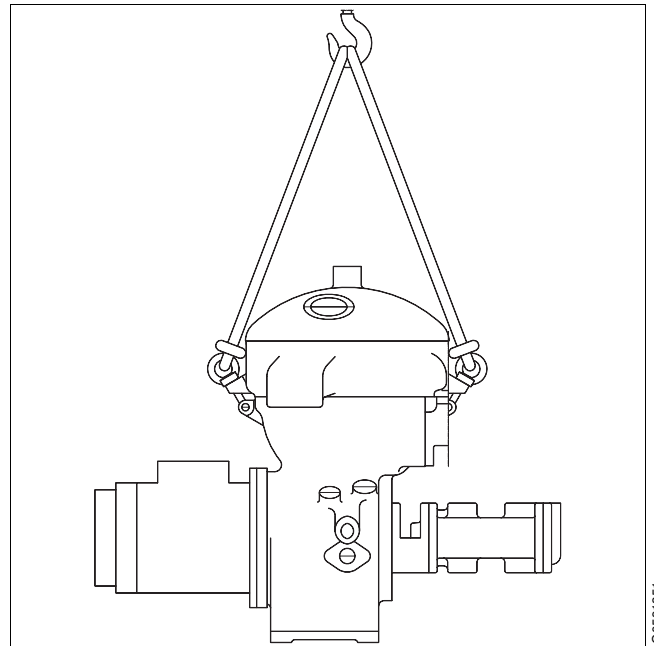
Remove the separator bowl before lifting to prevent bearings to be damaged.



WARNING

Crush hazards

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



G0591351

Do not lift the separator in any other way

6 *Dismantling/Assembly*

Contents

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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 Disc stack pressure” on page 58.](#)

In this example, look up check point [“5.3.4 Disc stack pressure” on page 58](#) 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

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



WARNING

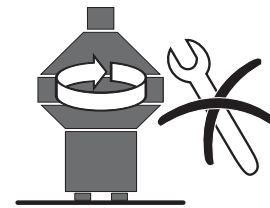
Entrapment hazards

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

The revolution counter and the motor fan indicates if separator parts are rotating or not.



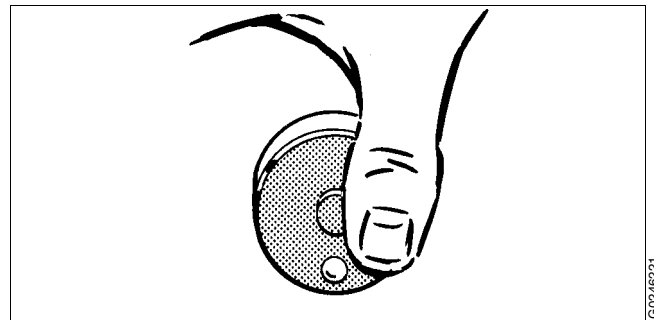
S0051011



S0051111

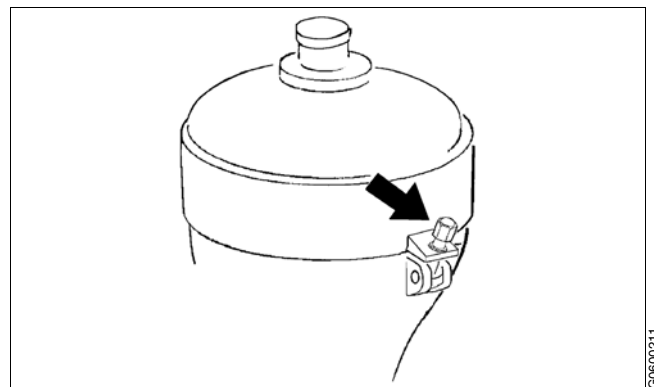
6.2.1 Bowl

1. Be sure the bowl has stopped rotating.



G0246221

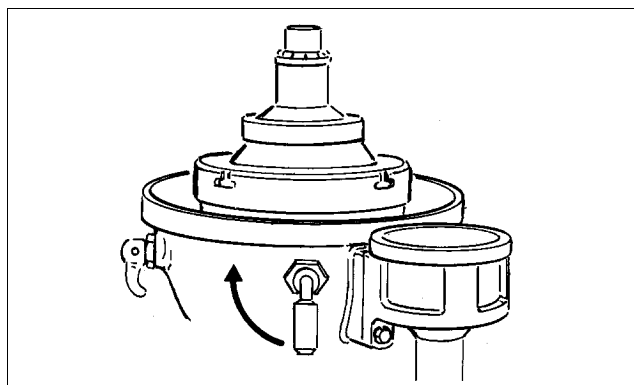
2. Loosen the cap nuts and open the collecting cover.



G0600211

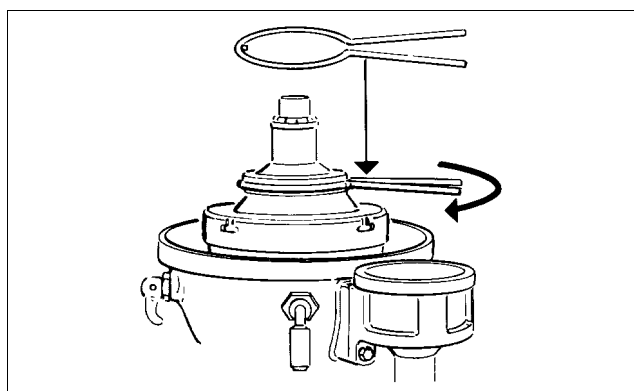
3. Tighten both lock screws.

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



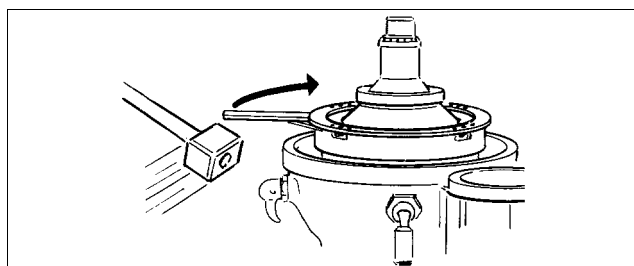
4. Unscrew the small lock ring by using the special tool, "Spanner for small lock ring".

Left hand thread!



5. Unscrew the large lock ring by using the special tool; "Spanner for lock ring" and a tin hammer.


Left hand thread!

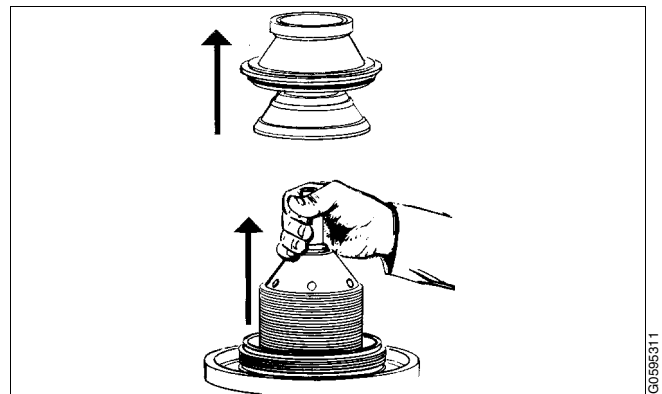


6. Lift off gravity disc/clarifier disc.

NOTE
 If the gravity disc has to be replaced owing to changed operating conditions, see “8.2.1 Gravity disc nomogram” on page 124.

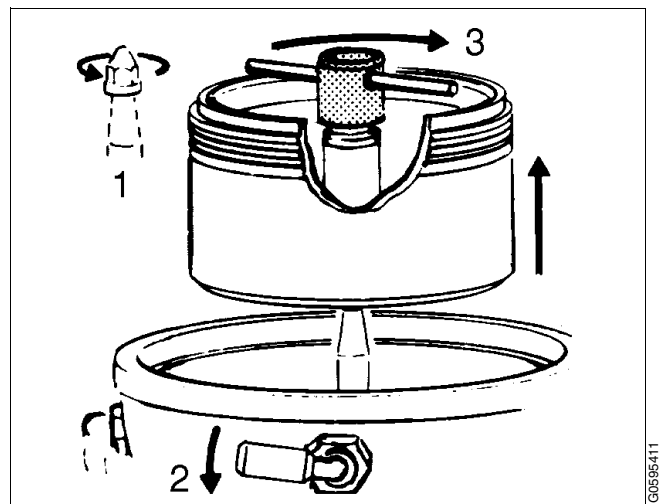
Lift out the top disc, disc stack and distributor.

CAUTION
 **Cut hazard**
 The discs have sharp edges.



G0595311

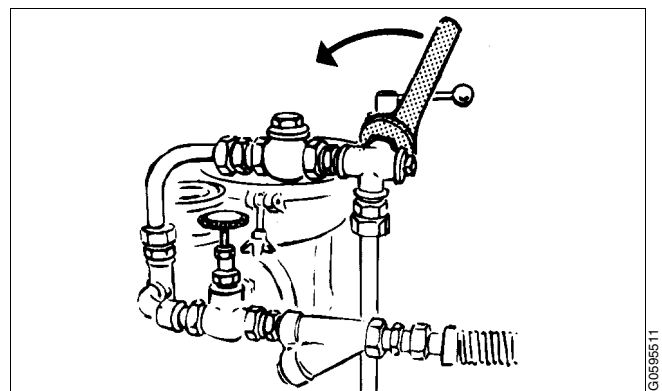
7. Unscrew the cap nut (1).
 Release the lock screws (2).
 Lift out the bowl body using the hand tool (3).



G0595411

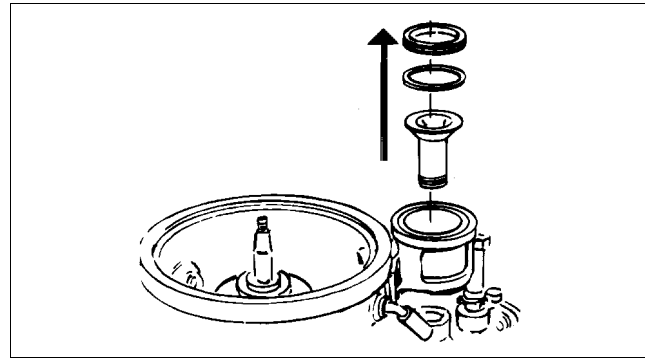
- 1 Cap nut
- 2 Lock screws
- 3 Lift bowl body from spindle

8. Disconnect the piping connections.



G0595511

9. Remove the outlet parts.

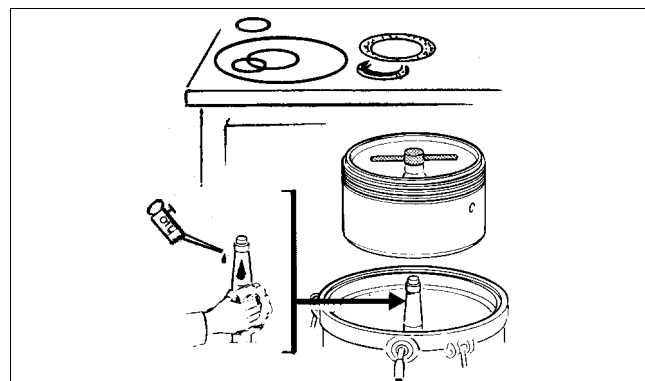


Outlet parts

10. Soak and clean all parts thoroughly in suitable cleaning agent, see [“5.4 Cleaning” on page 68](#). Remove O-rings and replace them with spares from the major service kit.

✓ **Check point**

“5.3.1 Corrosion” on page 54,
 “5.3.2 Erosion” on page 56,
 “5.3.3 Cracks” on page 57.



Clean the parts

6.2.2 Vertical driving device

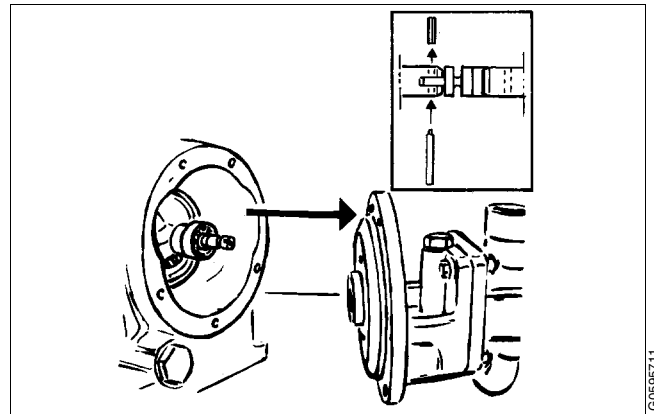
Remove the outlet housings, feed and discharge pumps and raise the collecting cover. Remove also the separator bowl.

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

✓ Check point

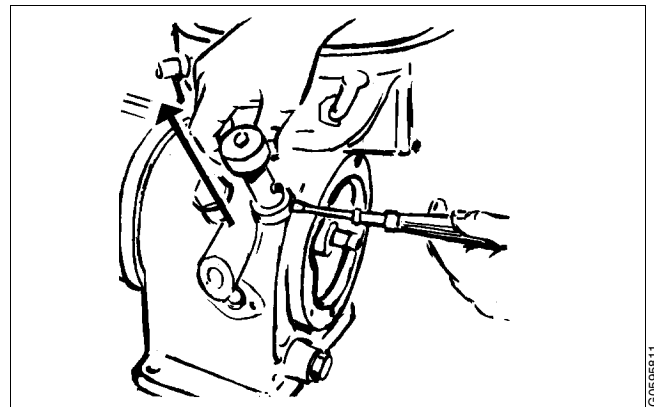
“5.3.6 Radial wobble of bowl spindle” on page 60.

1. Remove the pump assembly. Inspect the bushings and the wear of seals.



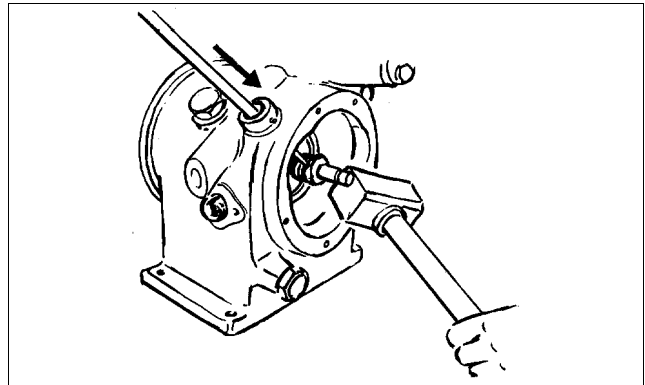
G0595711

2. Loosen the screw for the revolution counter and pull out the revolution counter.

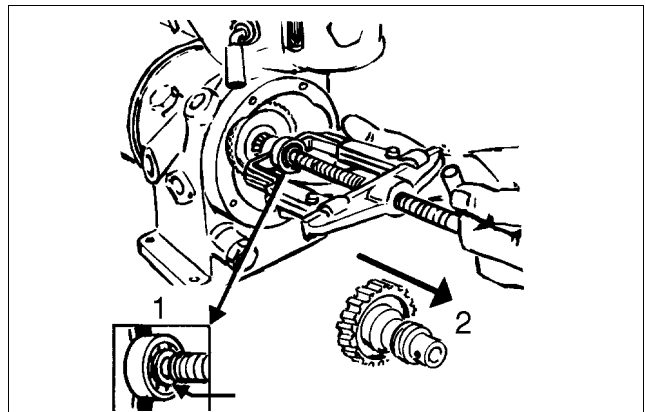


G0595811

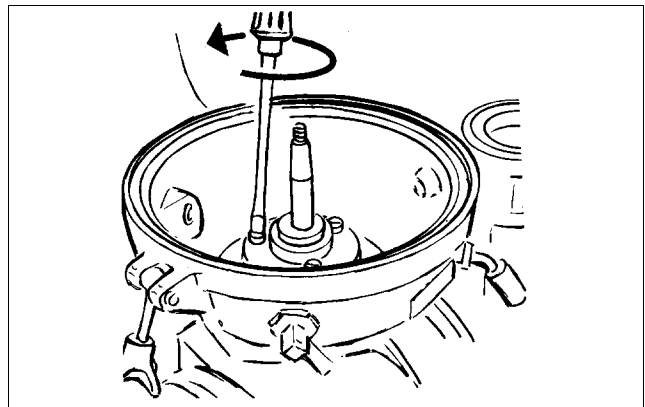
3. Force out the conical pin, using a tin hammer as a holder-on for the worm wheel shaft.



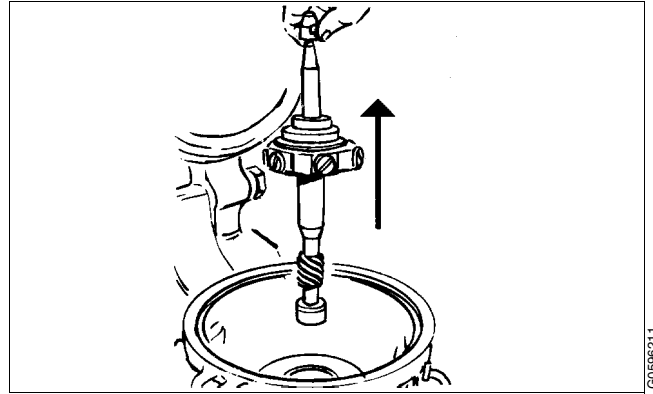
4. Use the puller-tool to first pull off the bearing and then the worm wheel.



5. Loosen the top bearing holder.

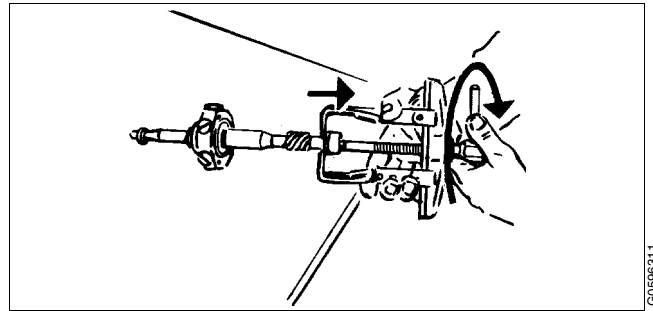


6. Fit the cap nut to the spindle top and lift the spindle.



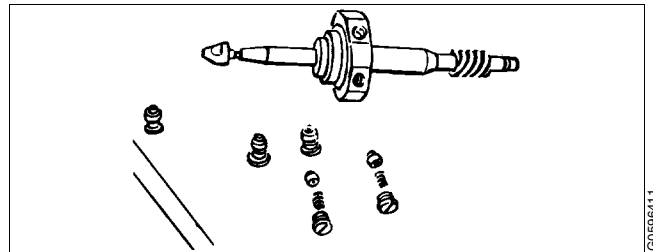
G0596211

7. Use the puller-tool to remove the bottom bearing from the spindle.



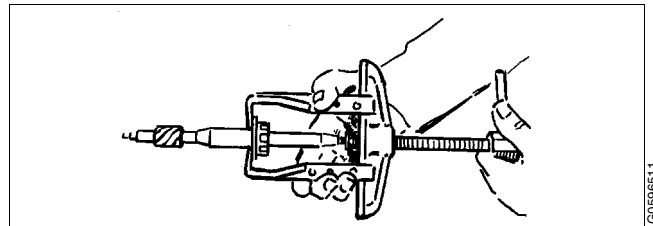
G0596311

8. Loosen and inspect the buffer springs.



G0596411

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

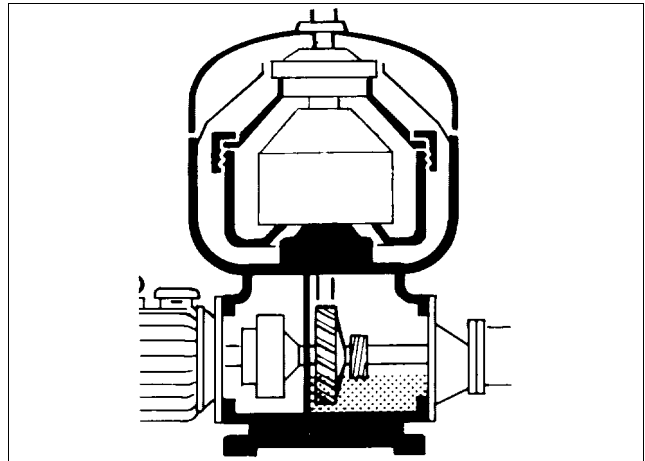


G0596511

NOTE

Always discard a used bearing.

10. Every 3 years: clean the oil sump.



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

✓ **Check point**

[“5.3.1 Corrosion” on page 54.](#)

Replace all parts supplied in the spare parts kit.

6.2.3 Horizontal driving device

1. Remove the motor.



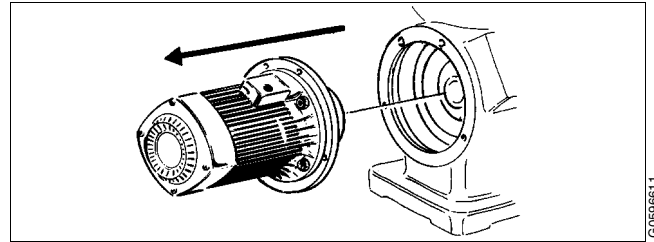
CAUTION

Inhalation hazard

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



G0596611

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.

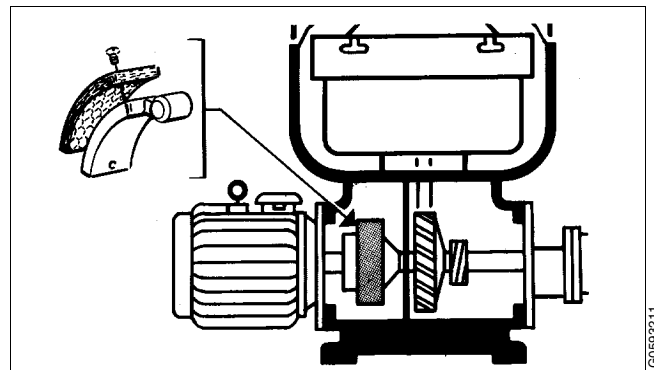
Secure the blocks with washer and split pin.

If the friction elements are worn: fit new ones.

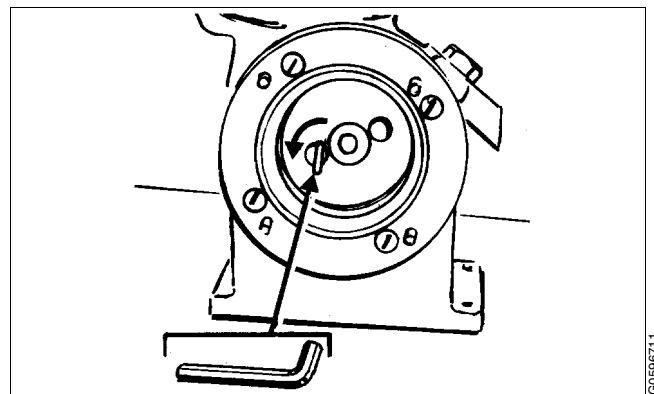
Replace all friction elements even if only one is worn.

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

3. Loosen the three screws holding the sealing washer. Use a hexagon key.

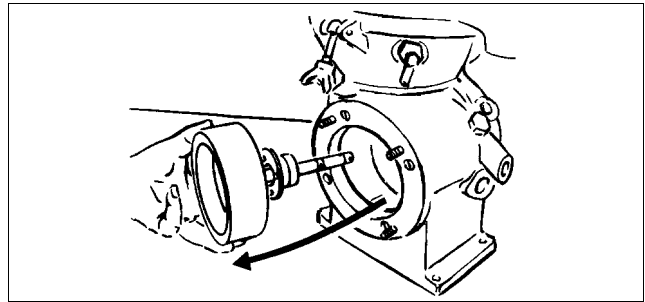


G0593211

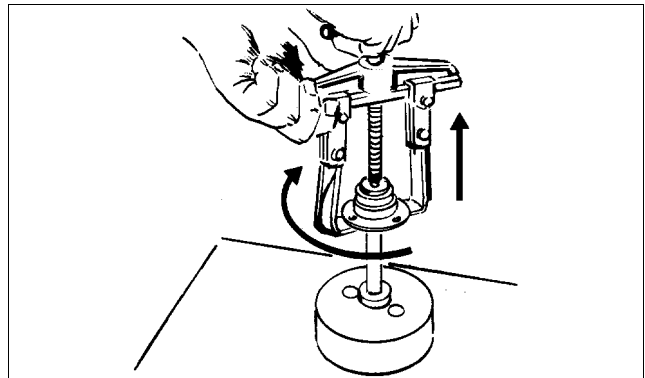


G0596711

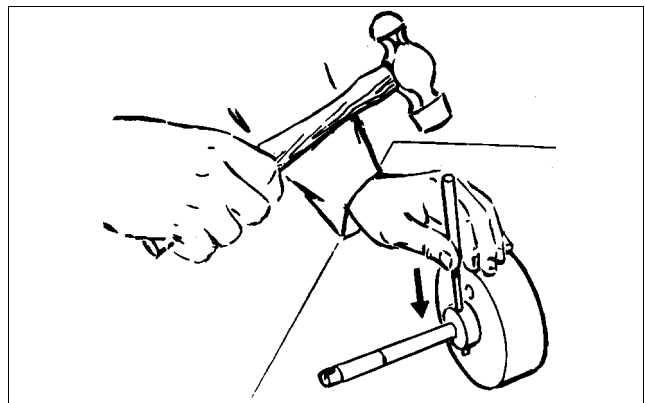
4. Remove the worm wheel shaft.



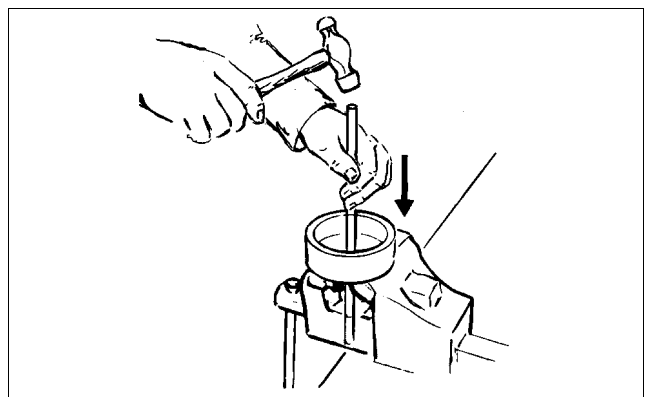
5. Use the puller tool to pull off the sealing washer. Protect end of worm wheel shaft with a washer.



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



7. Knock out the horizontal spindle.



6.3 Assembly

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

✓ Check point

- “5.3.1 Corrosion” on page 54,
- “5.3.2 Erosion” on page 56,
- “5.3.3 Cracks” on page 57,
- “5.3.11 Top bearing springs” on page 64,
- “5.3.12 Ball bearing housing” on page 64,
- “5.3.13 Worm wheel and worm; wear of teeth” on page 65.

6.3.1 Vertical driving device

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

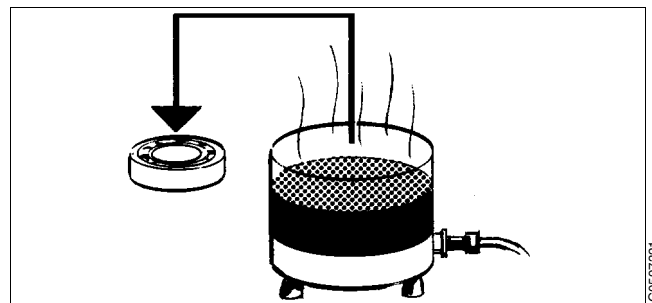
Wipe off and oil the bearing seat before fitting the ball bearing.

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.



G0597321

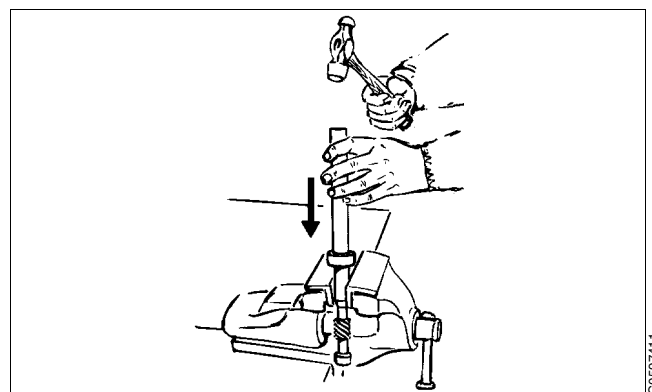
1. Fit the bearing onto the shaft.



CAUTION

Burn hazards

Use protective gloves when handling the heated bearings.



G0597411

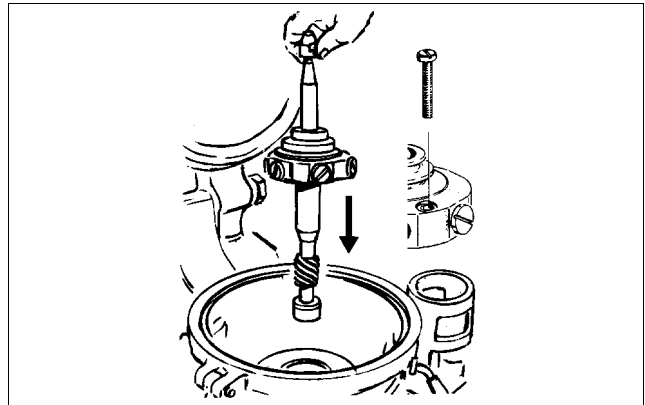
2. Lower the spindle into position.

Apply some Loctite 242 onto the threads of the screw.

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

✓ **Check point**

“5.3.7 Bowl spindle cone and bowl body nave” on page 61.

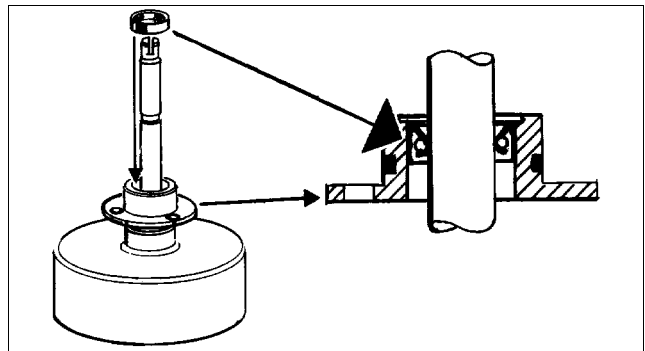


G0597511

6.3.2 Horizontal driving device

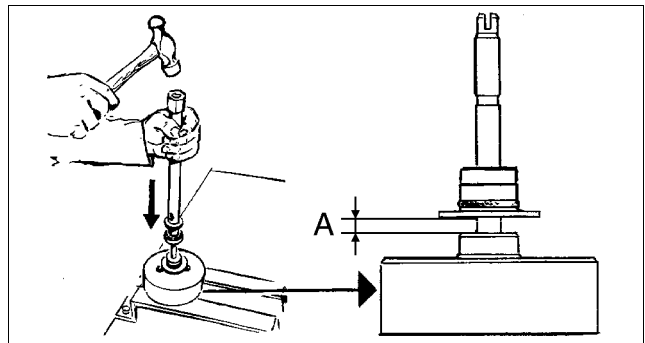
1. Clean the worm wheel shaft and the inner surface of the worm wheel nave thoroughly.

Make sure seal ring in sealing washer is turned in the right direction.



G0597611

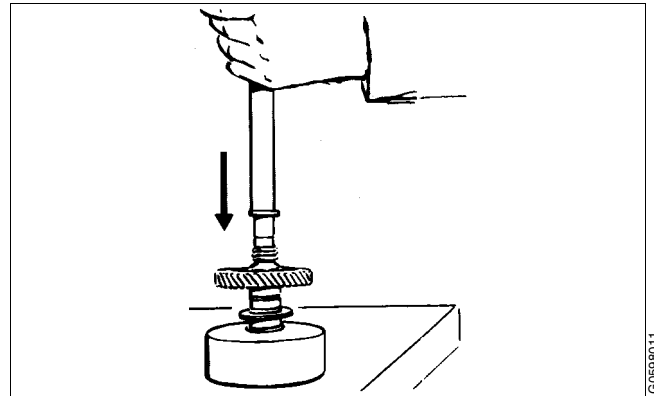
2. Force bearing onto shaft, but stop when sealing washer is approx. 10 mm from bottom position.




G0597711

Stop forcing bearing when $A=10$ mm

3. Push the worm wheel into its position on the shaft on top of the bearing.
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 119.

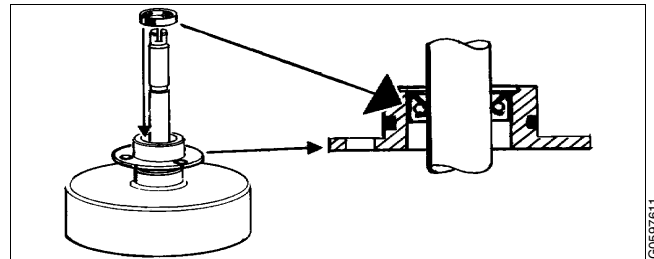


WARNING

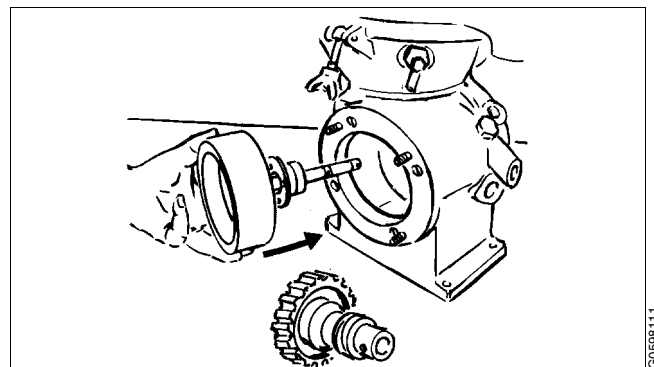
Disintegration hazard

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

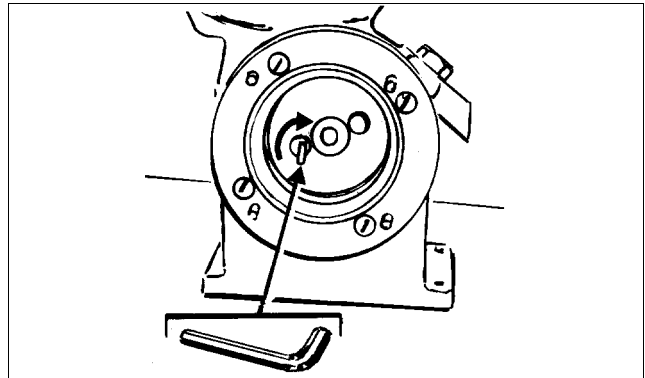
4. Check with the conical pin to get the larger side of holes in same direction, when holes coincide, mark the parts to facilitate the fitting. Remove worm wheel from shaft.



5. Clean the ball bearing housing in the frame and oil the outer race of the ball bearing.
Force the worm wheel shaft into its position in the frame, so that the ball bearing enters correctly into its seat.

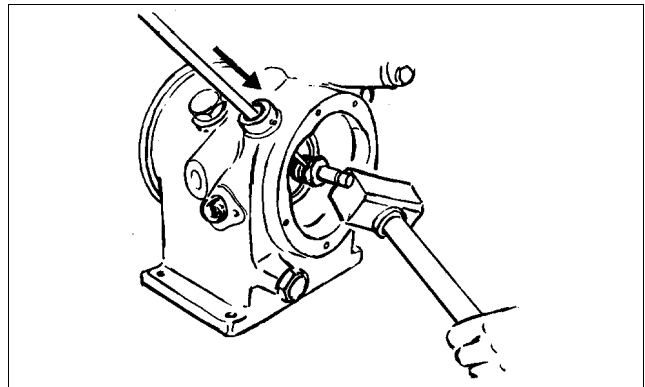


6. Tighten screws of sealing washer.



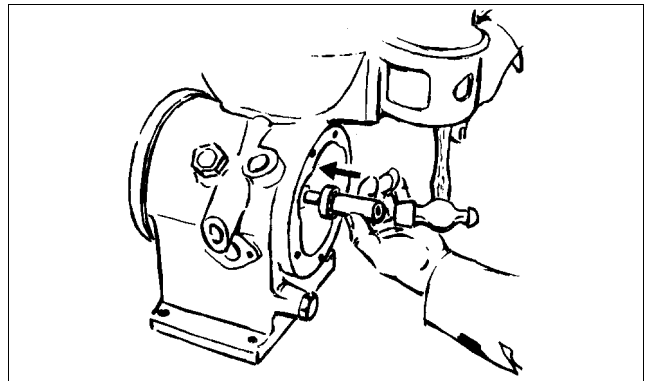
G0598211

7. Fit the worm wheel and knock conical pin into holes.



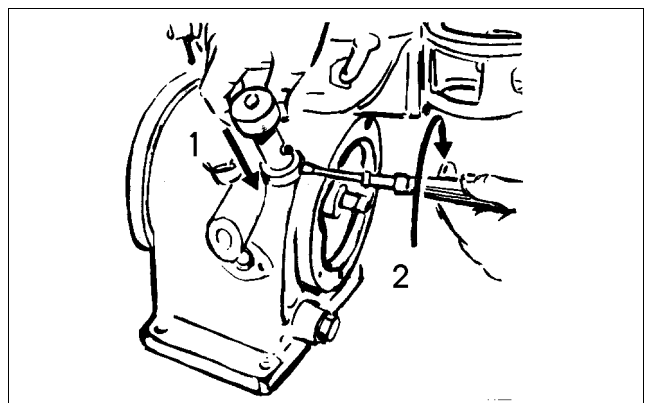
G0598311

8. Knock the bearing into position with the mounting tool and a hammer.



G0598411

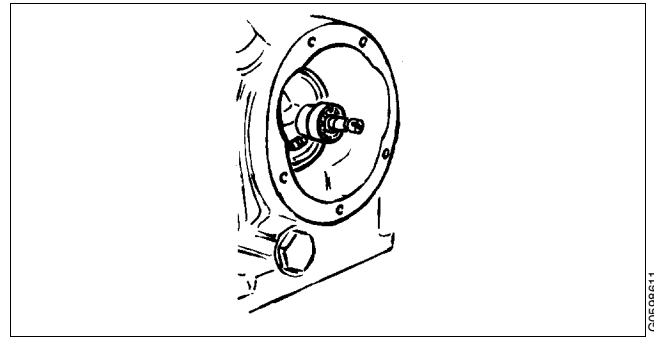
9. Fit the revolution counter.
Lock it with the lock screw.



G0598511

10. Fit pump and shear pin coupling.

See “6.4.1 Exchange of shear pin coupling” on page 102.

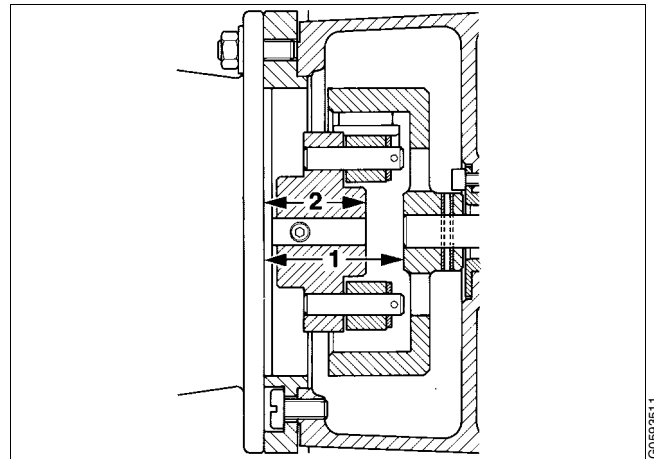


G0598611

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

✓ **Check point**

“5.3.8 Coupling disc of motor” on page 62.



G0598511

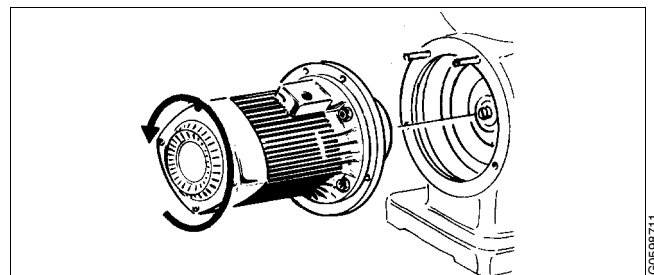
12. Fit the motor.



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.



G0598711

6.3.3 Bowl

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

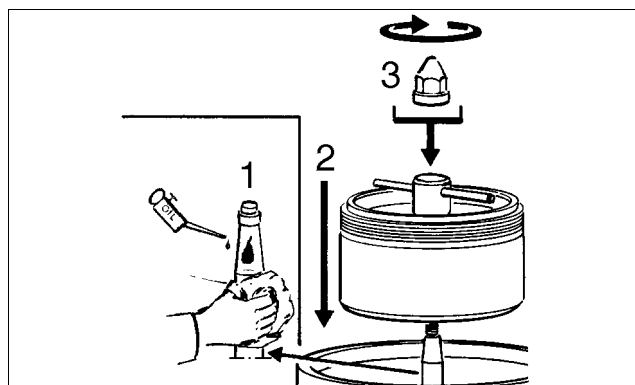
✓ Check points

“5.3.7 Bowl spindle cone and bowl body nave” on page 61.

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.

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

Screw cap nut onto the spindle. Tighten firmly.

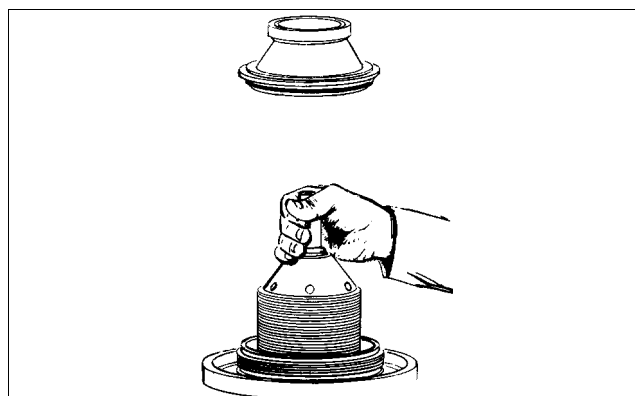


G0598811

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

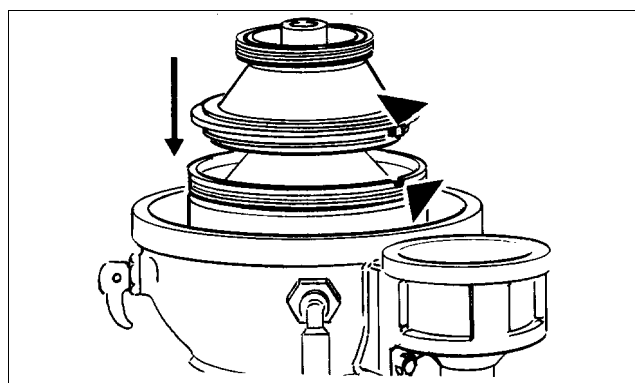
✓ Check point

“5.3.5 Lock ring; wear and damage” on page 58.



G0595331

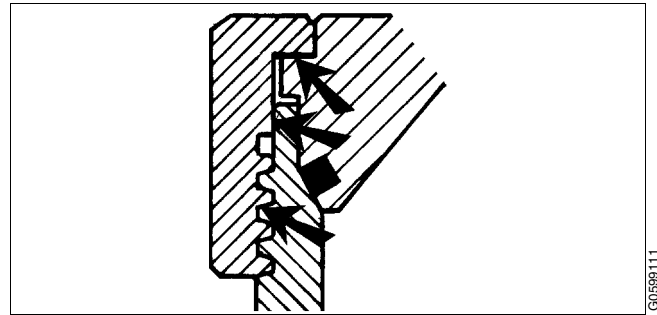
3. Fit bowl hood into position. Make sure guides are correctly located.



G0598011

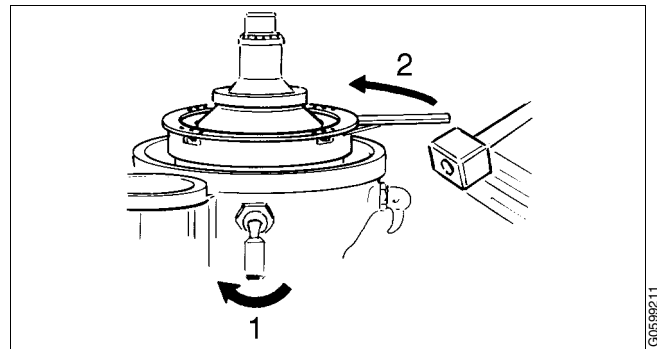
4. Degrease lock ring threads, contact and locating faces (see arrows above). Apply Molykote 1000 paste to the threads and faces stated.

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



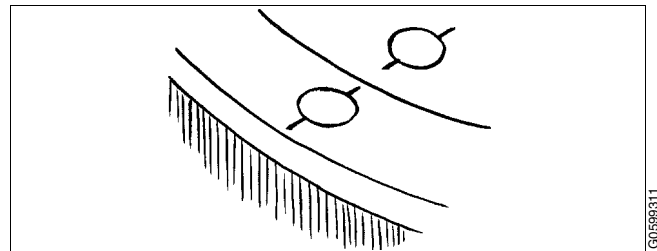
G0599111

5. Secure the bowl from rotating. Screw in **both** lock screws.



G0599211

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 above).



G0599311

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).

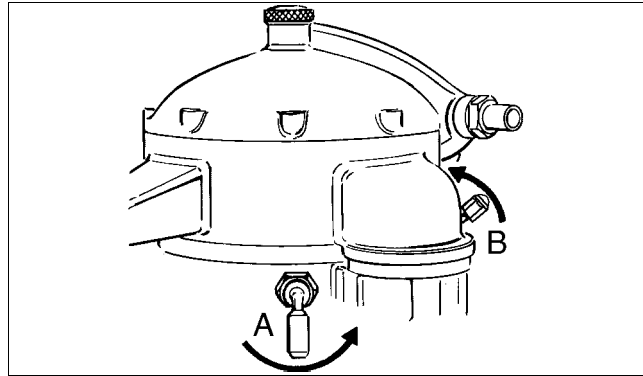
✓ Check point

"5.3.4 Disc stack pressure" on page 58.

7. Release both lock screws (A) and tighten both cap nuts (B) to a maximum torque of 12 Nm.

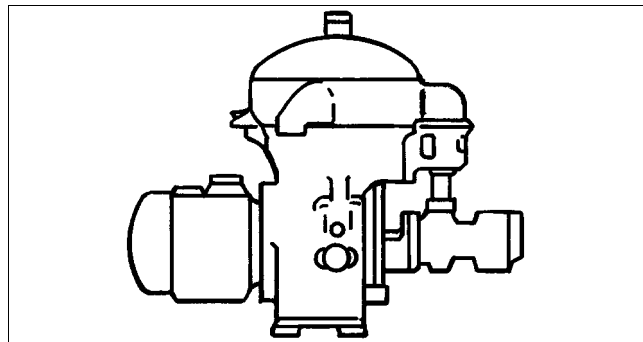
NOTE

The two lock screws must be fully released to prevent risk for damage to bowl body.



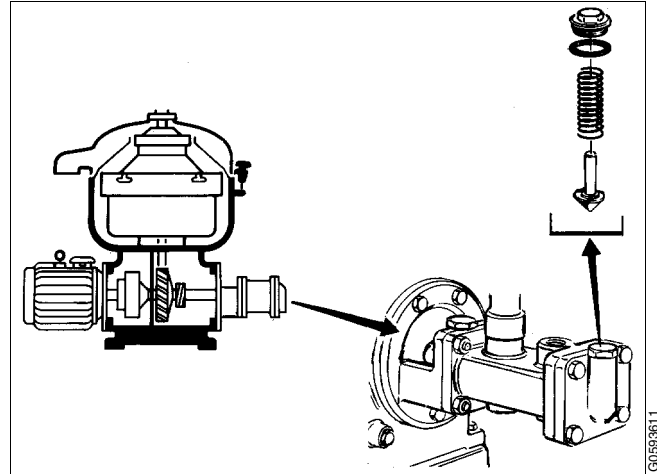
B = Max. torque 12 Nm.

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

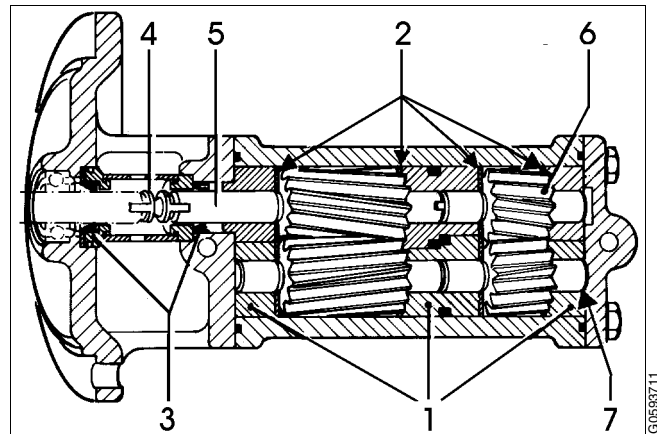


6.4 Feed and discharge pumps

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 “6.4.1 Exchange of shear pin coupling” on page 102.



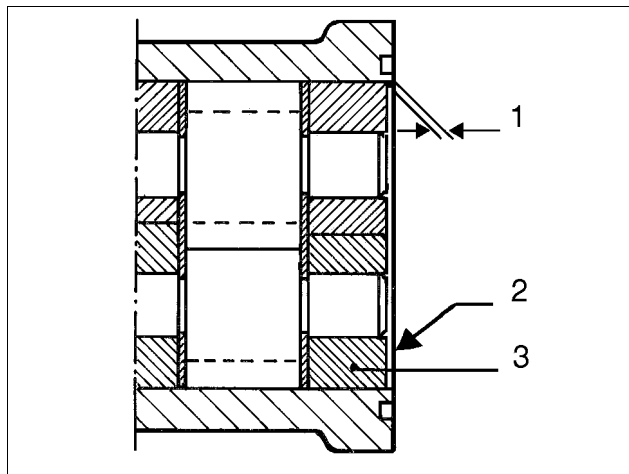
6. Impeller shaft:
Check the groove in the impeller shaft.
7. Disengagement:
The feed pump can be disengaged by turning the impeller (6), thereby placing the driving blade of the impeller in the recess of the shield.

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.

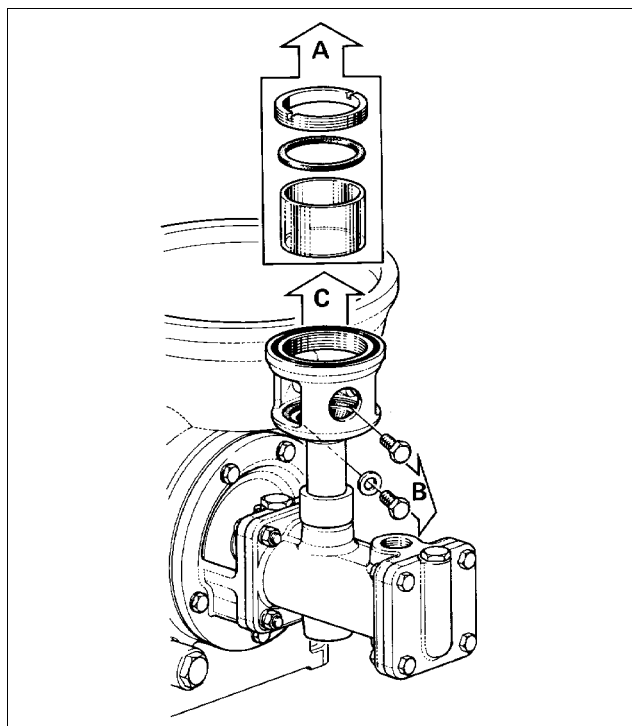
Insert the liner at (2). If the play is too small, grind off the bearing holder (3).



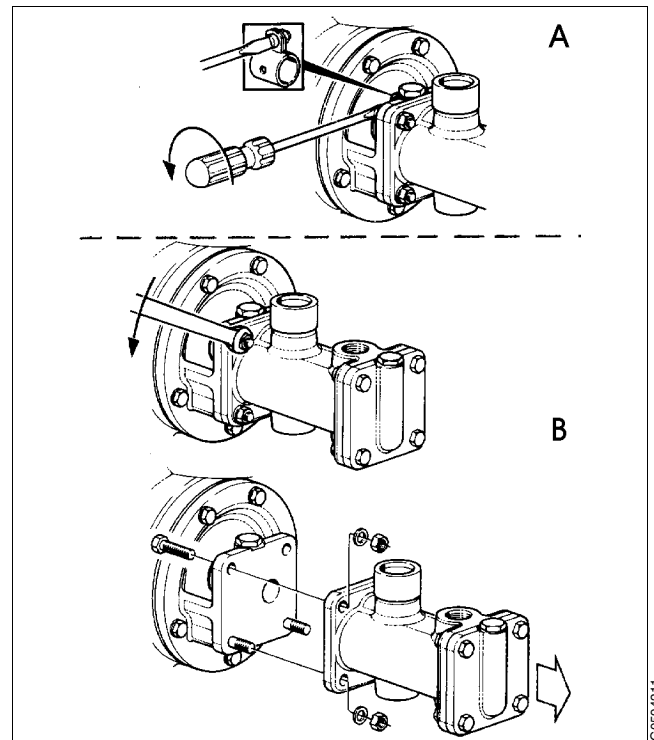
Axial play 0,1 - 0,3 mm

6.4.1 Exchange of shear pin coupling

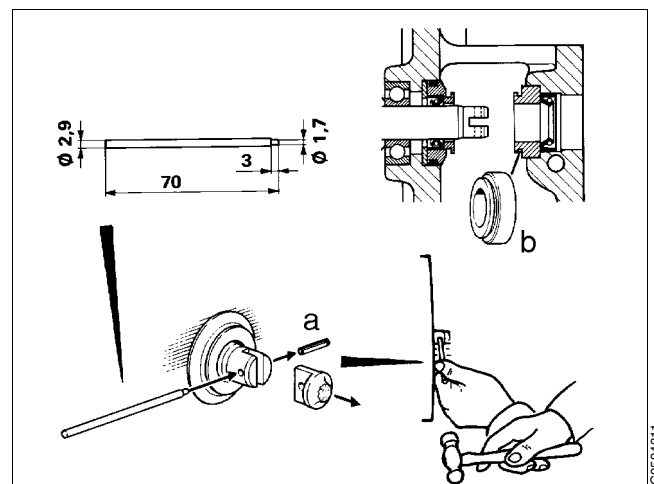
1. Remove the pipe connections of the pump. Screw off the lock ring of the sight glass. Remove the upper gasket and the sight glass. Remove the screws of the control housing. Lift the control housing with the lower gasket and the connecting piece.



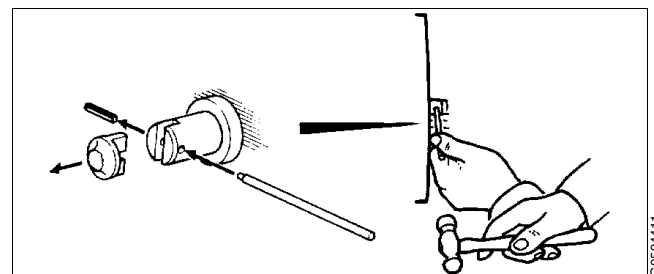
2. Remove the sleeve halves over the shear pin coupling.
Remove the pump housing with parts.



3. Drive out the tubular pin (a) from the worm wheel shaft. Use a counterstop.
Remove the sleeve (b) from the bearing shield.



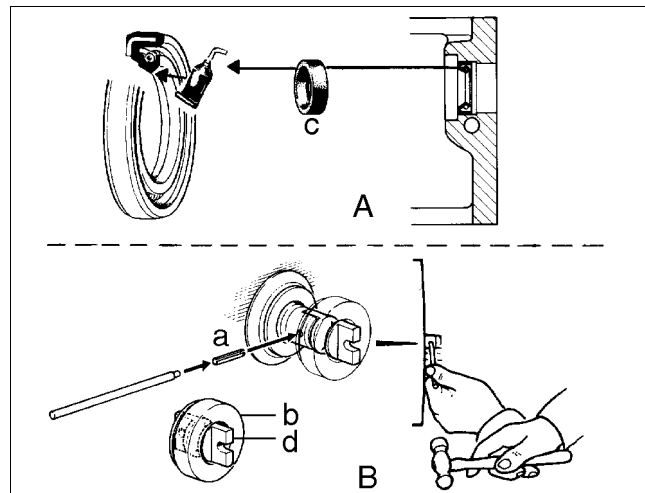
4. If the tubular pin in the impeller shaft is broken: drive out the tubular pin. Use a counterstop.



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.

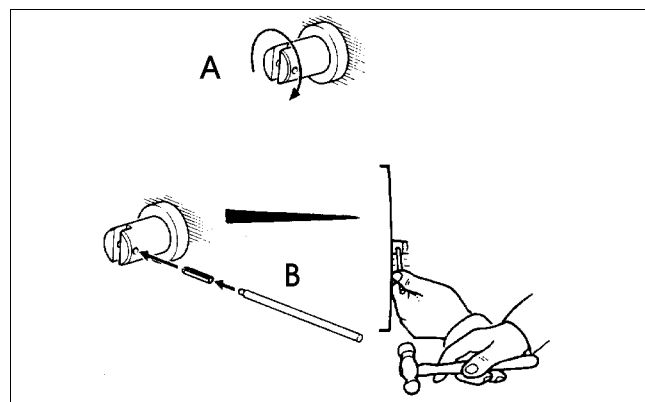


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6. Check that the impeller shaft can be revolved by hand.

Should this not be the case: dismantle the pump and check the parts. See [“6.4.1 Exchange of shear pin coupling” on page 102](#).

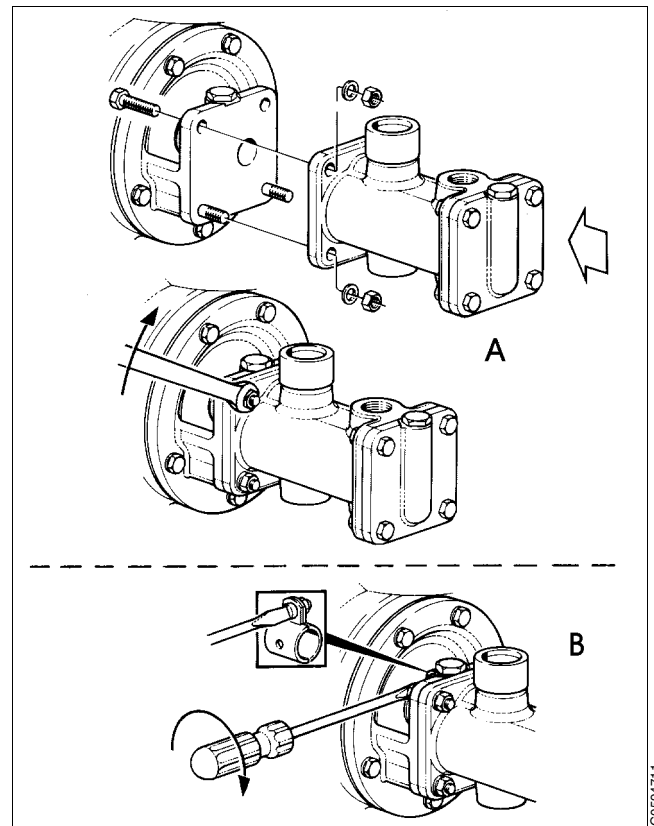
Drive in a new tubular pin if the old one is broken. Use a counterstop.



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

Fit the sleeve halves over the shear pin coupling.

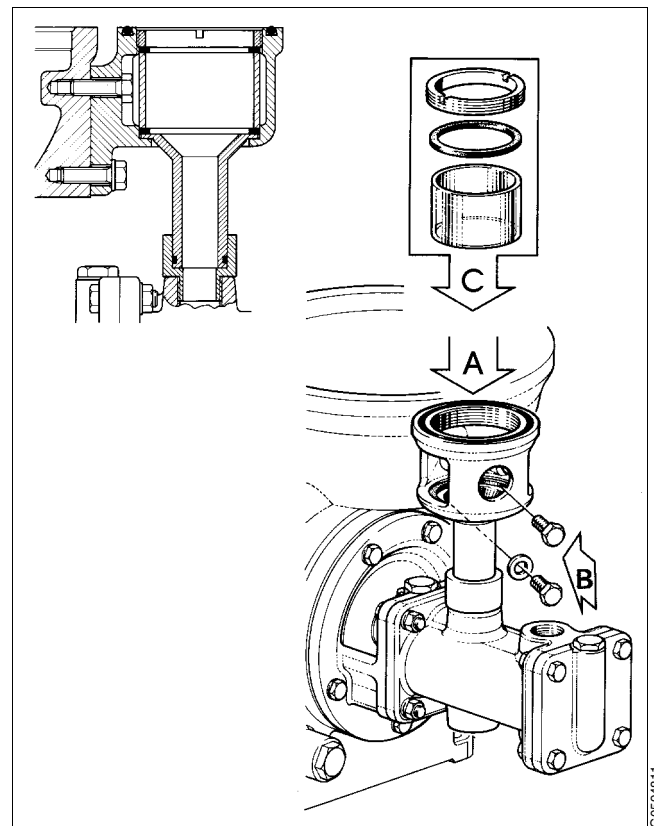


8. Put down the control housing with connecting piece and the lower gasket.

Tighten the screws.

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

Fasten the pipe connections of the pump.



6.5 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 119 must be well known.

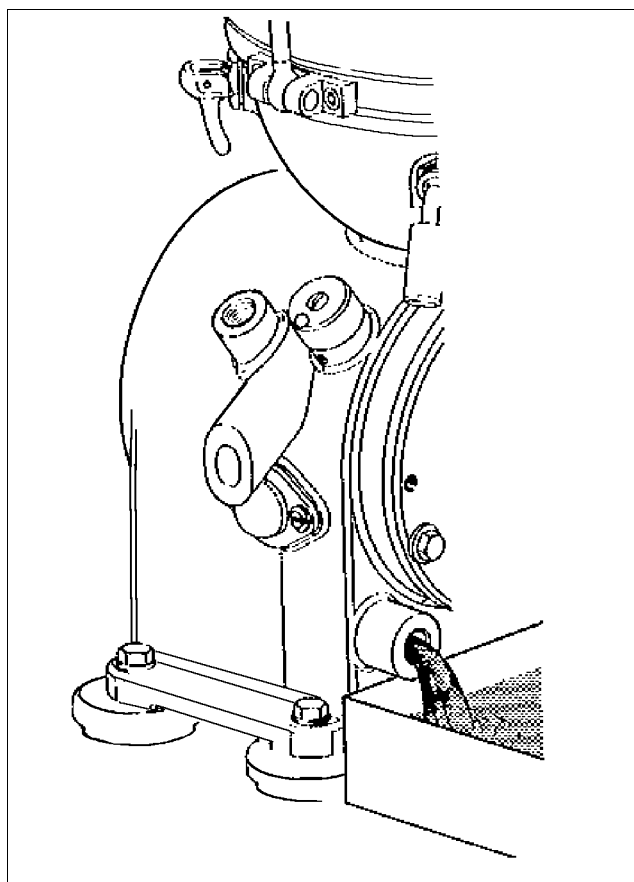
1. Place a collecting tray under the drain hole, remove the drain plug to drain off the oil.



CAUTION

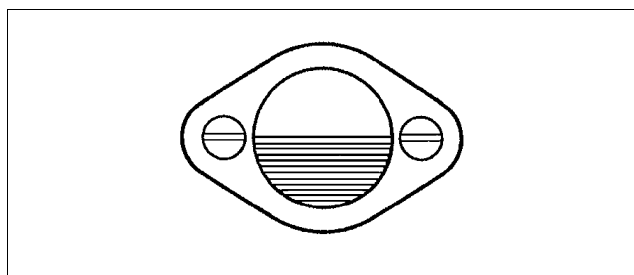
Burn hazards

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



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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 119.



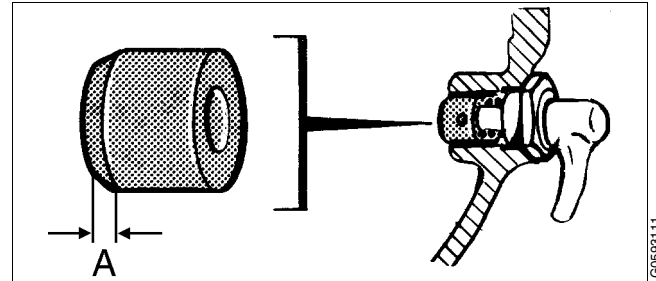
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6.6 Brake

6.6.1 Checking of brake plug

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

- Replace the plug when the friction material is worn. If the thickness **A** of the friction material is less than **0,5 mm** the brake plug need to be replaced.
- If the friction element is oily: clean the brake plug and the outside surface of the bowl body with a suitable degreasing agent.



Maximum wear of brake plug when $A=0,5$ mm

Checking the brake

After the brake assembly has been fitted, release the brake and rotate the bowl slowly by hand. If a scraping noise is heard, the friction element is probably touching the bowl surface.

For normal stopping time see [“8.2 Technical data” on page 121](#).

6.7 Frame feet

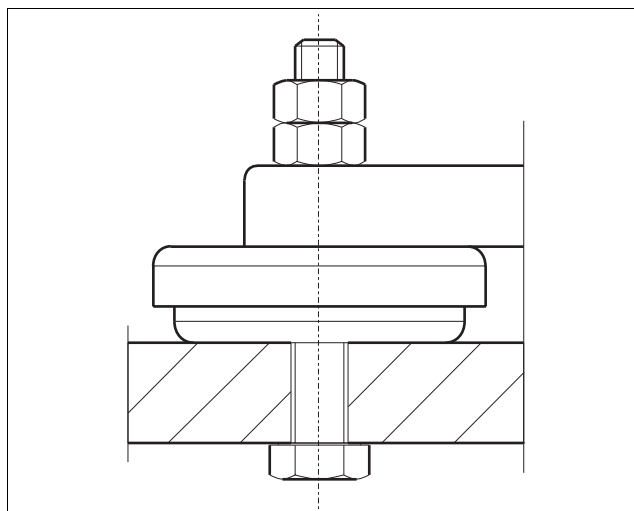
When replacing the frame feet, the separator must be lifted.

See “5.7 Lifting instructions” on page 79.

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

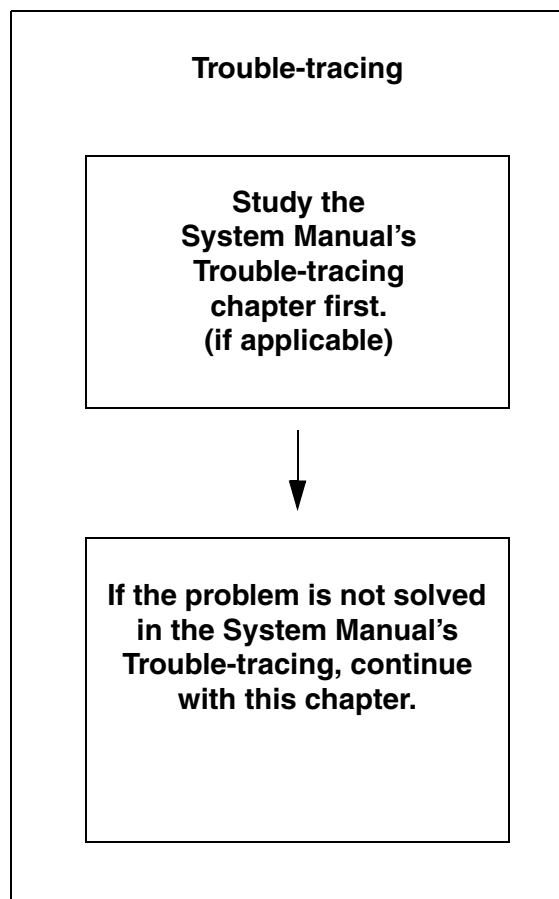
6.7.1 Mounting of new frame feet

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*

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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.
Bowl lock screws stops rotation.	Release lock screws.


7.2.2 Start-up time too long

Possible cause	Action
Brake applied.	Release brake.
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
Bowl lock screws stops rotation.	Release lock screws.
Brake is on.	Release brake.
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).	<p> DANGER: Disintegration hazard</p> <p>STOP immediately! Install correct transmission.</p> <p>Contact your local Alfa Laval representative. The bowl must be inspected.</p>
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 too few discs insufficiently tightened bowl hood bowl assembled with parts from other separators.	<p> WARNING: Disintegration hazard</p> <p>STOP immediately! Identify and rectify cause.</p>
Vibration dampers in frame feet worn out. Bowl spindle bent (max. 0,15 mm). Top and/or bottom bearing damaged or worn. Top bearing springs defective.	<p>Fit new vibration dampers.</p> <p>Fit a new bowl spindle.</p> <p>Fit new bearings.</p> <p>Fit new springs.</p>

7.2.6 Separator vibrates excessively during normal running

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

7.2.7 Smell

Possible cause	Action
Normal occurrence during start as the (new) friction blocks slip.	None.
Brake is applied.	Release the brake.
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).	<p>⚠ DANGER: Disintegration hazard</p> <p>STOP immediately! Install correct transmission.</p> <p>Contact your local Alfa Laval representative. The bowl must be inspected.</p>
Frequency of power supply too high.	Check.

7.2.10 Speed too low

Possible cause	Action
Brake is on.	Release the brake.
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 Stopping time too long

Possible cause	Action
Brake lining worn or oily.	Fit new friction pads or clean the old ones if they are oily.

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 displacement/ sealing water is not sufficient due to clogged strainer, kinked hose or low water pressure.	Straighten the hose or clean the strainer. Make sure the water pressure is 200-600 kPa (2-6 bar).
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 and brake is off. 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 basket in the bowl.
Disc stack clogged.	Clean the bowl discs.
Bowl speed too low.	See “7.2.10 Speed too low” on page 114.

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 114.
Bowl incorrectly assembled.	Examine and make correct.

7.4 Clarification faults

7.4.1 Unsatisfactory separation result

Possible cause	Action
Separating temperature too low.	Adjust.
Throughput too high.	Reduce throughput.
Feed oil contains water.	Re-assemble and operate the separator as a purifier.
Disc stack clogged.	Clean the bowl discs.
Sludge space in bowl filled.	Empty the sludge basket.
Bowl speed too low.	See “7.2.10 Speed too low” on page 114.

7.4.2 Oil discharge through water outlet

Possible cause	Action
Valve(s) in outlet line closed.	Open the valve(s) and adjust to normal back pressure.
Disc stack clogged.	Clean the bowl discs.
Seal ring under gravity disc is defective.	Fit a new seal ring.
Bowl incorrectly assembled.	Examine and make correct.

8 *Technical Reference*

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8.1 Product description

Alfa Laval ref. 553692-06 rev. 9

Units according to ISO Standard.

The manufacturer reserves the right to change specifications without notice.

Product number: 881145-09-01/7

Separator type: MAB 103B-24

Application: Mineral oil

Technical Design:: Purifier/clarifier with solid-wall separator bowl and collecting cover in aluminium.

Sealings available in NITRILE.

Intended for marine- and land applications.

Designed in accordance with standards:

98/37 EEC

91/368 EEC

93/44 EEC

The Council Directive of the European Communities (CE-marking is possible if manual is included in the delivery).

EN 12100-1

Safety of machines. Use of the machine in applications subject to hygienic demands requires a well adapted cleaning program.

Restrictions:

Feed temperature: 0 - 100 °C

Ambient temperature: 5 - 55 °C

Not to be used for liquids with flashpoint below 60 °C

Risk for corrosion and erosion has to be investigated in each case by the application centre.

8.2 Technical data

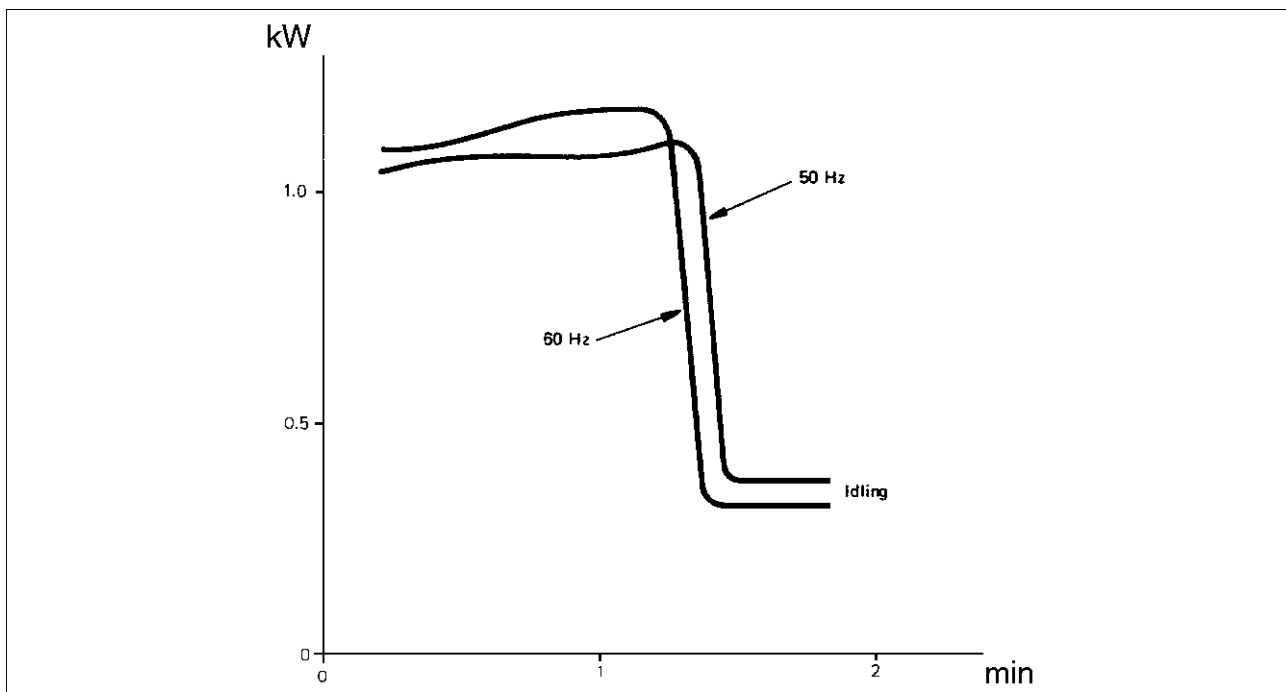
Alfa Laval ref. 556001 rev. 1

Units according to ISO Standard.

The manufacturer reserves the right to change specifications without notice.

Bowl speed max:	8571/ 8600	rev/min. 50Hz/60Hz
Speed motor shaft max:	1500/1800	rev/min. 50Hz/60Hz
Gear ratio:	40:7/43:9	50Hz/60Hz
Hydraulic capacity:	1,40	m ³ /h
Max. density of sediment/feed:	5000/1100	kg/m ³
Feed temperature:	0/100	min./max. °C
Weight of separator:	75,2	kg (without motor)
Motor power:	0,75	kW
Jp reduced to motor shaft:	1,60	kg/m ² 50Hz
Jp reduced to motor shaft:	1,10	kg/m ² 60Hz
Max. power consumption:	0,6	kW (at starting up)
Power consumption:	0,4/0,6	kW (idling/at max. capacity)
Lubricating oil volume:	0,7	litres
Starting time:	3,0	minutes (min. / max.)
Stopping time with brake:	2,0/2,5	minutes (min. / max.)
Stopping time without brake:	6,0	minutes (average)
Max. running time;		
empty bowl:	480	minutes
filled bowl:	480	minutes
Sound power/sound pressure level.	7,6 /64	Bel(A) /dB(A)
Vibration level, separator in use	9,0	mm/sec (r.m.s)
Bowl max. inner diameter	159	mm
Bowl volume	1,2	litres
Bowl weight	13	kg
Bowl body material	AL 111 2377-02	

There are other material than stainless steel in contact with process fluid.

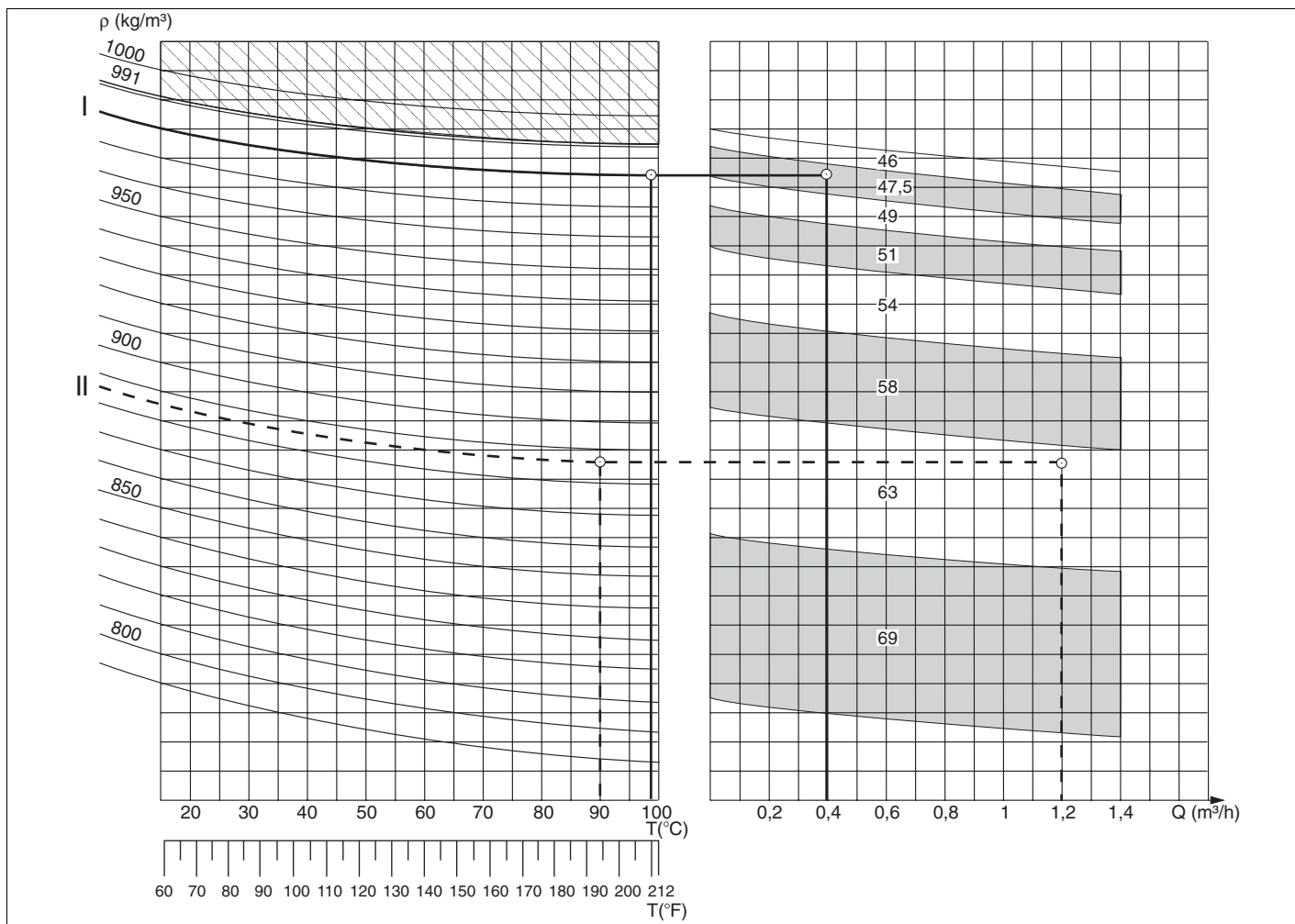


Power consumption at startup, power input vs time

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8.2.1 Gravity disc nomogram

Alfa Laval ref. 556414 rev. 0



ρ = Density of oil in kg/m^3 at $15\text{ }^{\circ}\text{C}$
 Q = Throughput in m^3/h
 T = Separating temperature in $^{\circ}\text{C}$ or $^{\circ}\text{F}$

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).

Example I in nomogram

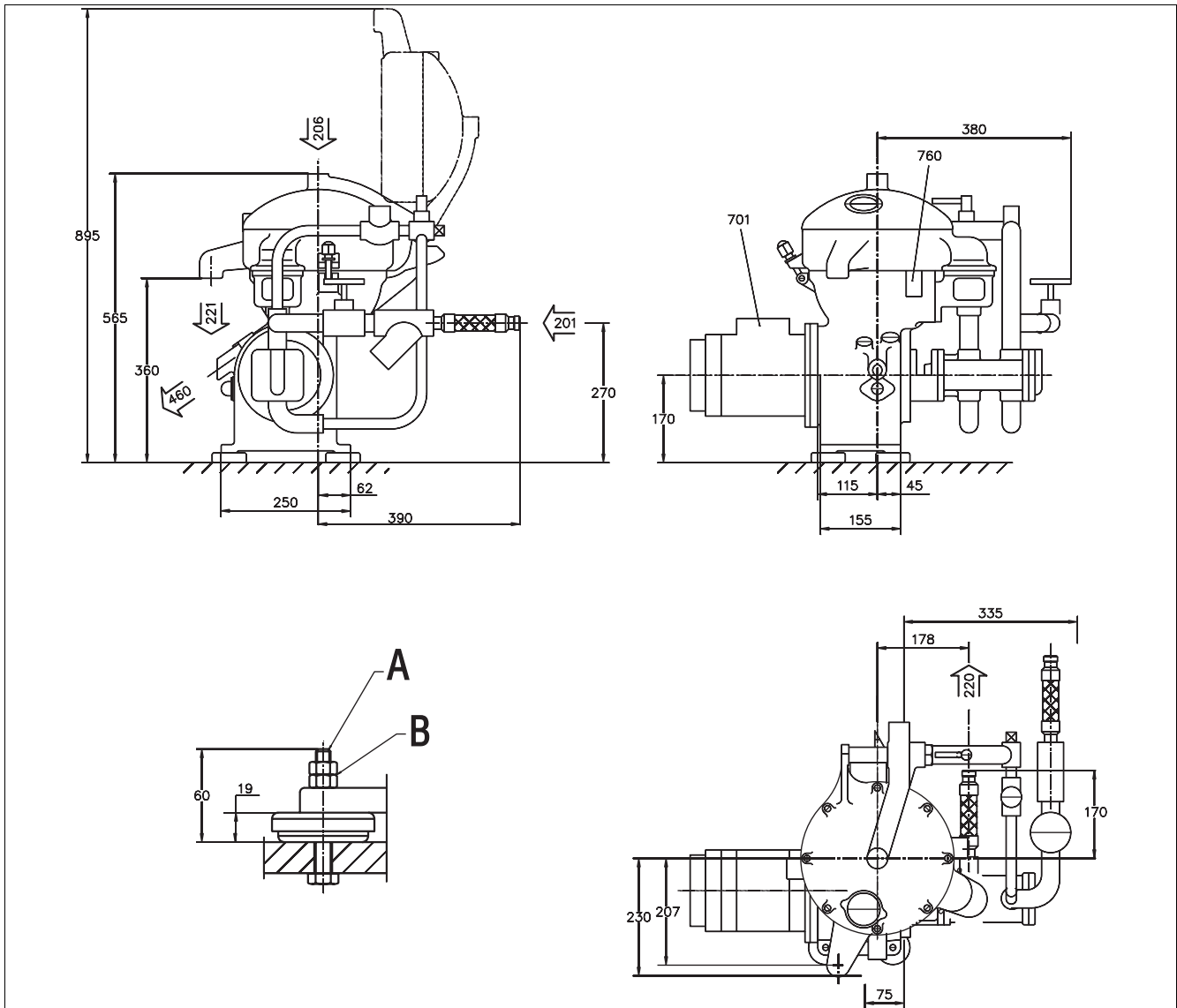
Density of oil	980kg/m ³ at 15 °C
Separating temp.	98 °C
Troughput	0,4 m ³ /h
Hole diameter	Ø 47,5 mm

Example II in nomogram

Density of oil	886kg/m ³ at 15 °C
Separating temp.	90 °C
Troughput	1,2 m ³ /h
Hole diamete	Ø 63 mm

8.3 Basic size drawing

Alfa Laval ref. 556939 rev. 0

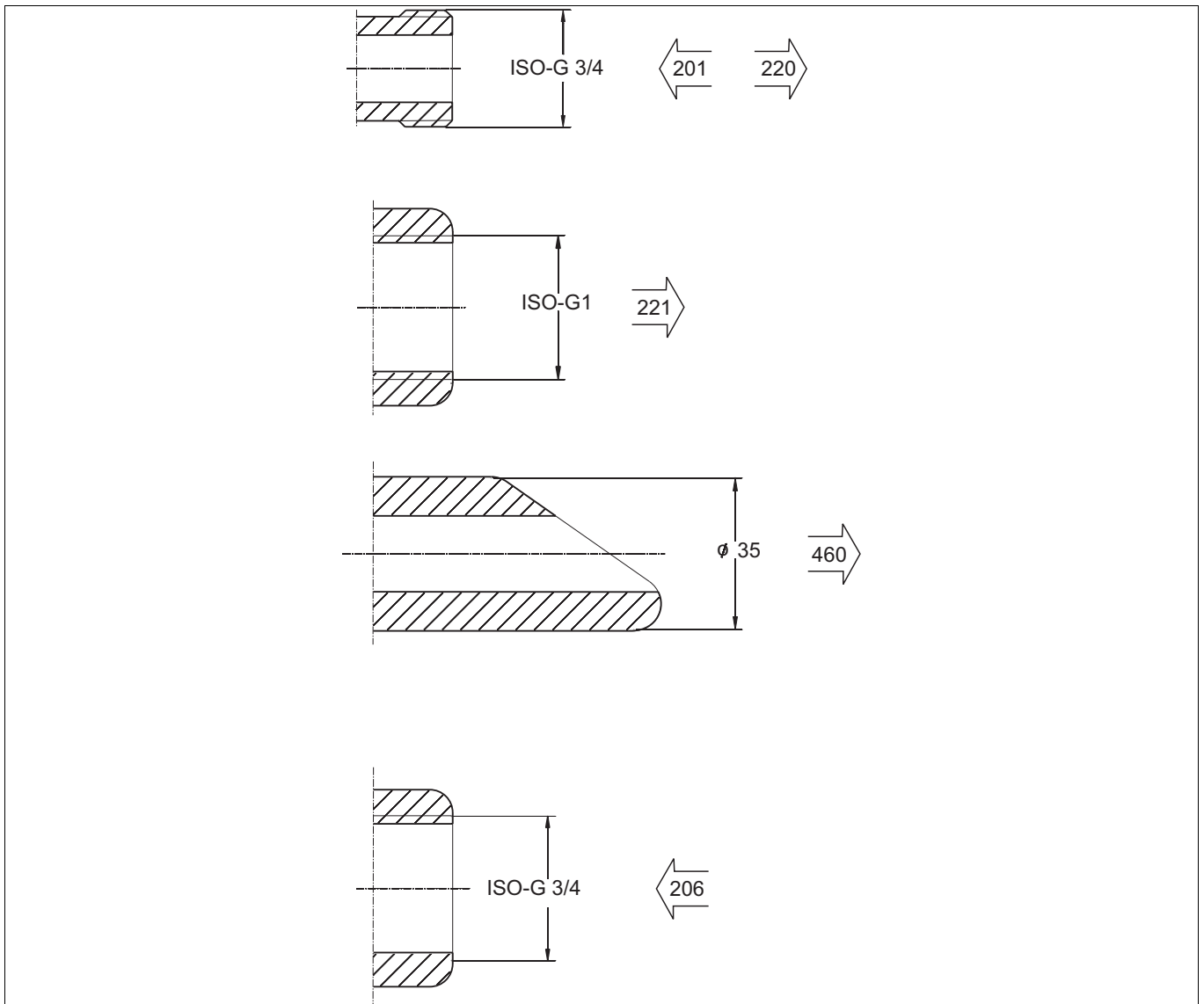


- A. Screw 3/8-16UNC
 B. Tightening torque 16 Nm locked with lock nut

Data for connections see [“8.5 Connection list”](#) on page 130.

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8.3.1 Dimensions of connections



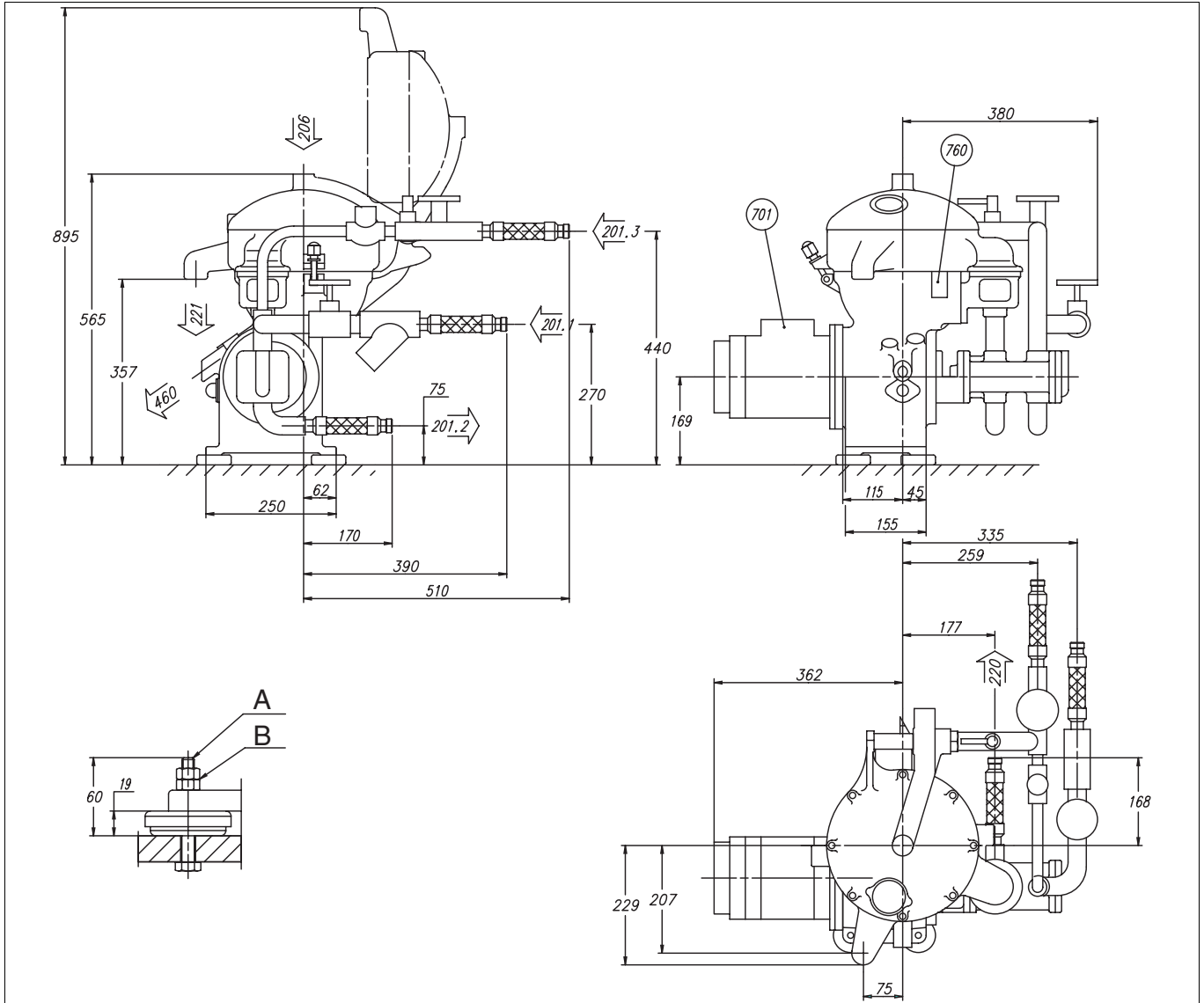
Data for connections, see chapter "8.5 Connection list" on page 130.

All connections to be installed non-loaded and flexible.

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8.4 Basic size drawing, for heater

Alfa Laval ref. 556928 rev. 0

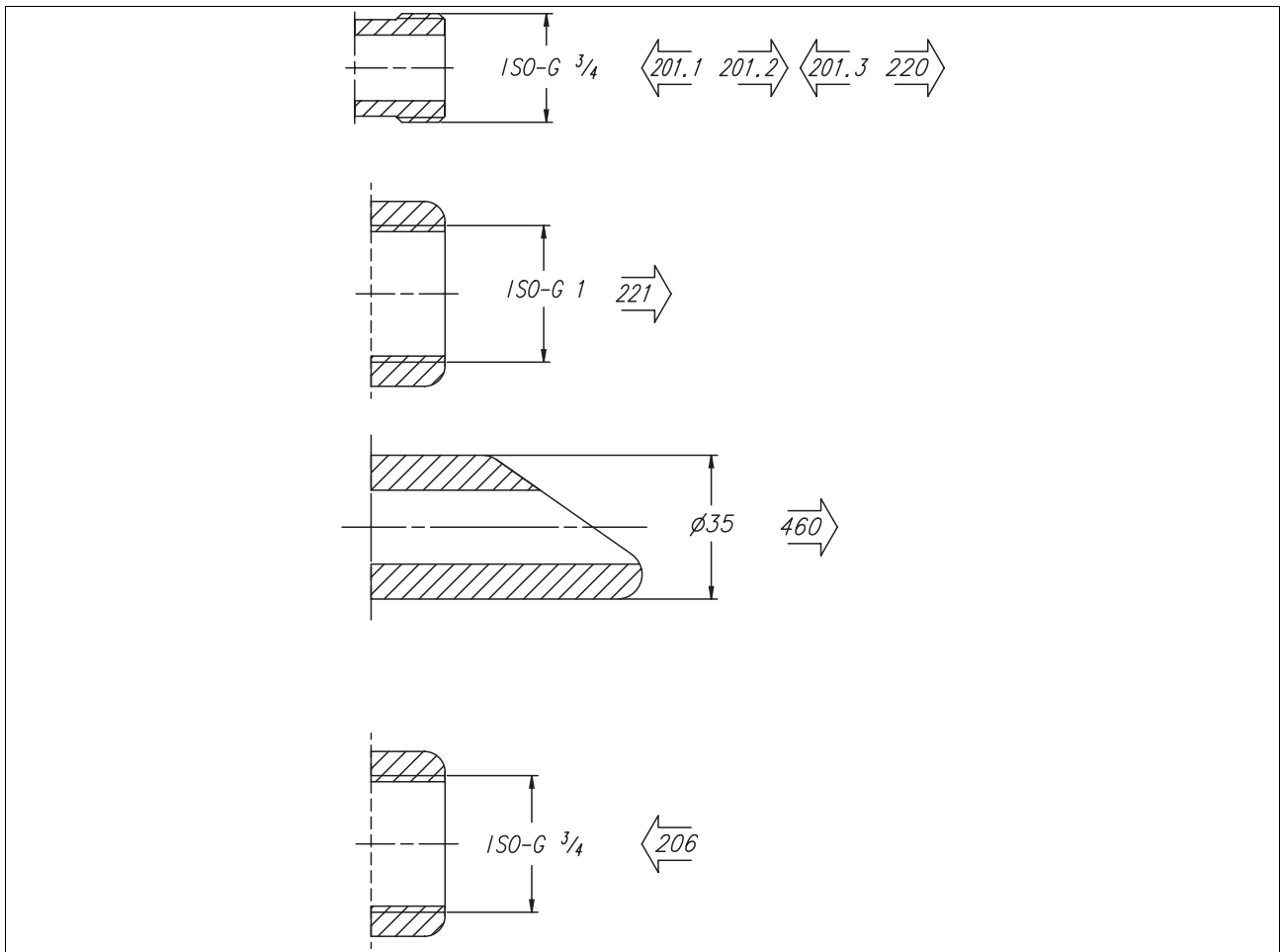


- A. Screw 3/8-16UNC
- B. Tightening torque 16 Nm locked with lock nut.

Data for connections see “8.6 Connection list, for heater” on page 131.

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8.4.1 Dimensions of connections



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Data for connections, see chapter "8.5 Connection list" on page 130.

All connections to be installed non-loaded and flexible.

8.5 Connection list

Alfa Laval ref. 556989 rev. 0

Connection No.	Description	Requirements/limit
201	Inlet for process liquid, (to pump) - Permitted temperatures	max. 100 °C, min. 0 °C
206	Inlet for water seal	Fresh water, approx 1 litre (depending on gravity disc)
220	Outlet for light phase (oil from pump)	
221	Outlet for heavy phase (water)	no counter pressure
460	Drain of frame	
701	Motor for separator - Max. deviation from nominal frequency	±5%
760	Cover interlocking switch (delivered as option) Type: Double, two-way microswitch Switch rating: Voltage Current	Max. 500 V Max. 3 A

8.6 Connection list, for heater

Alfa Laval ref. 556986 rev. 0

Machine with Pre-Heater.

Connection No.	Description	Requirements/limit
201.1	Inlet for process liquid, (to pump) - Permitted temperatures	max. 100 °C, min. 0 °C
201.2	Outlet for process liquid, (from pump to heater)	
201.1	Inlet for process liquid, (from pump to separator)	
206	Inlet for water seal	Fresh water, approx. 1litre (depending on gravity disc)
220	Outlet for light phase (oil from pump)	
221	Outlet for heavy phase (water)	no counter pressure
460	Drain of frame	
701	Motor for separator - Max. deviation from nominal frequency	±5%
760	Cover interlocking switch (delivered as option) Type: Double, two-way microswitch Switch rating: Voltage Current	Max. 500 V Max. 3 A

8.7 Interface description

Alfa Laval ref. 557119 rev. 2

In addition to the Connection List this document describes limitations and conditions for safe control, monitoring and reliable operation.

At the end of the document a function graph and running limitations are to be found.

8.7.1 Definitions

Ready for start means:

- The machine is assembled correctly.
- All connections are installed according to Connection List, Interconnection Diagram and Interface Description.

Start means:

- The power to the separator is on.
- The acceleration is supervised to ensure that a certain speed has been reached within a certain time. See [“8.2 Technical data” on page 121](#).

Normal stop means:

- Stopping of the machine at any time with feed or safety/backup liquid and with brake applied.

Safety stop means:

The machine must be stopped in the quickest and safest way due to vibrations or process reasons.

Comply to following conditions:

- The bowl must be kept filled.
- The machine must not be restarted before the reason for the Safety stop has been investigated and action has been taken.

In case of emergency condition in the plant, the machine must be stopped in a way that is described in EN 418.

8.7.2 Component description and signal processing

Separator motor 701

The separator is equipped with a 3-phase DOL-started (direct on line) motor. The separator can also be started by a Y/D starter, but then the time in Y-position must be maximized to 5 seconds.

Cover interlocking switch 760 (option)

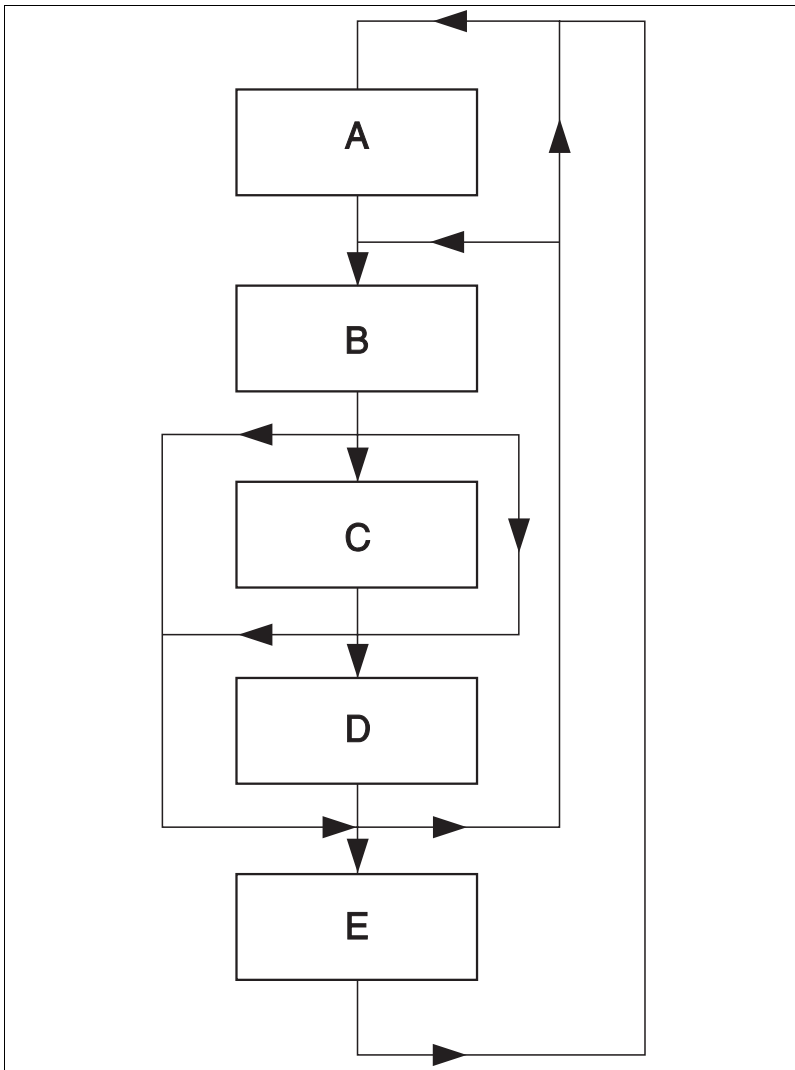
The cover of the separator is equipped with an interlocking switch. When the cover is closed the interlocking circuit in the starter control is closed and the separator could be started.

Signal processing:

The circuit is closed when the collecting cover of the separator is closed.

The interlocking switch should be connected so that starting of the motor is prevented when the separator collecting hood is not closed.

8.7.3 Function graph and running limitations



G0543211

- A Stand still
- B Starting mode
- C Running mode
- D Stop mode
- E Safety stop mode

8.8 Lubricants

8.8.1 Lubrication chart, general

Alfa Laval ref. 553216-01, rev. 6

Lubricating points	Type of lubricant
Bowl spindle ball bearings and buffers are lubricated by oil mist	Lubricating oil as specified in "Recommended lubricating oils"
Bowl spindle taper	Lube oil, only a few drops for rust protection
Metal buffers of bowl spindle	Lube oil
Bowl: Sliding contact surfaces and pressure loaded surfaces such as lock rings, threads of lock rings, bowl hood and cap nut	Pastes as specified in "Lubricants"
Rubber seal rings	Grease as specified in "Lubricants"
Friction coupling ball bearings	The bearings are packed with grease and sealed and need no extra lubrication
Electric motor	Follow manufacturer's instructions

Alfa Laval Lubricating Oil Groups

- **Group A oil:** a high quality gear oil on paraffin base with stable AW (anti wear) additives.
- **Group B oil:** a high quality gear oil on paraffin base with stable EP (extreme pressure) additives.
- **Group D oil:** a synthetic base oil with additives stable at high operating temperatures.
- **Group E oil:** Characteristics as a group D-oil but suitable at a higher operation power (≤ 55 kW)

Do not mix different oil brands or oils from different oil groups.

Always use clean vessels when handling lubricating oil.

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

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

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

NOTE

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

**CAUTION**

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

It is of utmost importance to use the lubricants recommended in our documentation.

This does not exclude, however, the use of other brands, provided they have equivalently high quality properties as the brands recommended. The use of oil brands and other lubricants than recommended, is done on the exclusive responsibility of the user or oil supplier.

Applying, handling and storing of lubricants

Always be sure to follow lubricants manufacturer's instructions.

8.8.2 Recommended lubricating oils

Alfa Laval ref. 553219-10 rev. 0

Three different groups of lubricating oils are approved for type of frame B 1200, B 1300, B 1400 with motor <3,7 kW.

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 ref. 553218-02 rev. 4” on page 140.](#)

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.

8.8.3 Recommended oil brands (01)

Alfa Laval ref. 553218-01, rev.3

Paraffinic mineral lubricating oil for general use

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

8.8.4 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

8.8.5 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 CFR 21 178.3570, 178.3620 and/or those generally regarded as safe (US 21 CFR 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/)

8.8.6 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)	537086-02 (1000 g)	
	Molykote 1000 (Paste)	537086-03 (100 g)	
	Molykote G-rapid plus (Paste)	537086-04 (50 g)	
Fuchs Lubritech	Gleitmo 705		
	Gleitmo 805K		
Klüber	Wolfracoat C (Paste)		
Rocol	Dry Moly Paste MT-LM		


Bonded coatings:

Manufacturer	Designation	Alfa Laval No	
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	Unisilikon L 250 L	Complies with German Environmental Agency on hygiene requirements for tap water. Certified by DVGW-KTW, WRC, AS4020, ACS.		
	Paraliq GTE 703	NSF Registered H1 (25 Feb 2004) Complies with LMBG and the European standard EN 1672, part 2.		
Bel-Ray	No-Tox Silicone Valve Seal	NSF Registered H1 (19 June 2002)		
MMCC	ALCO 220	NSF Registered H1 (25 March 2002)		
Rocol	Foodlube Hi-Temp	NSF Registered H1 (18 April 2001)		

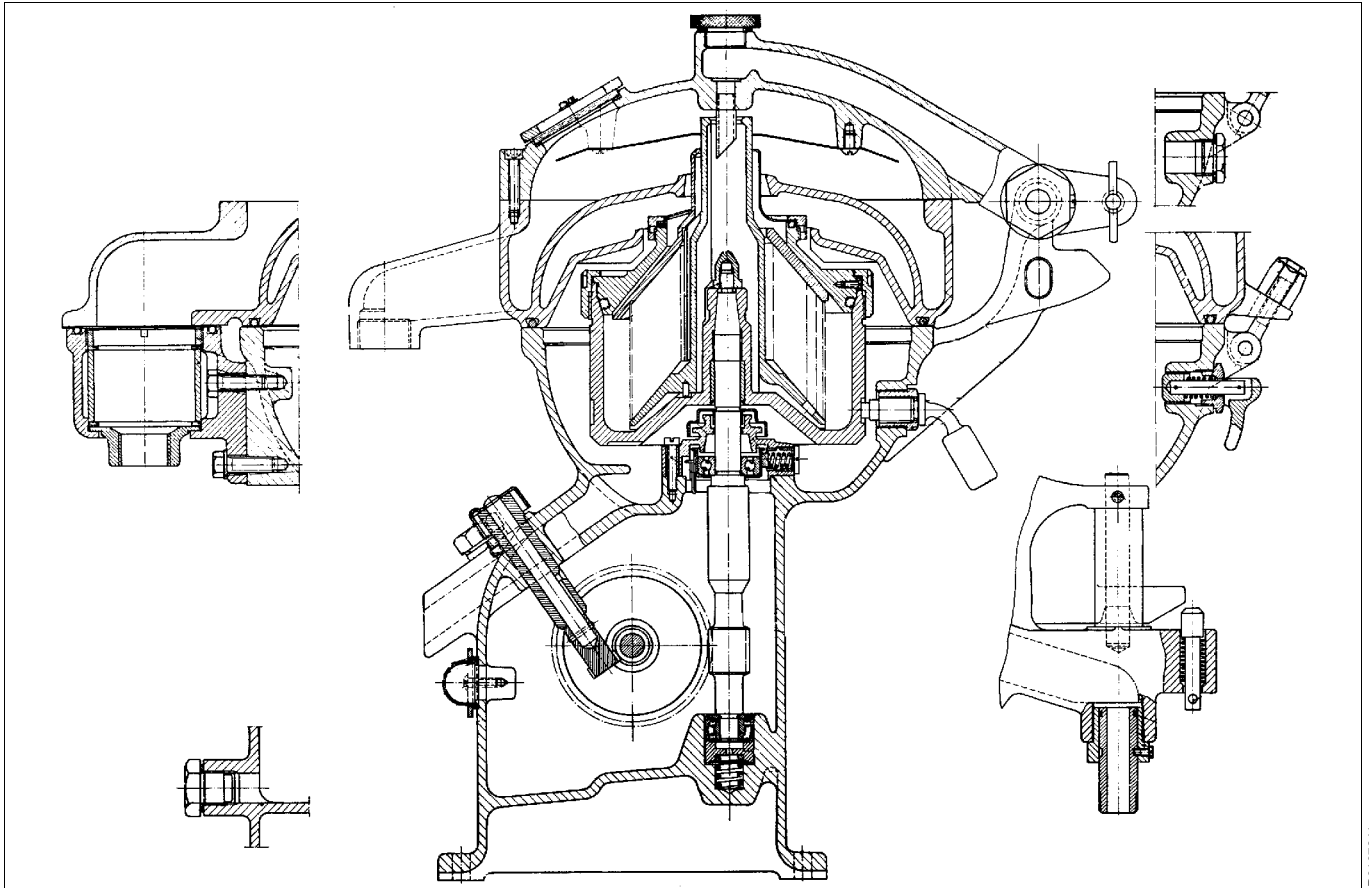
Greases for ball and roller bearings:**NOTE**

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

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

8.9 Drawings

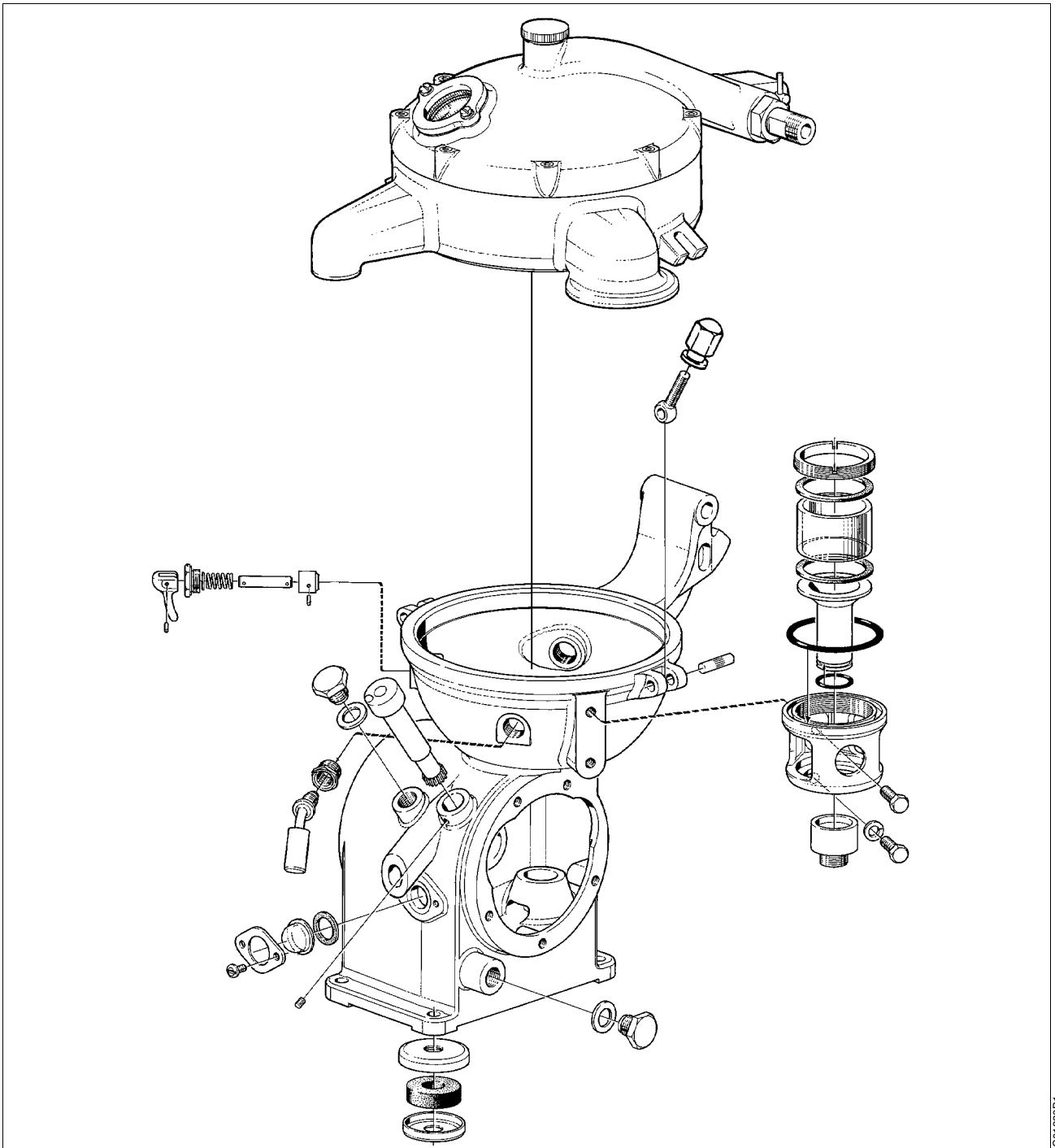
8.9.1 Cross-section of separator



Cross-section of separator

R0107941

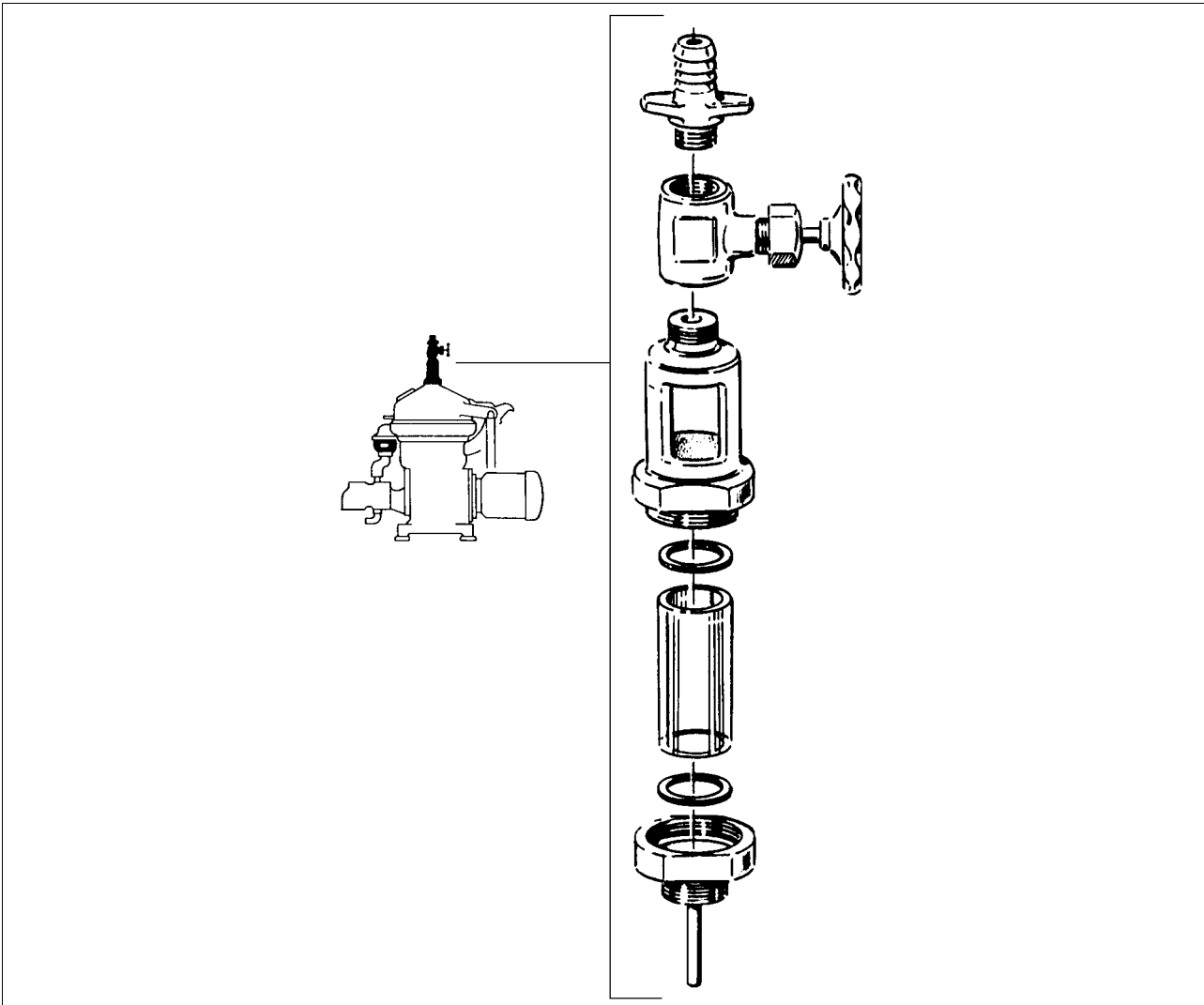
8.9.2 Exploded view



Exploded view of separator frame

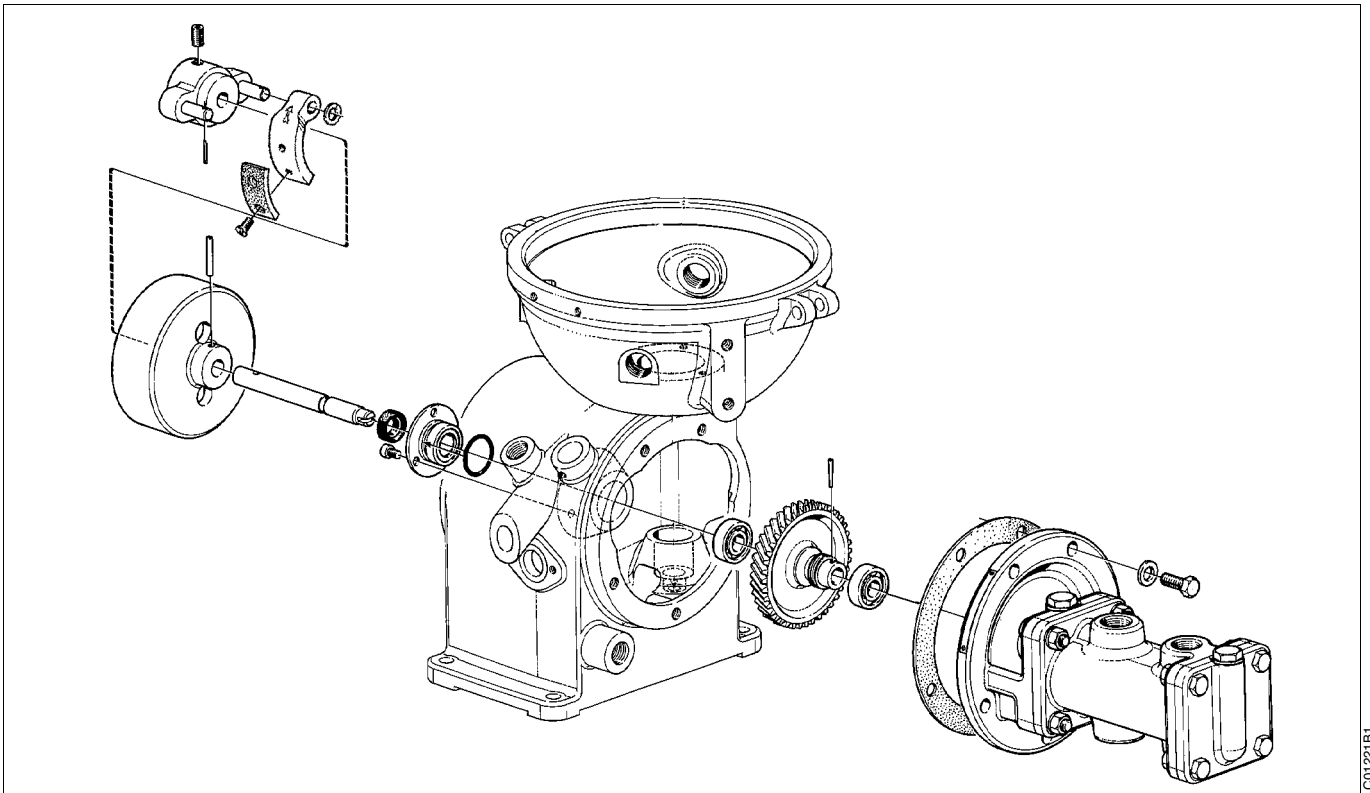
C0122081

8.9.3 Water adding device (option)

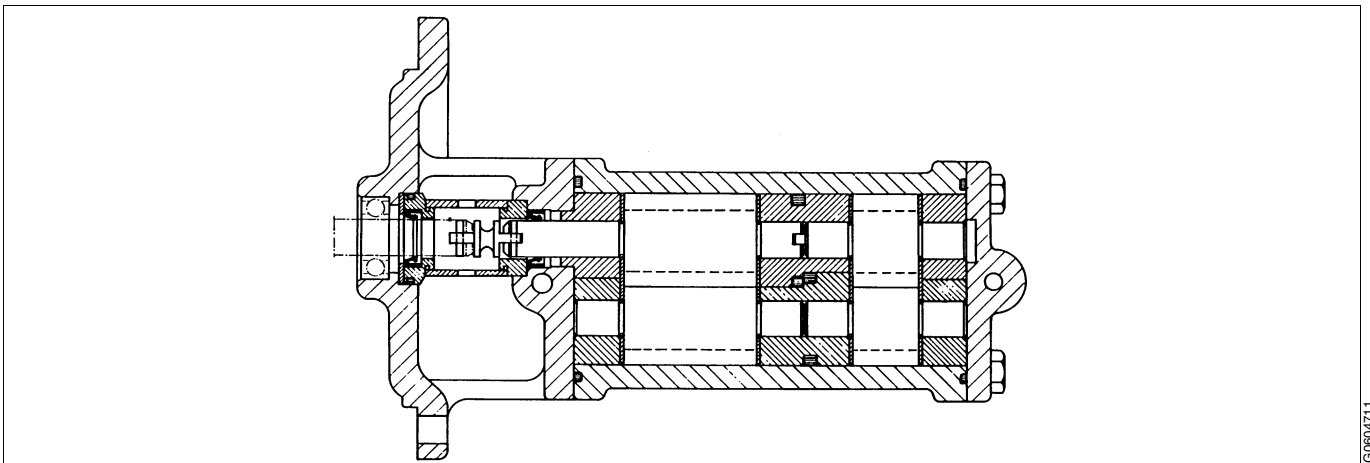


G0877521

8.9.4 Pump



Inlet and outlet pump, exploded view

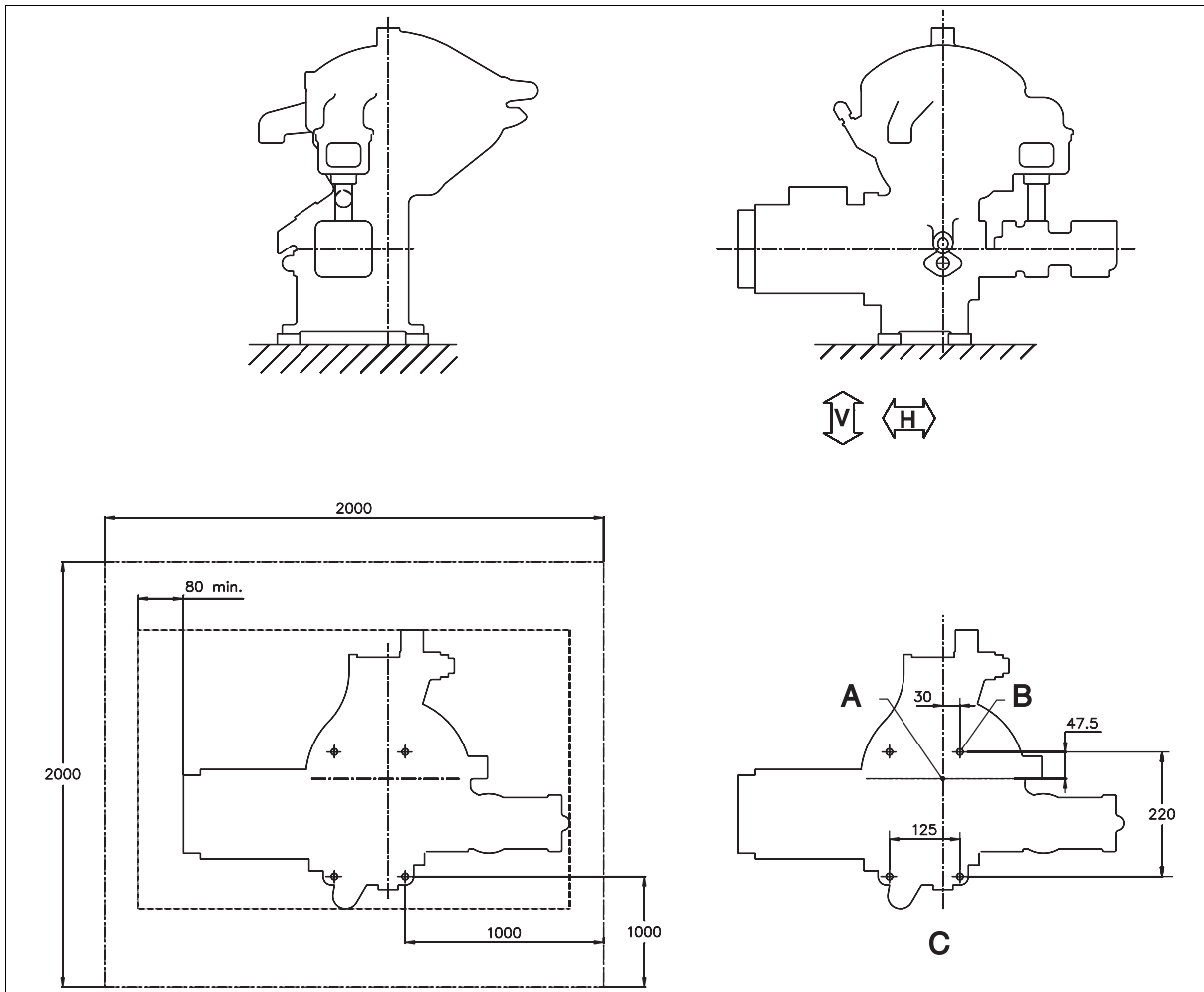


Inlet and outlet pump, cross-section

Alfa Laval ref. 529209

8.9.5 Foundation drawing

Alfa Laval ref. 556885 rev. 0



G0602131

- A Center of separator bowl
- B 4 holes Ø 11,5 for anchorage
- C Service side

----- Recommended free floor space for unloading when doing service

----- Min. access area for overhead hoist (no fixed installation within this area)



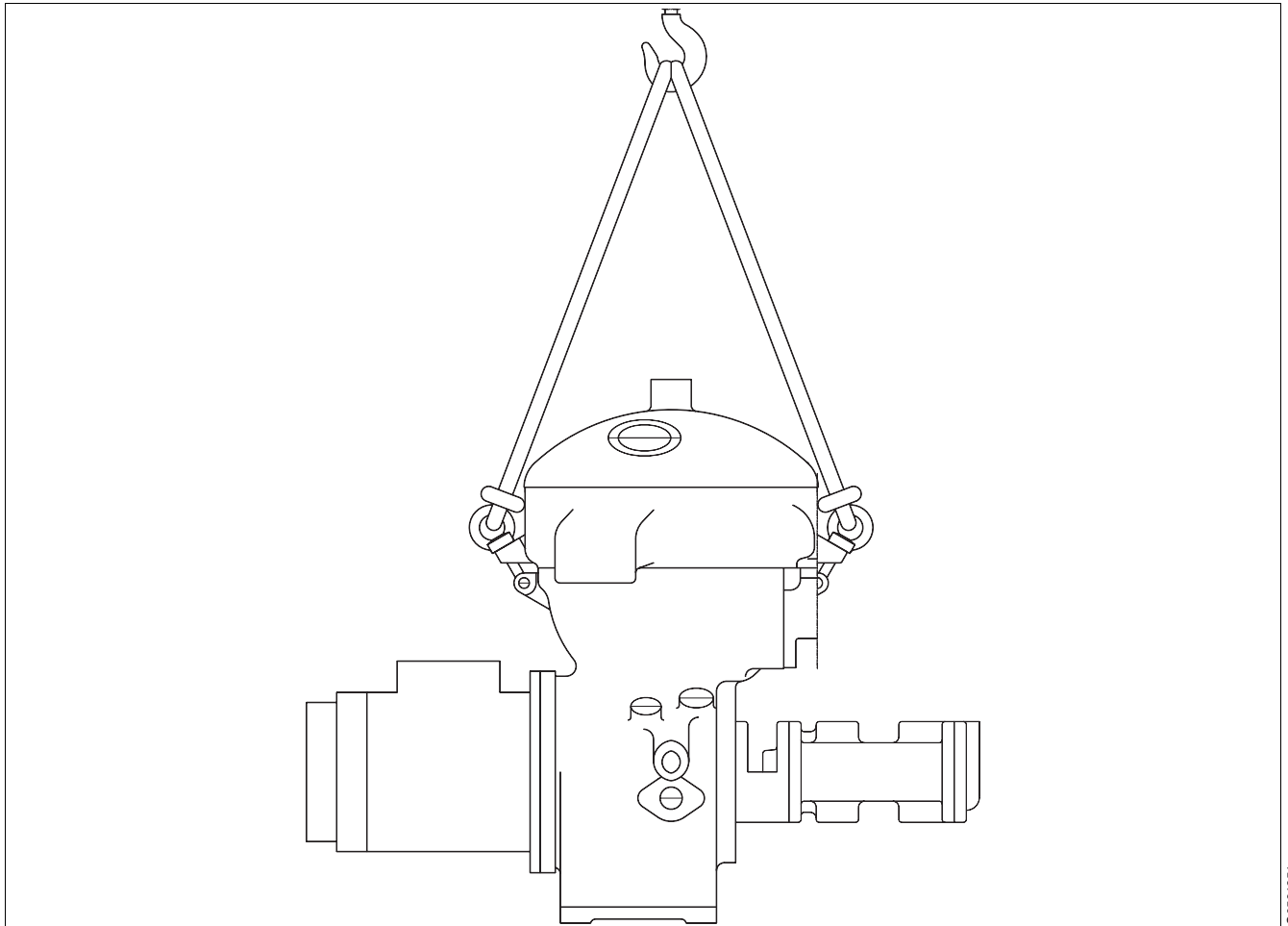
Vertical force not exceeding 6 kN/foot



Horizontal force not exceeding 6 kN/foot

8.9.6 Lifting instruction

Alfa Laval ref. 556213 rev. 0



Weight to lift 80 kg

NOTE

Never lift the separator with the separator bowl inside.

Lifting the separator

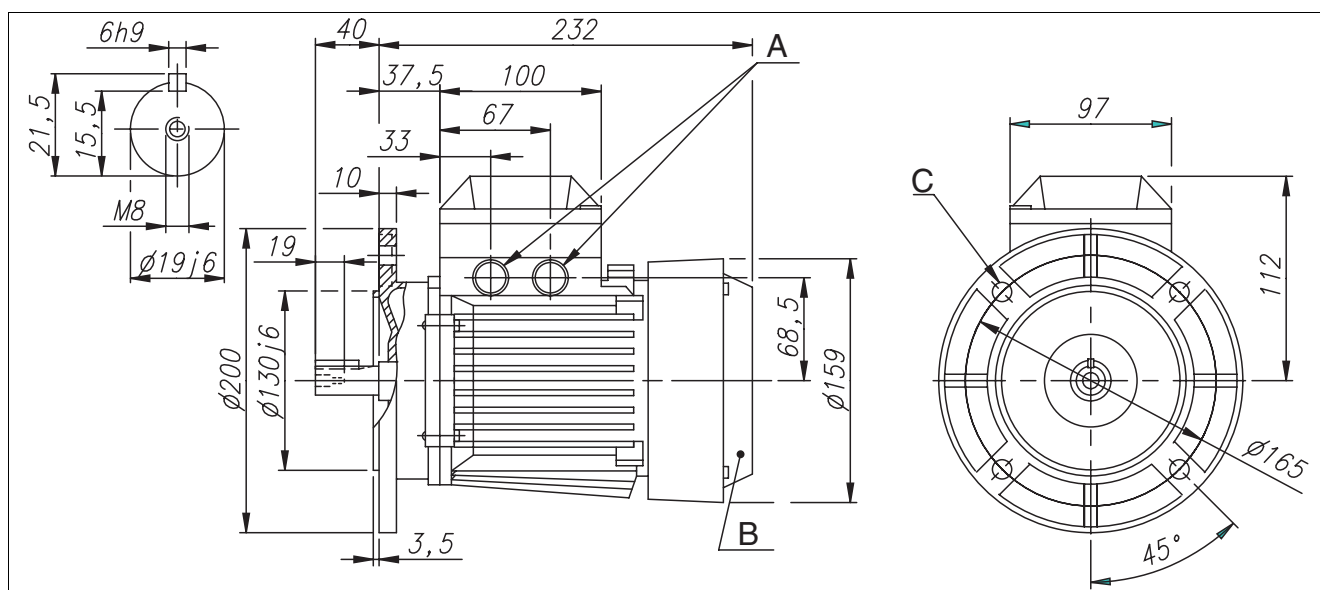
1. Remove cap nut on hinged bolt
2. Remove separator bowl
3. Assemble lifting eye nuts on hinged bolt.

NOTE

Never lift the separator in any other way.

8.9.7 Electric motor

Alfa Laval ref. 551587 rev. 5



- A Knockout openings for 2 x M20 cable glands on both sides
- B Sheet-steel fan hood
- C 4xØ12

Manufacturer ABB Motors
Manufacture drawing Cat. BA/Marine motors
 GB 98-05
Standards IEC 34-series, 72, 79, 85.
Size IEC 80B
Type M2AA 80B
Weight 10 kg
Poles 4
Insulation class F
Bearings D-end 6204-2Z/C3
 N-end 6203 2Z/C3
Method of cooling IC411 (IEC 34-6)
 Totally enclosed 3-phase motor for marine service ³⁾

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

Note! The motor bearings are permanently lubricated.

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

1. I_{st}/I =starting current/rated current at direct on line starting.
2. Thermistors tripping temperature. if applicable
3. The motors can be designed to fulfill requirements of the following Classification Societies: (Essential Service if required)

Lloyds Register of Shipping	(LR)	Nippon Kaiyi Kyokai	(NK)
Det Norske Veritas	(DnV)	Korean Register of Shipping	(KR)
Germanischer Lloyd	(GL)	Po/ski Rejester Statkow	(PRS)
Bureau Veritas	(BV)	China Classification Society	(CCS)
American Bureau of Shipping	(ABS)	Indian Register of Shipping	(IRS)
Registro Italiano Navale	(RINa)	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.

- 4) These motors are provided with heating element for 200V - 240V according to variant code +451.

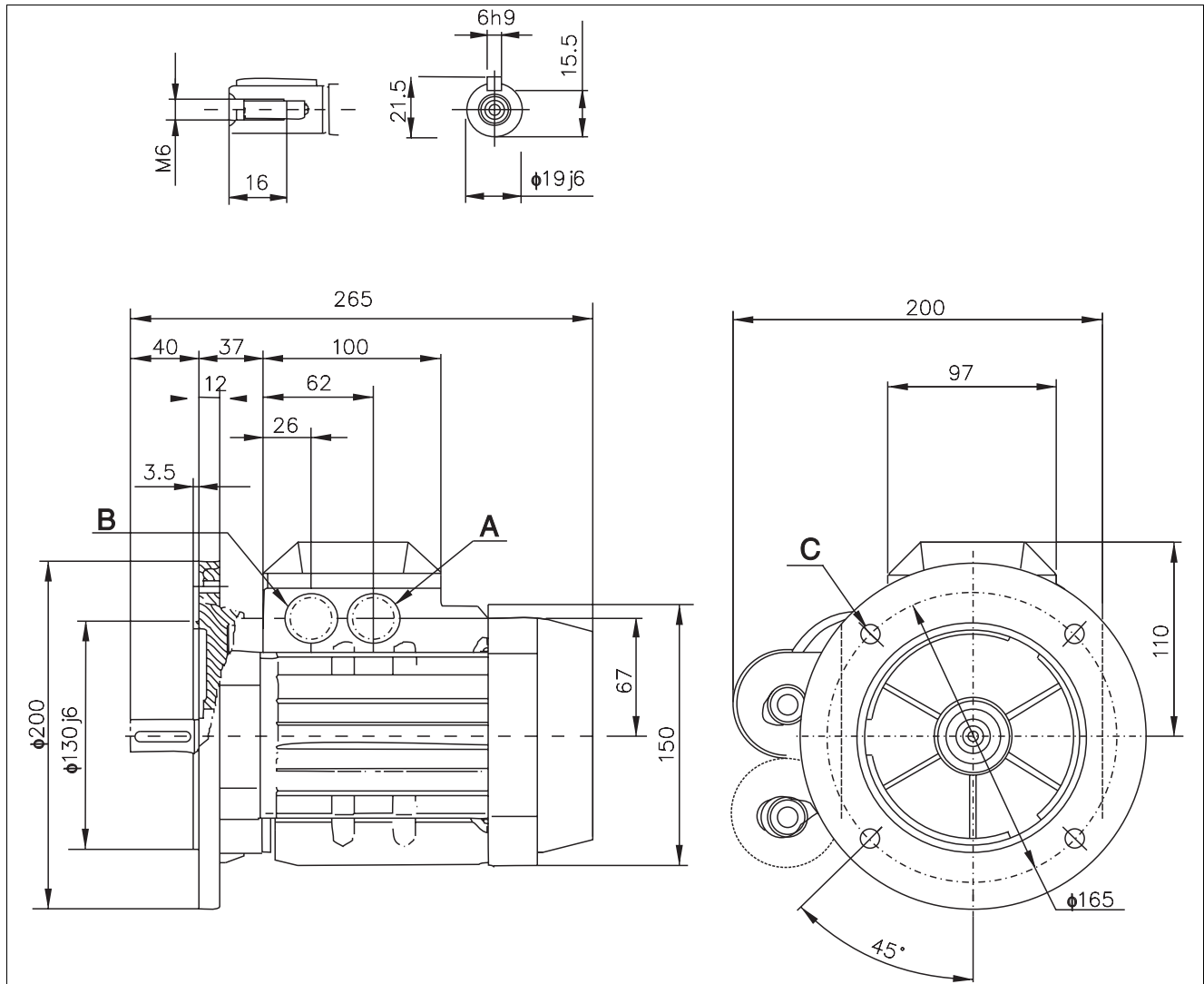
Connection to separate terminal board in the main terminal box according to attached connection diagram.

NOTE

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

8.9.8 Electric motor

Alfa Laval ref. 53558260 rev. 0



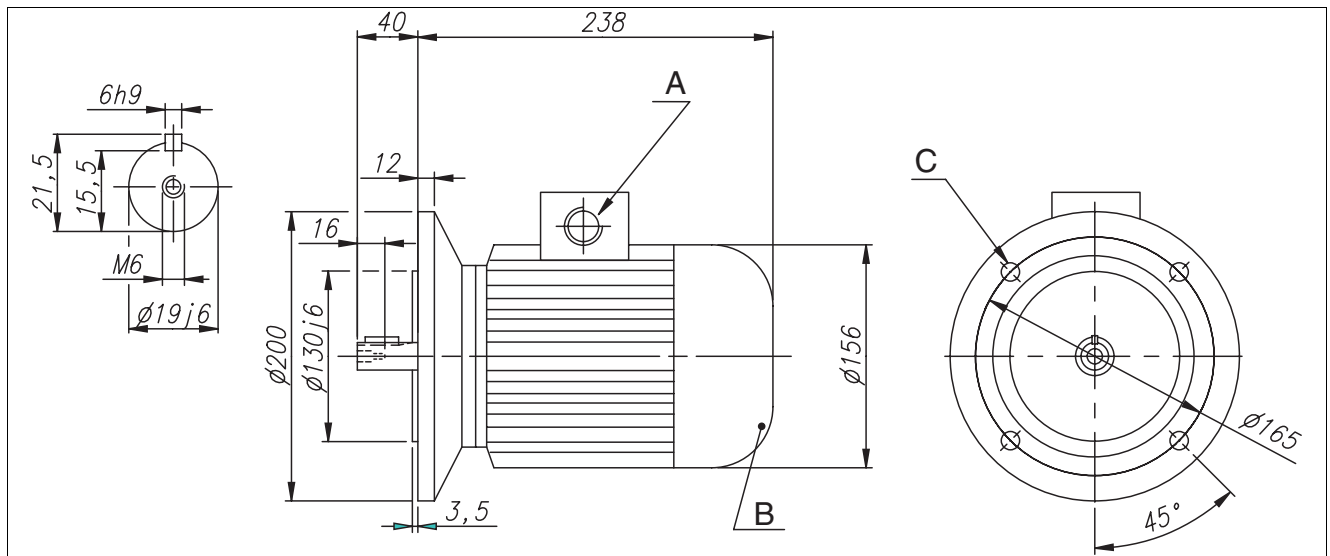
- A PG16.
- B M20x1,5
- C 4xØ12

G0605581

Supplier:	ABB Motors
Power:	0,95 kW
Voltage/Frequency:	200V/50Hz, single phase
Speed:	1410g/min
Type:	M3VD 80 C 3GVD 082003
Weight:	11,5 kg
Efficiency:	73.0 %
Insulation class:	F
Bearings:	Totally enclosed
Power factor:	$\text{Cos}\phi$ 0,93
Current:	$I_n=6,1\text{A}$ Nm; $I_s/I_n=4,1$
Torque:	$T_n=6,1\text{Nm}$; $T_s/T_n=1,8$; $T_{\text{max}}/T_n=1,8$
Capacitor:	Start: $80\mu\text{F}$; Run: $16\mu\text{F}$
Moment of inertia:	$J=1/4$ GD2; $0,00194$ kgm ²
Enclosure:	IP 55
Flange mounted motor:	Im B5

8.9.9 Electric motor


Alfa Laval ref. 580751 rev. 2



- A Cable entry $\text{Ø}20$.
 B Sheet-steel fan hood
 C 4x $\text{Ø}12$

Manufacturer:	Crompton Greaves Ltd
Manufacture drawing:	Cat. Crompton Greaves Lt, TEFC, SCR
Standards:	IEC 34-series, 72, 79 and 85.
Size:	IEC 80
Type:	GD80
Weight:	12 kg
Poles:	4
Insulation class:	F
Bearings:	D-end 6204-2Z N-end 6003 2Z
Method of cooling:	IC 411 (IEC 34-6)

Totally enclosed 3-phase motor for marine service ³⁾

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

NOTE

The motor bearings are permanently lubricated.

The rotor balanced with half key.

Max. vibration velocity 1,8 mm/S (rms) according to IEC 34-14.

1. $I_{st} / I =$ starting current/ rated current at direct on line starting.
2. Thermistors tripping tamp. if applicable
3. All ratings can be CSA marked

Factory test certificate to be enclosed at the delivery. Rated output (kW) valid for temperature rise max 80 °C.

Some motors can be provided with space heaters for 230V 60W.

State supply voltage when ordering.

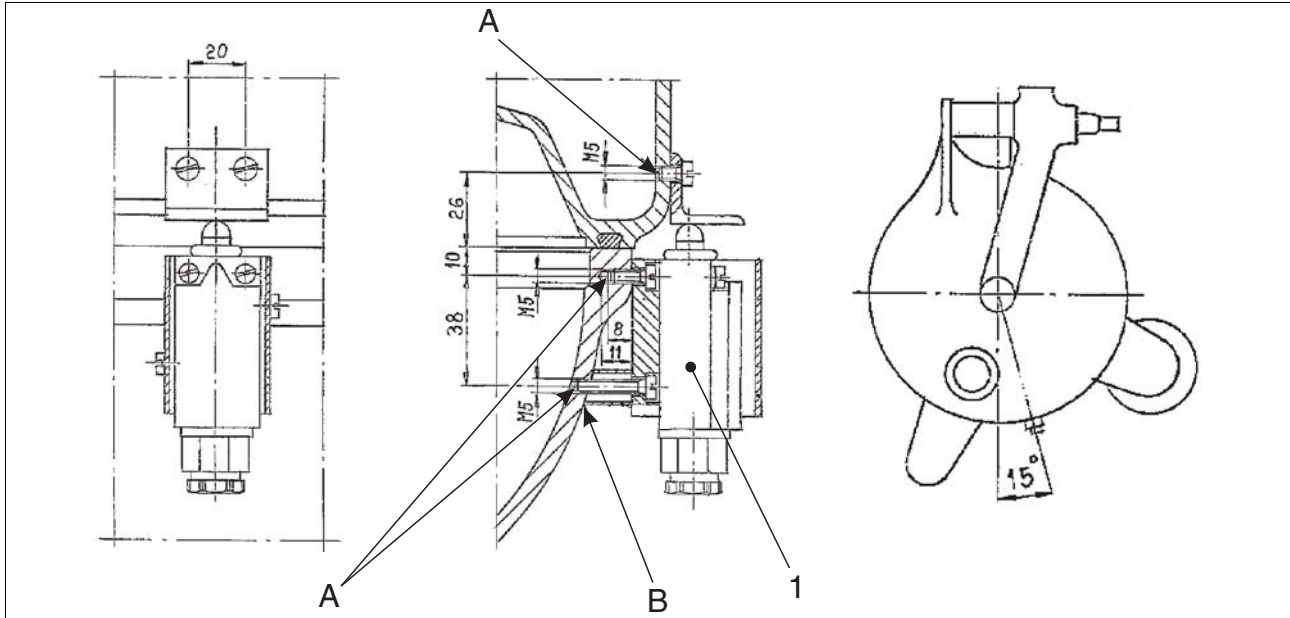
Connection to separate terminal board in the main terminal box according to attached connection diagram.

NOTE

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

8.10 Lock switch

Alfa Laval ref. 535867, rev. 2

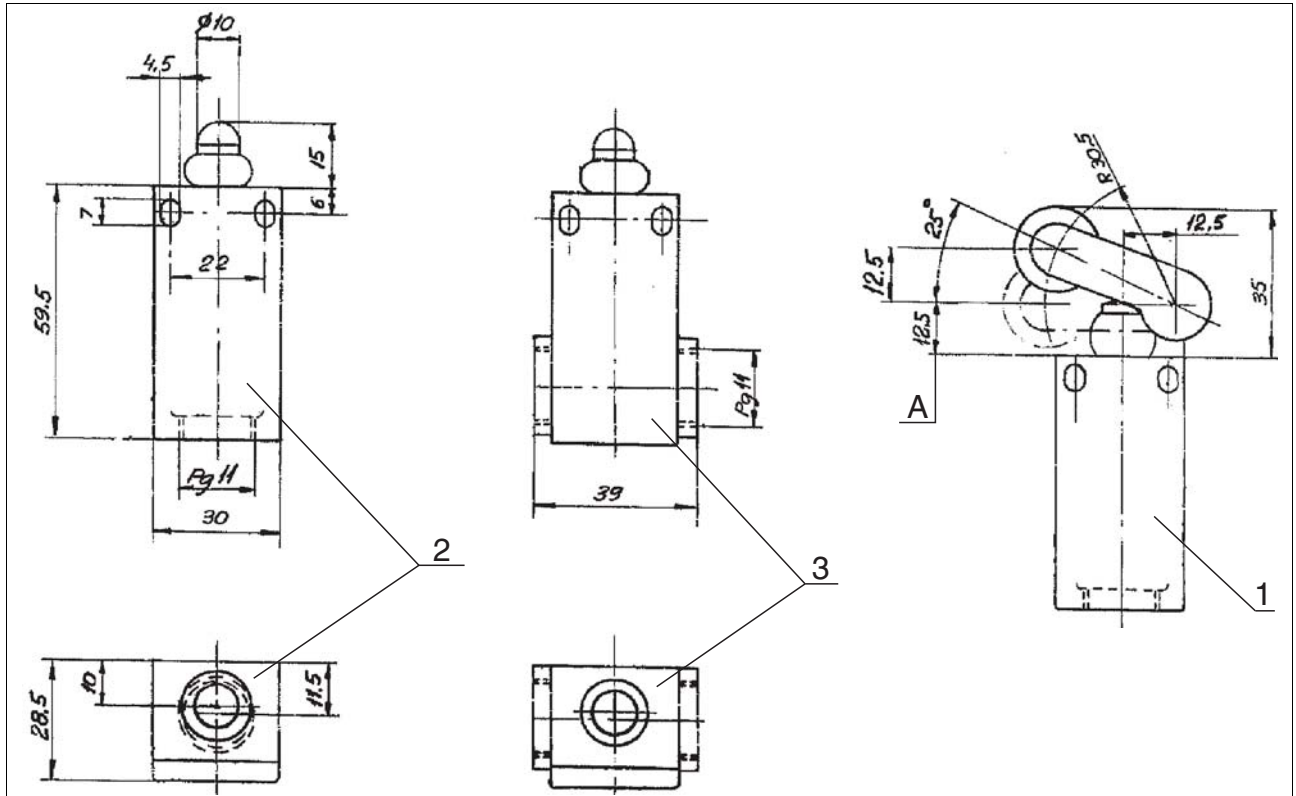


G0548151

- 1. Switch
- A. Sealed with Loctite 270
- B. Tube fitted at site

8.10.1 Switch

Alfa Laval ref. 530007, rev. 2



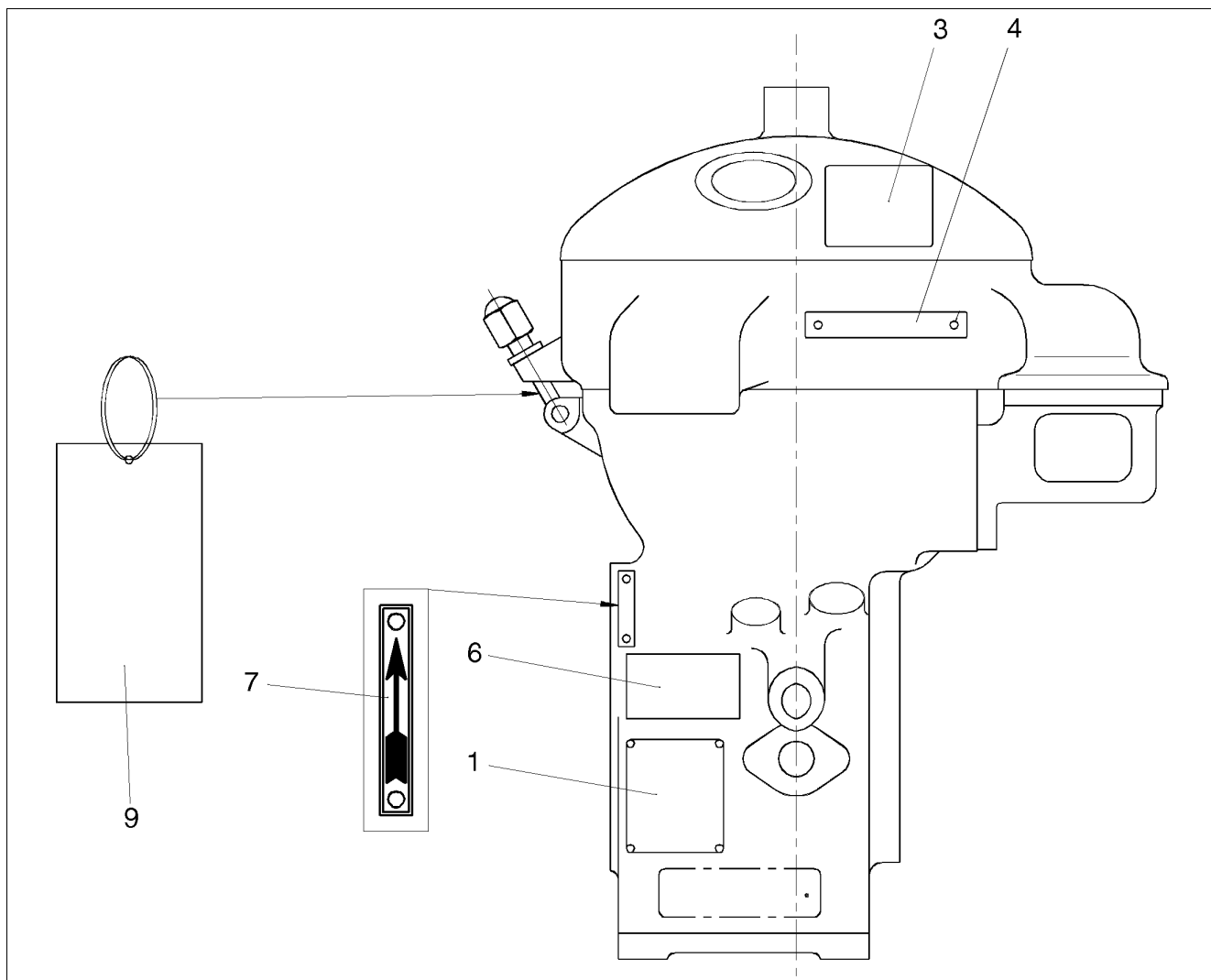
A. Max and Min position

1. 500V, GA, P43 (Type:ES11i HRB sGU)
2. 500V, GA, P43 (Type: ES11i + GU)
3. 500V, GA, P43 (Type: ES11il + GU)

For other technical information see chapter
 “8.5 Connection list” on page 130 and
 “8.7 Interface description” on page 132.

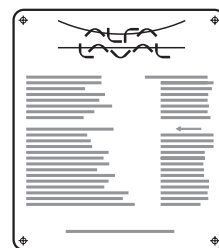
8.10.2 Machine plates and safety labels

Alfa Laval ref. 549438 rev. 2



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.



S0061411

3. Safety label

Text on label:

WARNING:

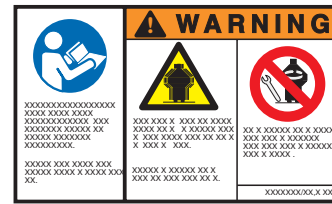
Read the instruction manuals **before** installation, operation and maintenance. Consider inspection intervals.

Failure to strictly follow instructions can lead to fatal injury.

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

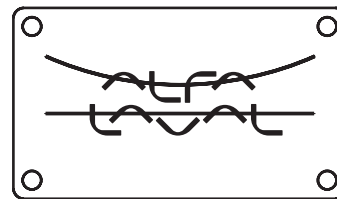
Out of balance vibration will become worse if bowl is not full during rundown.

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



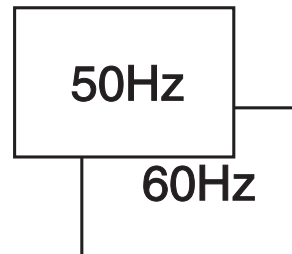
S00690IN1

4. Name plate



S0063211

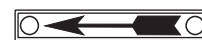
6. Power supply frequency



S0063111

7. Arrow

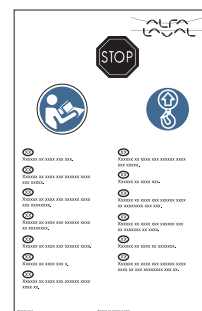
Indicating direction of rotation of horizontal driving device.



S0068K

9. Stop, follow lifting instruction

This transport label is not permanently fixed to the separator.



S0069111

8.11 Storage and installation

8.11.1 Storage and transport of goods

Storage

Specification

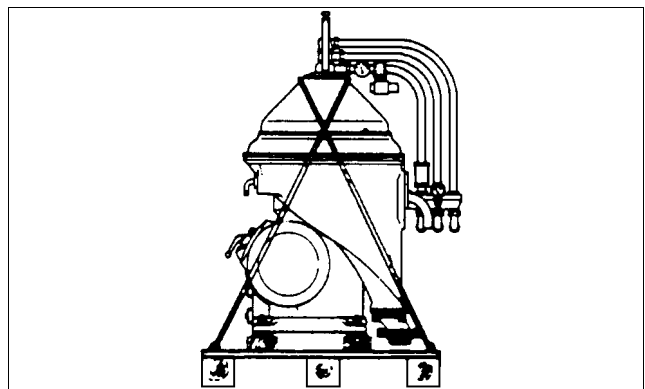
Upon arrival to the store, **check all components and keep them:**

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.

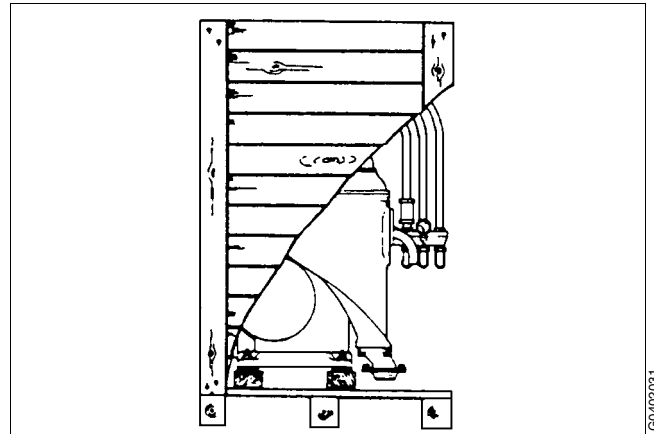
The separator must be stored in a storage room well protected from mechanical damage and theft and also dry and protected from rain and humidity.



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.

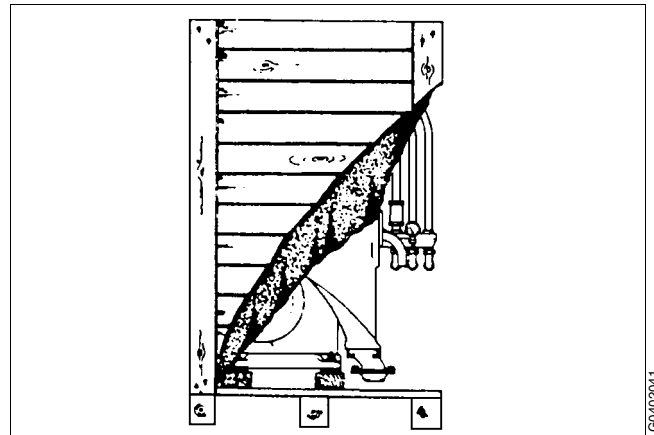


In a wooden box which is not water tight

- 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.

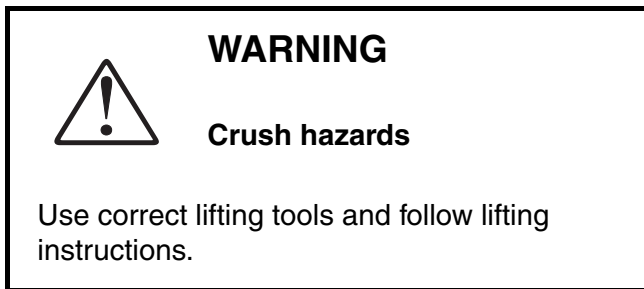


In a special water-resistant box for outdoor storage

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 “[5.7 Lifting instructions](#)” on page 79.



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

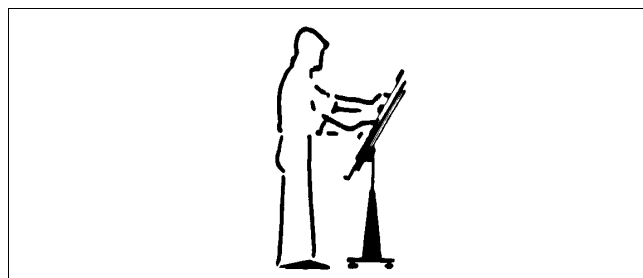
8.11.2 Planning and installation

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 119.



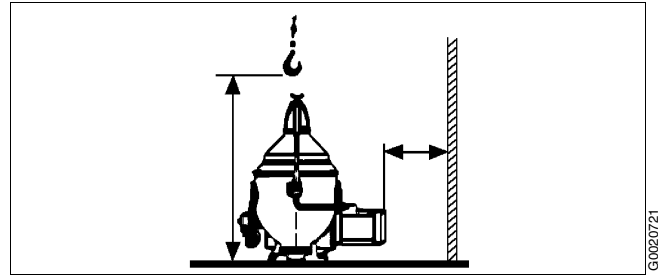
Check the drawings when planning the installation

G002061

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 “[8.9.5 Foundation drawing](#)” on page 152 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.

Lifting height for transport of bowl

Specification

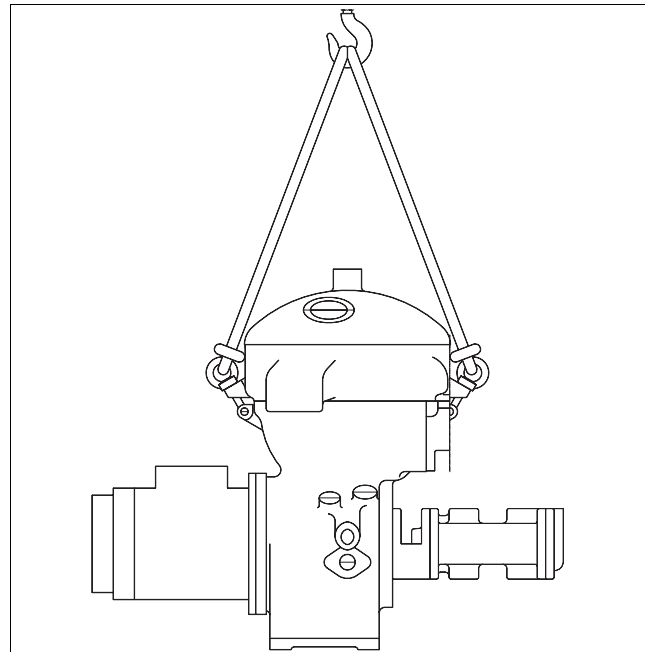
- A minimum height is required to lift the bowl, bowl parts and the bowl spindle, see “8.9.6 Lifting instruction” on page 153.

Recommendation

- When two or more separators are installed, the lifting height may have to be increased to enable parts from one separator to be lifted and moved over an adjoining assembled separator.

NOTE

Remove the separator bowl before lifting.



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Do not 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.

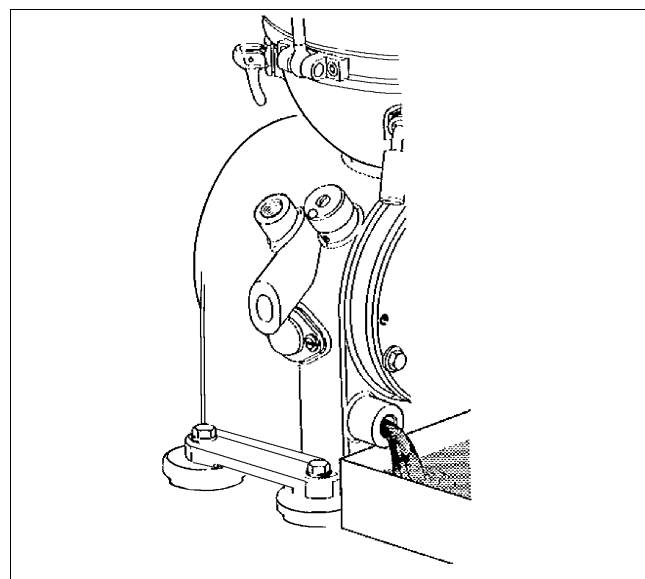
Space for oil changing

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.



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

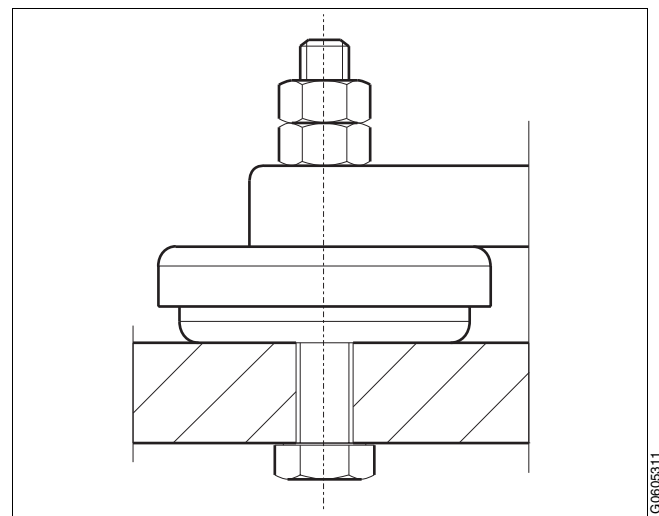
8.11.3 Foundations

Specification

- The separator should be installed at floor level, see “8.9.5 Foundation drawing” on page 152.
- 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

G0605311

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