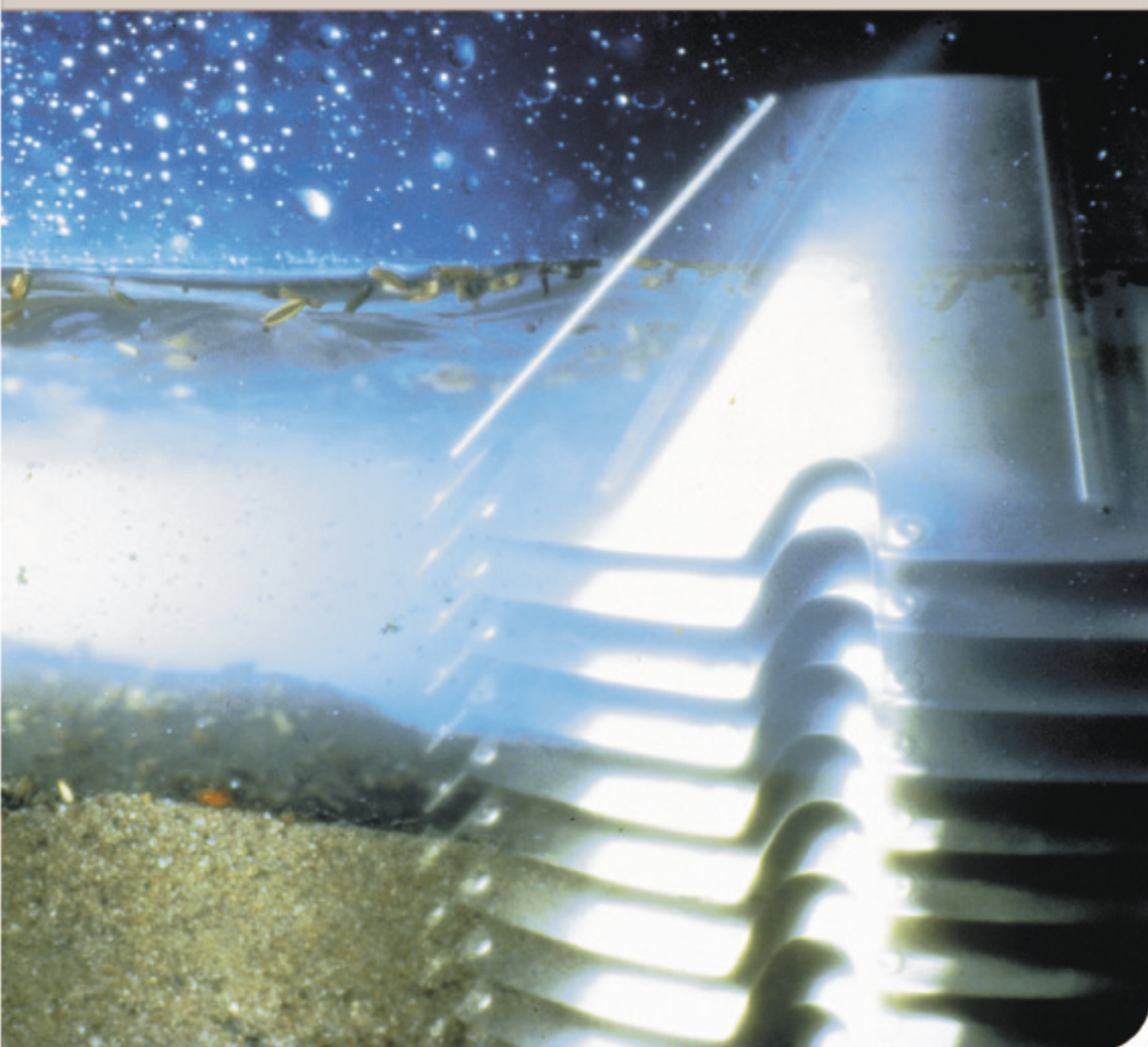




Separator manual  
High speed separator

**S 817**



**Published By:**  
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## **Original instructions**

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# Contents

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|          |                                             |           |
|----------|---------------------------------------------|-----------|
| <b>1</b> | <b>Read this first</b>                      | <b>9</b>  |
| <b>2</b> | <b>Safety instructions</b>                  | <b>11</b> |
| 2.1      | Warning signs in text                       | 15        |
| 2.2      | Recycling information                       | 16        |
| 2.3      | Requirements of personnel                   | 17        |
| 2.4      | Remote start                                | 17        |
| <b>3</b> | <b>Basic principles of separation</b>       | <b>19</b> |
| 3.1      | Introduction                                | 19        |
| 3.2      | Separation by gravity                       | 19        |
| 3.3      | Centrifugal separation                      | 20        |
| 3.4      | Temperatures                                | 20        |
| <b>4</b> | <b>Separator basics</b>                     | <b>21</b> |
| 4.1      | <b>Design and function</b>                  | <b>21</b> |
| 4.1.1    | Application                                 | 21        |
| 4.1.2    | Design                                      | 22        |
| 4.1.3    | Outline of function                         | 23        |
| 4.1.4    | Separating function                         | 24        |
| 4.1.5    | Separating function (emergency operation)   | 27        |
| 4.1.6    | Sludge discharge function                   | 29        |
| 4.1.7    | Power transmission                          | 31        |
| 4.1.8    | Sensors and indicators                      | 32        |
| 4.2      | <b>Definitions</b>                          | <b>33</b> |
| <b>5</b> | <b>Service instructions</b>                 | <b>35</b> |
| 5.1      | <b>Periodic maintenance</b>                 | <b>35</b> |
| 5.1.1    | Introduction                                | 35        |
| 5.1.2    | Maintenance intervals                       | 35        |
| 5.1.3    | Maintenance procedure                       | 37        |
| 5.1.4    | Service kits                                | 37        |
| 5.2      | <b>Maintenance Logs</b>                     | <b>38</b> |
| 5.2.1    | Daily checks                                | 38        |
| 5.2.2    | Oil change - monthly                        | 38        |
| 5.2.3    | Intermediate Service (IS)                   | 39        |
| 5.2.4    | Major service (MS)                          | 40        |
| 5.3      | <b>Check points at Intermediate Service</b> | <b>42</b> |

---

|             |                                      |           |
|-------------|--------------------------------------|-----------|
| 5.3.1       | Corrosion                            | 42        |
| 5.3.2       | Erosion                              | 44        |
| 5.3.3       | Cracks                               | 45        |
| 5.3.4       | Discharge mechanism                  | 46        |
| 5.3.5       | Bowl hood and sliding bowl bottom    | 46        |
| 5.3.6       | Spindle top cone and bowl body nave  | 49        |
| 5.3.7       | Threads of inlet pipe, paring disc   | 49        |
| 5.3.8       | Threads on bowl hood and bowl body   | 50        |
| 5.3.9       | Priming of bowl parts                | 51        |
| 5.3.10      | Disc stack pressure                  | 52        |
| <b>5.4</b>  | <b>Check points at Major Service</b> | <b>53</b> |
| 5.4.1       | Paring disc height adjustment        | 53        |
| 5.4.2       | Radial wobble of bowl spindle        | 54        |
| <b>5.5</b>  | <b>3-year service</b>                | <b>55</b> |
| <b>5.6</b>  | <b>Lifting instructions</b>          | <b>56</b> |
| <b>5.7</b>  | <b>Cleaning</b>                      | <b>58</b> |
| 5.7.1       | Cleaning agents                      | 59        |
| 5.7.2       | Cleaning of bowl discs               | 61        |
| <b>5.8</b>  | <b>Oil change</b>                    | <b>62</b> |
| 5.8.1       | Oil change procedure                 | 62        |
| <b>5.9</b>  | <b>Lubricants</b>                    | <b>64</b> |
| 5.9.1       | Lubrication chart, general           | 64        |
| 5.9.2       | Recommended lubricants               | 65        |
| 5.9.3       | Recommended lubricating oils         | 69        |
| <b>5.10</b> | <b>Vibration</b>                     | <b>71</b> |
| 5.10.1      | Vibration analysis                   | 71        |
| 5.10.2      | Vibration switch (optional)          | 72        |
| <b>5.11</b> | <b>General directions</b>            | <b>73</b> |
| 5.11.1      | Ball and roller bearings             | 73        |
| 5.11.2      | Before shut-downs                    | 76        |

|            |                                      |            |
|------------|--------------------------------------|------------|
| <b>6</b>   | <b>Dismantling &amp; Assembly</b>    | <b>77</b>  |
| <b>6.1</b> | <b>Inlet/outlet and bowl</b>         | <b>80</b>  |
| 6.1.1      | Inlet/outlet and bowl - dismantling  | 84         |
| 6.1.2      | Inlet/outlet and bowl - assembly     | 90         |
| <b>6.2</b> | <b>Bowl spindle and frame</b>        | <b>101</b> |
| 6.2.1      | Bowl spindle and frame - dismantling | 101        |
| 6.2.2      | Bowl spindle and frame - assembly    | 109        |
| <b>6.3</b> | <b>Friction coupling</b>             | <b>119</b> |
| 6.3.1      | Friction coupling - dismantling      | 121        |
| 6.3.2      | Friction coupling - assembly         | 124        |
| <b>6.4</b> | <b>Change of belt</b>                | <b>127</b> |
| <b>6.5</b> | <b>Oil filling device</b>            | <b>132</b> |
| 6.5.1      | Dismantling/assembly                 | 132        |
| <b>6.6</b> | <b>Water tank</b>                    | <b>133</b> |

---

|             |                                                |            |
|-------------|------------------------------------------------|------------|
| <b>6.7</b>  | <b>Brake</b>                                   | <b>133</b> |
| 6.7.1       | Exploded view                                  | 133        |
| 6.7.2       | Checking of friction element                   | 134        |
| <b>6.8</b>  | <b>Frame feet</b>                              | <b>135</b> |
| 6.8.1       | Mounting of new frame feet                     | 135        |
| <b>7</b>    | <b>Technical reference</b>                     | <b>137</b> |
| <b>7.1</b>  | <b>Product description</b>                     | <b>137</b> |
| <b>7.2</b>  | <b>Declaration</b>                             | <b>138</b> |
| <b>7.3</b>  | <b>Technical data</b>                          | <b>142</b> |
| <b>7.4</b>  | <b>Connection list</b>                         | <b>143</b> |
| <b>7.5</b>  | <b>Basic size drawing</b>                      | <b>145</b> |
| 7.5.1       | Dimensions of connections                      | 146        |
| <b>7.6</b>  | <b>Interface description</b>                   | <b>147</b> |
| 7.6.1       | Scope                                          | 147        |
| 7.6.2       | References                                     | 147        |
| 7.6.3       | Definitions                                    | 147        |
| 7.6.4       | Goal                                           | 148        |
| 7.6.5       | Description of separator modes                 | 148        |
| 7.6.6       | Handling of connection interfaces              | 150        |
| <b>7.7</b>  | <b>Water quality</b>                           | <b>155</b> |
| <b>7.8</b>  | <b>Foundation drawing</b>                      | <b>156</b> |
| <b>7.9</b>  | <b>Interconnection diagram</b>                 | <b>157</b> |
| <b>7.10</b> | <b>Monitoring kit</b>                          | <b>158</b> |
| 7.10.1      | Speed sensor                                   | 159        |
| <b>7.11</b> | <b>PX sealing diagram</b>                      | <b>160</b> |
| <b>7.12</b> | <b>Electric motor</b>                          | <b>161</b> |
| <b>7.13</b> | <b>Performance data, in- and outlet device</b> | <b>162</b> |
| <b>7.14</b> | <b>Power consumption</b>                       | <b>163</b> |
| <b>7.15</b> | <b>Machine plates and safety labels</b>        | <b>164</b> |
| <b>7.16</b> | <b>Storage and Installation</b>                | <b>166</b> |
| 7.16.1      | Introduction                                   | 166        |
| 7.16.2      | Protection and storage of goods                | 167        |
| 7.16.3      | Storage at out of operation                    | 168        |
| 7.16.4      | Before start-up                                | 169        |
| 7.16.5      | Connections to surrounding equipment           | 170        |
| 7.16.6      | Reassembly and Start up                        | 171        |
| 7.16.7      | Storage and transport of goods                 | 171        |
| 7.16.8      | Planning of installation                       | 174        |
| 7.16.9      | Foundations                                    | 176        |

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|          |                                   |            |
|----------|-----------------------------------|------------|
| <b>8</b> | <b>Operating</b>                  | <b>177</b> |
| 8.1      | <b>Operating routine</b>          | <b>177</b> |
| 8.2      | <b>ALCAP operation</b>            | <b>178</b> |
| 8.2.1    | Operating water interface         | 178        |
| 8.3      | <b>Emergency operation</b>        | <b>179</b> |
| 8.3.1    | Operating water interface         | 179        |
| 8.3.2    | Selection of gravity disc         | 180        |
| 8.3.3    | Gravity disc nomogram             | 181        |
| 8.4      | <b>Before first start</b>         | <b>182</b> |
| 8.5      | <b>Start after a service</b>      | <b>184</b> |
| 8.5.1    | Before normal start               | 184        |
| 8.5.2    | Starting and running-up procedure | 186        |
| 8.5.3    | Separation                        | 188        |
| 8.5.4    | Stopping procedure                | 188        |
| 8.5.5    | Safety stop                       | 189        |
| 8.6      | <b>After safety stop</b>          | <b>190</b> |



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

**Not following the instructions can result in serious accidents.**

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



---

# 1 *Read this first*

---

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

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

*In addition to this Separator manual a Spare parts catalogue, SPC is supplied.*

*The Separator manual consists of:*

## **Safety instructions**

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

## **Basic principles of separation**

This chapter describes the purpose of separation and separation principles.

## **Design and function**

This chapter contains a description of the separator.

## **Operating instructions**

This chapter contains operating instructions for the separator only.

## **Service, dismantling, assembly**

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

### **Fault finding**

Refer to this chapter if the separator functions abnormally.

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

### **Technical reference**

This chapter contains Technical data concerning the separator and drawings.

### **Installation**

This chapter contains specifications and recommendations concerning separator installation.

**NOTE**

**A complete reading of this manual by personnel in contact with the machine is essential to safety.**

**Do not allow personnel to clean, assemble, operate or maintain the separator until they have read and fully understood this manual.**

**Ensure that all personnel who operate and service the separator are well-trained and knowledgeable concerning the machine and the work to be carried out.**

## 2 *Safety instructions*



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

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

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

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

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

The following basic safety instructions therefore apply:

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



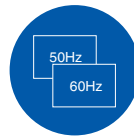
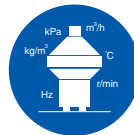
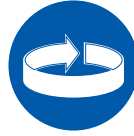
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### Disintegration hazards

- If power cables have been disconnected, always check direction of motor rotation. Incorrect direction rotation can cause vital rotating parts to unscrew.
- This can be done by checking the rotation on the motor fan.
- If excessive vibration occurs, **stop** separator and **keep bowl filled** with liquid during rundown.
- Use the separator only for the purpose and parameter range specified by Alfa Laval.
- Check that the gear/pulley ratio is correct for power frequency used. If incorrect, subsequent overspeed may result in a serious break down.
- Welding or heating of parts that rotate can seriously affect material strength.
- Inspect regularly for **corrosion** and **erosion** damage. Inspect frequently if process or cleaning liquid is corrosive or erosive.



### Fall hazard

- Do **NOT** stand on the separator or separator parts.



### Entrapment hazards

- Make sure that rotating parts have come to a **complete standstill** before accessing parts inside the machine or starting **any** dismantling work. If there is no braking function the run down time can exceed two hours.
- To avoid accidental start, switch off and lock power supply before starting **any** dismantling work. Assemble the machine **completely** before start. **All** covers, connections and guards must be in place.



### Electrical hazard

- Follow local regulations for electrical installation and earthing (grounding).
- Only qualified electricians are allowed to install and maintain the drive.



### Crush hazards

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



### Noise hazards

- Use ear protection in noisy environments.



### Burn hazards

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



**Skin irritation hazards**

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

**Cut hazards**

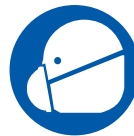
- Sharp edges, especially on bowl discs and threads, can cause cuts. Wear protective gloves.

**Flying objects**

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

**Health hazards**

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





## 2.1 Warning signs in text

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



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



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



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



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



## 2.2 Recycling information

### 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.

### Scrapping

At the end of use, the equipment must be recycled according to relevant local regulations.

Besides the equipment itself, any hazardous residues from the process liquid must be taken into consideration and dealt with in a proper manner. When in doubt, or in the absence of local regulations, please contact your local Alfa Laval sales company.



## 2.3 Requirements of personnel

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

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

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

## 2.4 Remote start

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

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



# 3 *Basic principles of separation*

## 3.1 Introduction

*The purpose of separation can be:*

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

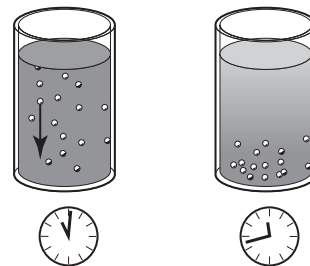
## 3.2 Separation by gravity

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

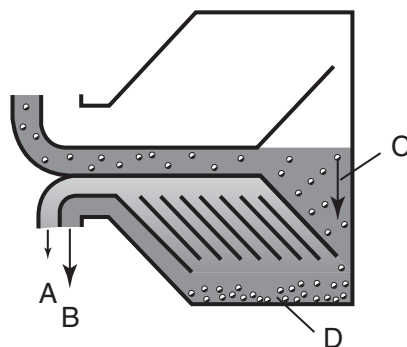
A lighter liquid rises while a heavier liquid and solids sink.

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

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



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

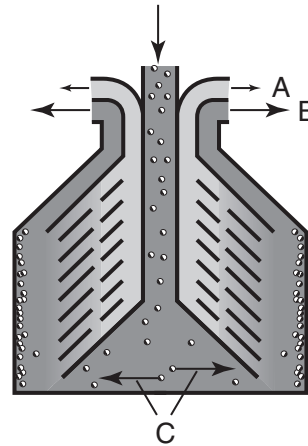
### 3.3 Centrifugal separation

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

Separation and sedimentation is continuous and happens very quickly.

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

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



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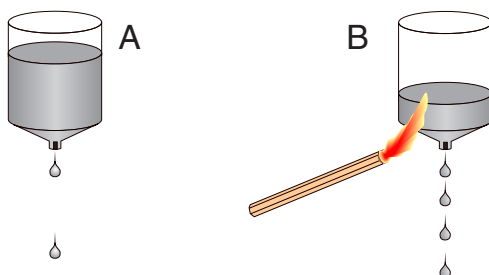
- A. Lighter liquid
- B. Heavier liquid
- C. Centrifugal force

### 3.4 Temperatures

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

#### Viscosity

Viscosity is a fluids resistance against movement. Low viscosity facilitates separation. Viscosity can be reduced by heating.

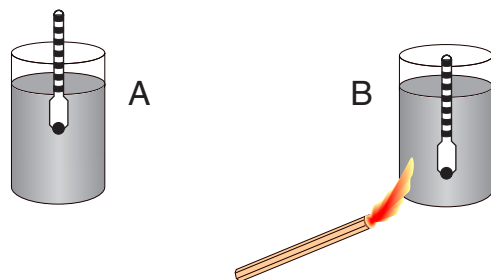


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- A. High viscosity
- B. Low viscosity

#### Density difference

Density is mass per volume unit. The greater the density difference between the two liquids, the easier the separation. The density difference can be increased by heating.



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- A. High density (with low temperature)
- B. Low density (with high temperature)

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# 4 Separator basics

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## 4.1 Design and function

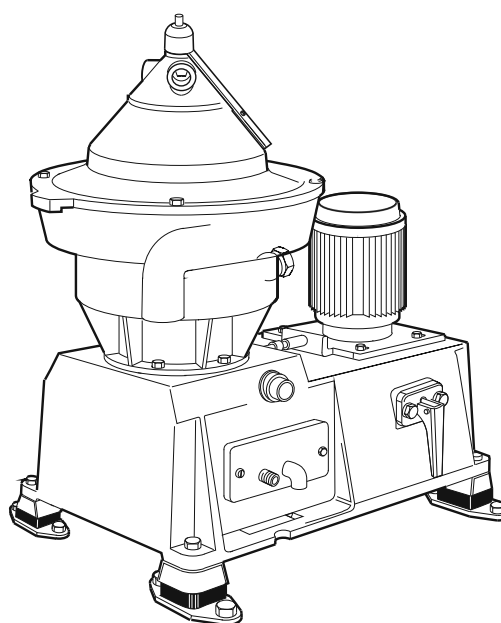
### 4.1.1 Application

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

- Distillate, viscosity 1,5 - 5,5 cSt/40 °C
- Marine diesel oil, viscosity 13 cSt/40 °C
- Intermediate fuel oil and heavy fuel oil (viscosity 30-700 cSt/50 °C)
- Lubricating oil of R & O type, detergent or steam turbine.

The separator is operated as an ALCAP type of separator but can, in Emergency operation, be operated as a purifier.

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



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#### Disintegration hazard

Use the separator only for the purpose and parameters (type of liquid, rotational speed, temperature, density etc.) specified in [chapter 7 Technical reference on page 137](#) and in the Purchase Order documents.

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

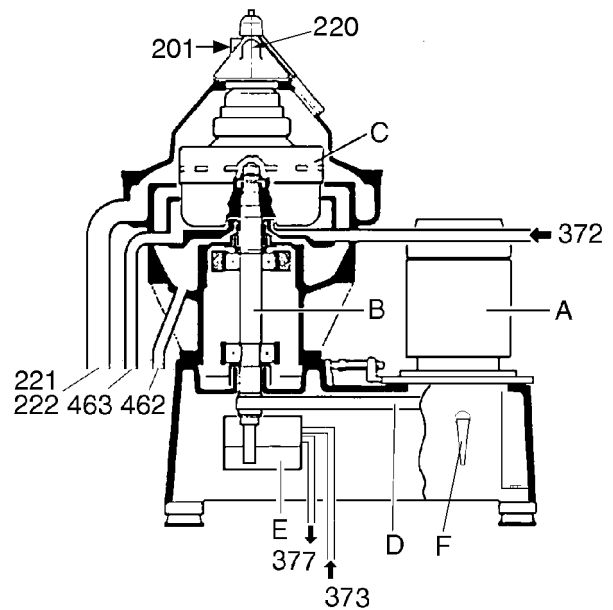
### 4.1.2 Design

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

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

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

The main inlets and outlets are shown with their connection numbers in the illustration. The connections are listed in chapter Technical reference where the basic size drawing also can be found.



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

### 4.1.3 Outline of function

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

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

Permissible pressures and operating conditions are specified in chapter [7 Technical reference on page 137](#).

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

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

### 4.1.4 Separating function

#### **ALCAP<sup>TM</sup> concept**

When the sludge space is filled up and water enters the disc stack, traces of water will escape with the cleaned oil. The increase of water content in the cleaned oil is the sign of reduced separation efficiency. This condition is monitored by the process control system, and water is removed from the bowl until minimal levels are recorded.

## Liquid flow

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

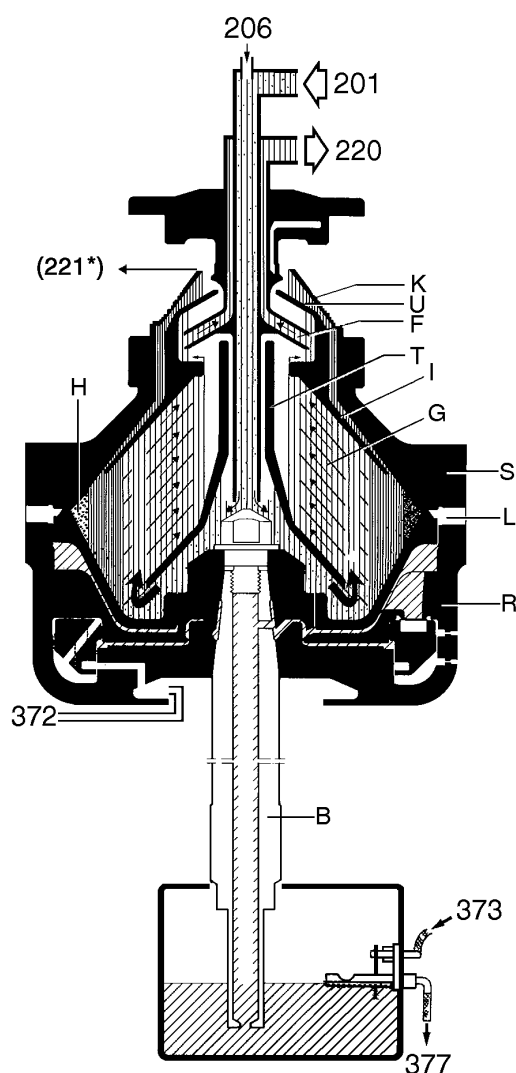
When the unseparated oil reaches the slots of the distributor, it will rise through the channels formed by the disc stack (G) where it is evenly distributed into the disc stack.

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

Separated sludge and water move towards the bowl periphery.

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

In ALCAP mode, a disc (K) seals off the water outlet (221). In this case no water seal is required and consequently there is no oil/water interface in the bowl. The disc is the default disc at delivery. This disc is not shown in the nomograms.



G0112381

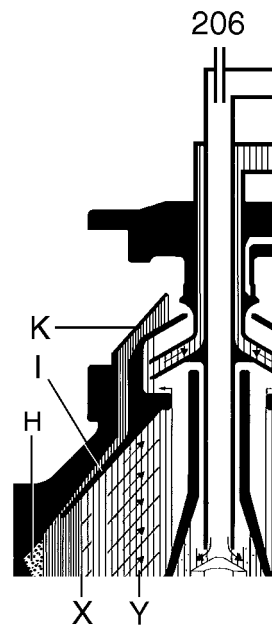
- F. Paring disc
- G. Disc stack
- H. Sludge space
- I. Top disc
- K. Disc
- L. Sludge ports
- R. Bowl body
- S. Bowl hood
- T. Distributor
- U. Paring chamber cover
- 201. Oil inlet
- 206. Water seal and displacement water inlet
- 220. Oil outlet
- 221\*. Water outlet (Only for Emergency operation)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

### Displacement of oil

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

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

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



G0112391

*Principle of liquid seal and displacement water in purification*

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

### 4.1.5 Separating function (emergency operation)

#### NOTE

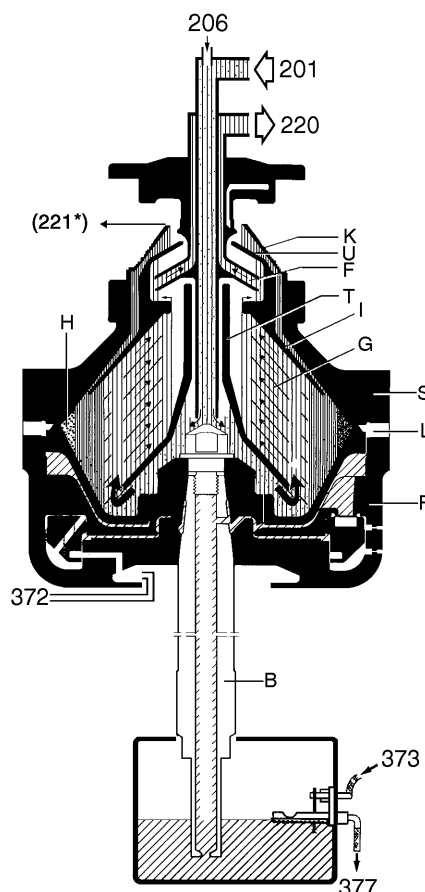
Emergency operation can be applied at e.g. extreme water contamination or when the automatic system is out of function. Although, this mode can only be used for densities below  $991 \text{ kg/m}^3$ .

#### Liquid flow

As in ALCAP mode except:

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

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



G0112381

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

### Water seal in purification

(Emergency operation)

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

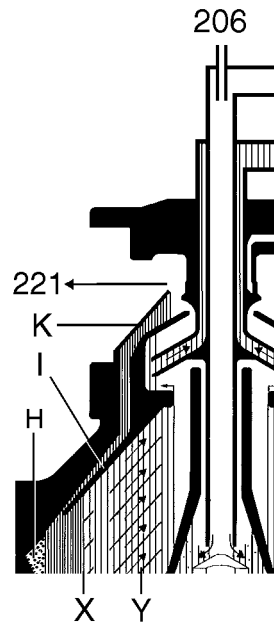
### Gravity disc

(Emergency operation)

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

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

The correct gravity disc is selected from a nomogram, see [8.3.3 Gravity disc nomogram on page 181](#). The sizes of the gravity discs are normally stamped on the discs.



G0112371

*Principle of liquid seal and displacement water in purification*

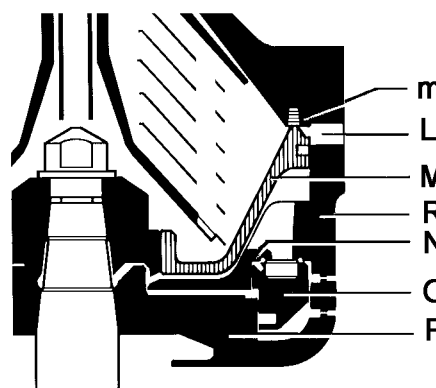
- H. Sludge*
- I. Top disc*
- K. Gravity disc*
- X. Normal interface position*
- Y. Interface position just before discharge*
- 206. Water inlet*
- 221. Water outlet*
- 221. Water outlet (Only in Emergency operation)*

### 4.1.6 Sludge discharge function

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

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

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



G0112411

*Sludge discharge mechanism*

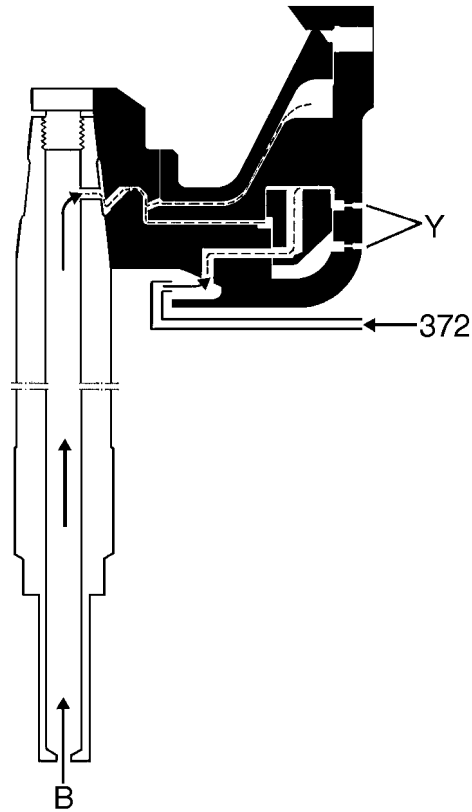
- L. Sludge ports*
- M. Sliding bowl bottom*
- m. Sealing ring*
- N. Upper distributor ring*
- O. Operating slide*
- P. Lower distributor ring*
- R. Bowl body*

### Bowl opening

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

### Bowl closing

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



G0112521

*Supply of opening water and closing water*

*372. Opening water*

*B. Closing and make-up water through bowl spindle*

*Y. Nozzles*

### 4.1.7 Power transmission

#### Bowl spindle

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

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

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

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

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

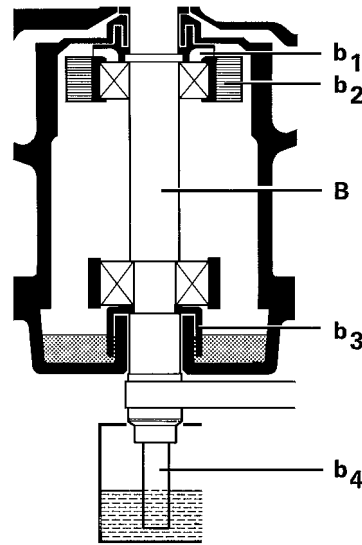
#### Belt drive

The bowl spindle is driven by a flat belt.

Procedure for change of belt will secure a fixed distance between spindle and motor belt pulley.

#### Friction coupling

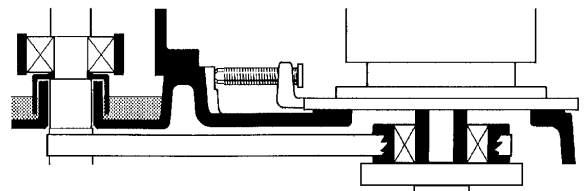
The friction coupling on the motor pulley ensures gentle start-up and prevents overload of the electric motor. Centrifugal force creates a torque that acts on the pulley through the friction elements.



G0112721

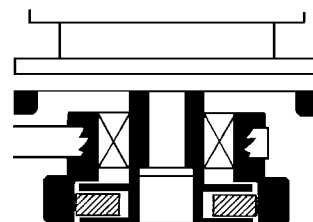
*Bowl spindle assembly*

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



G0112841

*Bowl spindle assembly*



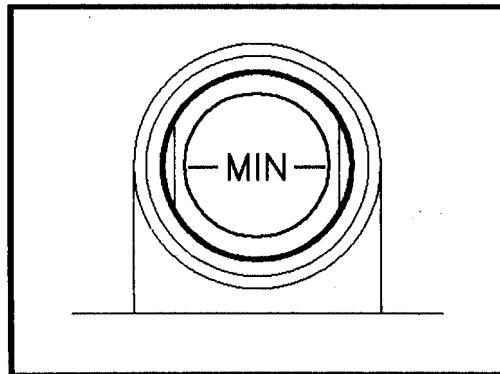
G0112911

*Friction coupling*

### 4.1.8 Sensors and indicators

#### Sight glass

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



*The separator is equipped with a speed sensor. As option, an unbalance sensor can be fitted.*

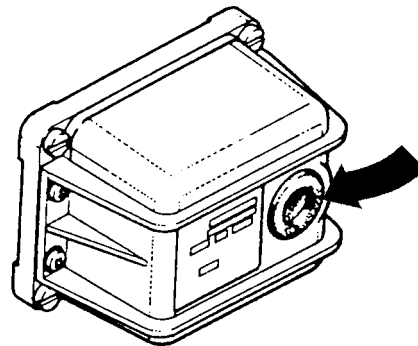
#### Speed sensor

A speed sensor indicates the speed of the separator. The correct speed is needed to achieve the best separating results and for reasons of safety. Refer to type plate for speed particulars.

#### Vibration switch (option)

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

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



G0548421

*Reset push button on vibration switch*

## 4.2 Definitions

|                                  |                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Back pressure</b>             | Pressure in the separator outlet.                                                                                                                                                                                                                                                                                                                                         |
|                                  |                                                                                                                                                                                                                                                                                                                                                                           |
|                                  |                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Counter pressure</b>          | See Back pressure.                                                                                                                                                                                                                                                                                                                                                        |
| <b>Density</b>                   | Mass per volume unit. Expressed in kg/m <sup>3</sup> at a specified temperature, normally at 15 °C                                                                                                                                                                                                                                                                        |
| <b>Disc (ALCAP mode)</b>         | The disc seals off the heavy phase outlet in the bowl, thus no liquid seal exists.                                                                                                                                                                                                                                                                                        |
| <b>Gravity disc</b>              | 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 Emergency operation (purifier mode).                                                                                                                                                                                             |
| <b>Interface</b>                 | Boundary layer between the heavy phase (water) and the light phase (oil) in a separator bowl.                                                                                                                                                                                                                                                                             |
| <b>Intermediate Service (IS)</b> | Overhaul of separator bowl and inlet/outlet. Renewal of seals in bowl and inlet/outlet.                                                                                                                                                                                                                                                                                   |
| <b>Major Service (MS)</b>        | Overhaul of the complete separator, including bottom part (and activities included in an Intermediate Service). Renewal of seals and bearings in bottom part.                                                                                                                                                                                                             |
| <b>Phase</b>                     | Light phase: the lighter liquid separated, e.g. oil.<br>Heavy phase: the heavier liquid separated, e.g. water.                                                                                                                                                                                                                                                            |
| <b>Purification</b>              | Liquid/liquid/solids separation with the intention of separating two intermixed and mutually insoluble liquid phases of different densities. Solids having a higher density than the liquids can be removed at the same time. The lighter liquid phase, which is the major part of the mixture, shall be purified as far as possible.<br><br>Only at emergency operation. |
| <b>Sediment (sludge)</b>         | Solids separated from a liquid                                                                                                                                                                                                                                                                                                                                            |
| <b>Sludge discharge</b>          | Ejection of sludge from the separator bowl.                                                                                                                                                                                                                                                                                                                               |
| <b>Throughput</b>                | The feed of process liquid to the separator per time unit. Expressed in m <sup>3</sup> /hour or litres/hour.                                                                                                                                                                                                                                                              |
| <b>Viscosity</b>                 | Fluid resistance against movement. Normally expressed in centistoke (cSt = mm <sup>2</sup> /s), at a specified temperature.                                                                                                                                                                                                                                               |
| <b>Water seal</b>                | 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.                                                                                                                                                                                                          |



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# 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 logs are shown on the following pages in order to facilitate periodic maintenance.



#### **Disintegration hazards**

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

### 5.1.2 Maintenance intervals

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

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

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

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

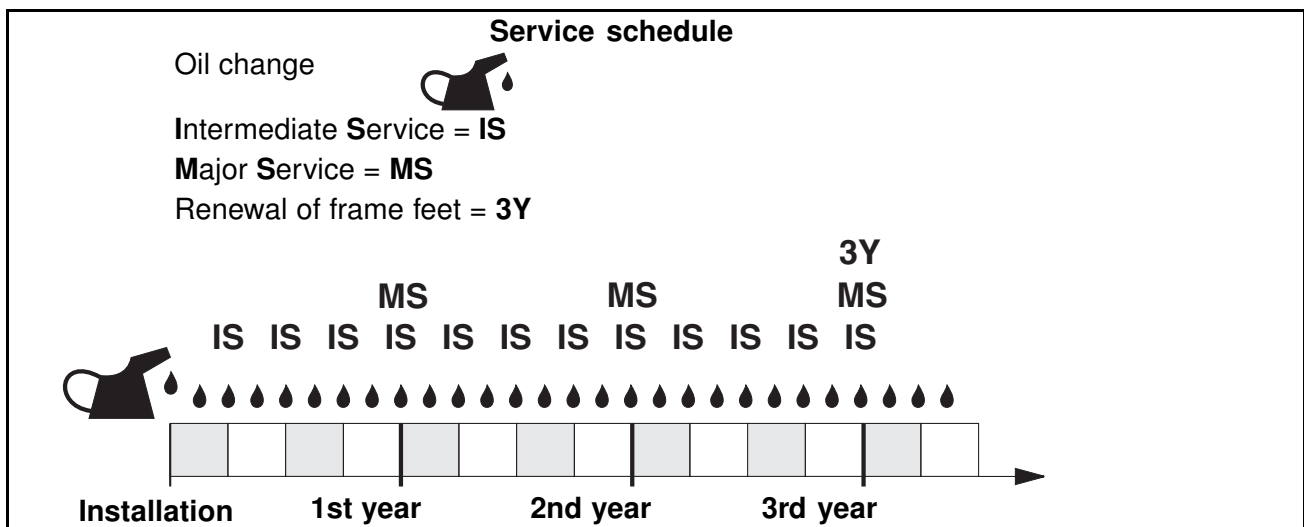
Time of operation between oil changes can be extended from the normal 1500 hours to 2000 hours if a synthetic oil of group D is used.

In seasonal operation change the oil before a new period.

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

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

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



## Other

Check and prelubricate spindle bearings of separators which have been out of service for 6 months or longer. Also see [5.11.2 Before shut-downs on page 76](#).

### NOTE

#### Do not interchange bowl parts!

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

### 5.1.3 Maintenance procedure

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

1. Dismantle the parts as mentioned in the service log and described in [6 Dismantling & Assembly on page 77](#). Place the separator parts on clean, soft surfaces such as pallets.
2. Inspect and clean the dismantled separator parts according to the service log.
3. Fit all the parts delivered in the service kit while assembling the separator as described in [6 Dismantling & Assembly on page 77](#). The assembly instructions have references to check points which should be carried out during the assembly.

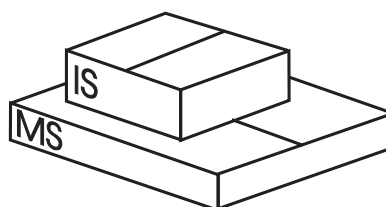
### 5.1.4 Service kits

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

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

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

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



*Spare parts kits are available for Intermediate Service and Major Service*

#### NOTE

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

## 5.2 Maintenance Logs

### 5.2.1 Daily checks

The following steps should be carried out daily.

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

### 5.2.2 Oil change - monthly

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

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

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

See chapter [5.9 Lubricants on page 64](#) for further information on oil brands etc.

| Main component and activity          | Part            | Page                | Notes |
|--------------------------------------|-----------------|---------------------|-------|
| <b>Bowl spindle and transmission</b> |                 |                     |       |
| Check                                | Belt tension    | <a href="#">130</a> |       |
| Change                               | Oil in oil sump | <a href="#">62</a>  |       |

### 5.2.3 Intermediate Service (IS)

Name of plant:

Local identification:

Separator:

Manufacture No./Year:

Total running hours:

Product No:

Date:

Signature:

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

| Main component and activity          | Part                                 | Page | Notes |
|--------------------------------------|--------------------------------------|------|-------|
| <b>Inlet and outlet, frame</b>       |                                      |      |       |
| Clean and inspect                    | Threads of inlet pipe                | 49   |       |
|                                      | Paring disc                          | 49   |       |
|                                      | Housing and frame hood               | -    |       |
| <b>Separator bowl</b>                |                                      |      |       |
| Clean and inspect                    | Bowl hood                            | 46   |       |
|                                      | Top disc                             |      |       |
|                                      | Bowl discs                           | 61   |       |
|                                      | Distributor                          |      |       |
|                                      | Sliding bowl bottom                  | 46   |       |
|                                      | Discharge mechanism                  | 46   |       |
|                                      | Threads on bowl hood and bowl body   | 50   |       |
|                                      | Bowl spindle cone and bowl body nave | 49   |       |
|                                      | Corrosion                            | 42   |       |
|                                      | Cracks                               | 45   |       |
|                                      | Erosion                              | 44   |       |
|                                      | Galling of guide surface             | 50   |       |
|                                      | Disc stack pressure                  | 52   |       |
| <b>Power transmission</b>            |                                      |      |       |
| Check                                | Belt and belt tension                | 130  |       |
| Change                               | Oil in oil sump                      | 62   |       |
| <b>Electrical motor</b>              |                                      |      |       |
| Lubrication (if nipples are fitted)  | See sign on motor                    |      |       |
| <b>Signs and labels on separator</b> |                                      |      |       |
| Check attachment and legibility      | Safety label on hood                 | 164  |       |
|                                      | Other plates and labels              |      |       |

### 5.2.4 Major service (MS)

Name of plant:

Separator:

Total running hours:

Date:

Local identification:

Manufacture No./Year:

Product No:

Signature:

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

| Main component and activity                                                                 | Part                                 | Page | Notes |
|---------------------------------------------------------------------------------------------|--------------------------------------|------|-------|
| <b>Inlet and outlet, frame</b><br>Clean and inspect                                         | Threads of inlet pipe                | 49   |       |
|                                                                                             | Paring disc                          | 49   |       |
|                                                                                             | Housing and frame hood               | -    |       |
|                                                                                             |                                      |      |       |
| <b>Separator bowl</b><br>Clean and inspect<br><br><br><br><br><br><br><br><br><br><br>Check | Bowl hood                            | 46   |       |
|                                                                                             | Top disc                             |      |       |
|                                                                                             | Bowl discs                           | 61   |       |
|                                                                                             | Distributor                          |      |       |
|                                                                                             | Nozzles in bowl body                 |      |       |
|                                                                                             | Sliding bowl bottom                  | 46   |       |
|                                                                                             | Discharge mechanism                  | 46   |       |
|                                                                                             | Threads on bowl hood and bowl body   | 50   |       |
|                                                                                             | Bowl spindle cone and bowl body nave | 49   |       |
|                                                                                             | Corrosion                            | 42   |       |
|                                                                                             | Cracks                               | 45   |       |
|                                                                                             | Erosion                              | 44   |       |
|                                                                                             | Galling of guide surface             | 50   |       |
|                                                                                             | Height of paring disc                | 53   |       |
|                                                                                             | Disc stack pressure                  | 52   |       |

| Main component and activity          | Part                              | Page | Notes |
|--------------------------------------|-----------------------------------|------|-------|
| <b>Vertical driving device</b>       |                                   |      |       |
| Clean and inspect                    | Oil mist fan                      | 106  |       |
|                                      | Oil pump                          | 106  |       |
|                                      | Water tank                        | 133  |       |
|                                      | Pump sleeve                       |      |       |
|                                      | Bowl spindle                      | 101  |       |
|                                      | Ball bearing housing indentations | 101  |       |
| Check                                | Radial wobble of bowl spindle     | 54   |       |
| <b>Oil sump</b>                      |                                   |      |       |
| Clean                                | Oil sump                          | 62   |       |
| Change                               | Oil                               | 62   |       |
| Clean and inspect                    | Oil filling device                | 132  |       |
| <b>Friction coupling</b>             |                                   |      |       |
| Clean and inspect                    | Friction coupling                 | 119  |       |
| <b>Electrical motor</b>              |                                   |      |       |
| Replace                              | Bearings*                         |      |       |
| <b>Signs and labels on separator</b> |                                   |      |       |
| Check attachment and legibility      | Safety label on hood              | 164  |       |
|                                      | Other signs and labels            | -    |       |

\* See manufacturer's instructions.

## 5.3 Check points at Intermediate Service

### 5.3.1 Corrosion

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



#### **Disintegration hazard**

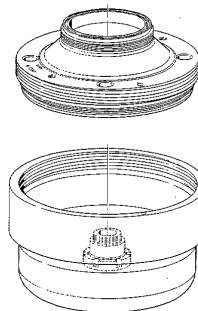
**Inspect regularly for corrosion damage. Inspect frequently if the process liquid is corrosive.**

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

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

#### **Non-stainless steel and cast iron parts**

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



G0172111

*Main bowl parts to check for corrosion*

### Stainless steel

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

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

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

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



#### Disintegration hazard

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

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

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

### 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.



*Example of chloride corrosion in stainless steel*



*Polish corrosion marks to prevent further damage*

### 5.3.2 Erosion

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



#### Disintegration hazard

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

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

Erosion is characterized by:

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

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

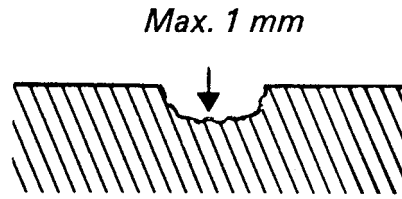


#### Disintegration hazard

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

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

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



G0205221

*Max. permitted erosion*

### 5.3.3 Cracks

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

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

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



#### **Disintegration hazard**

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

**Always replace a part if cracks are present.**

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

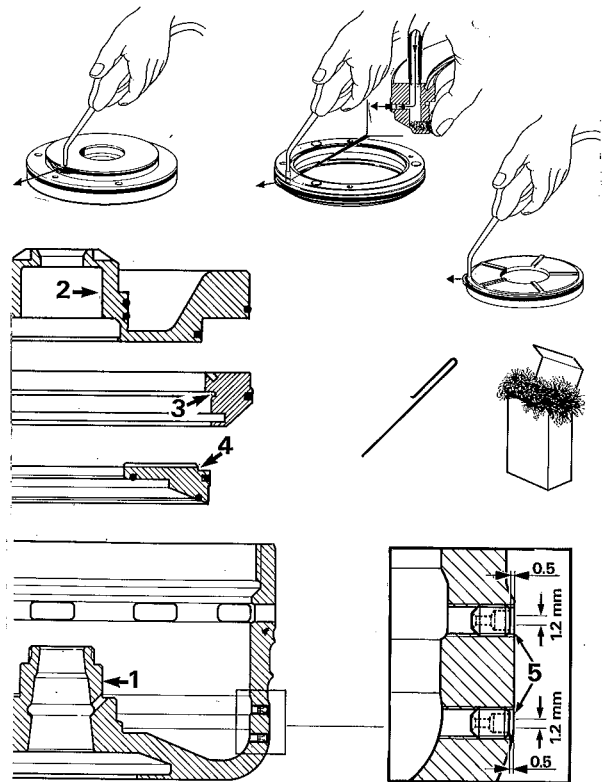
Always contact your Alfa Laval representative if you suspect that the largest depth of the damage exceeds 1,0 mm. Do not continue to use the separator until it has been inspected and cleared for operation by Alfa Laval.

### 5.3.4 Discharge mechanism

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

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

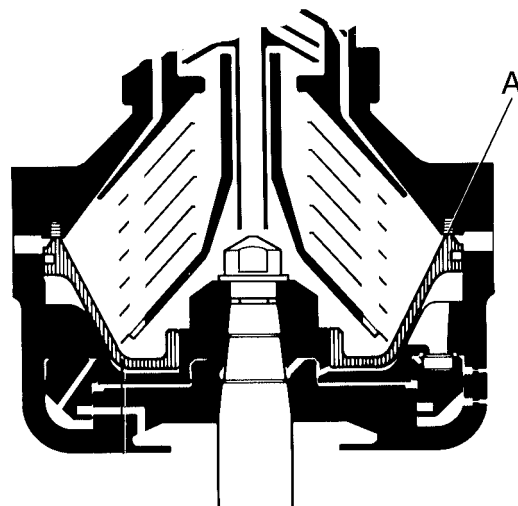
Use Loctite 242 on the threads if the nozzles have been removed or replaced.



G0121511

### 5.3.5 Bowl hood and sliding bowl bottom

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



G0071031

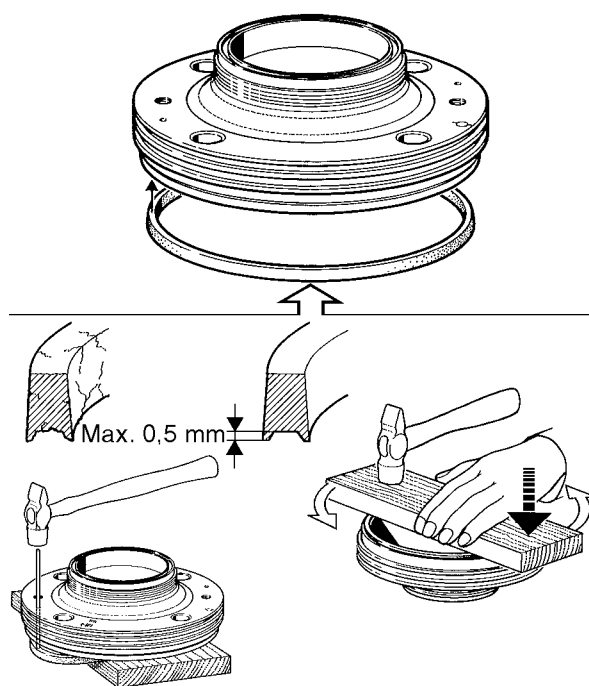
*A Sealing surface in the bowl between bowl hood and sliding bowl bottom.*

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

**NOTE**

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

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

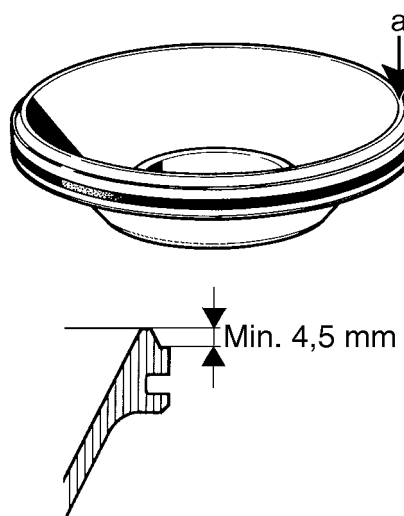


G0071121

*Exchange of seal ring in bowl hood.*

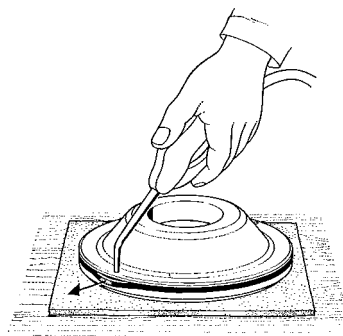
Check the sealing edge (a) of the sliding bowl bottom.

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



G0071221

*Sealing edge on sliding bowl bottom*



G0071231

*Removal of seal ring on sliding bowl bottom.*

### 5.3.6 Spindle top cone and bowl body nave

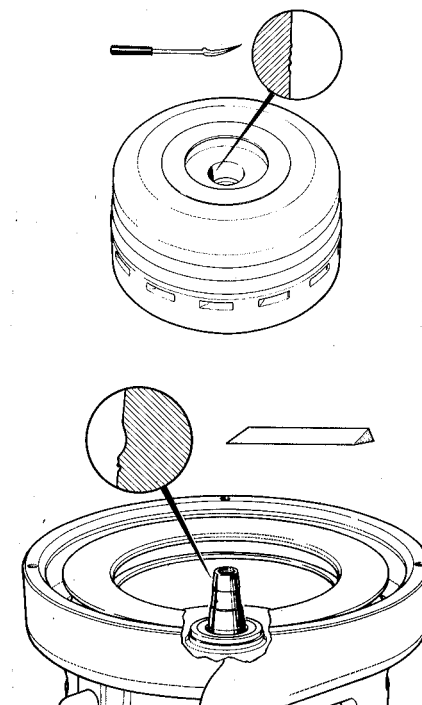
Impact marks on the spindle cone or in the bowl body nave may cause the separator to vibrate while running.

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

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

#### NOTE

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



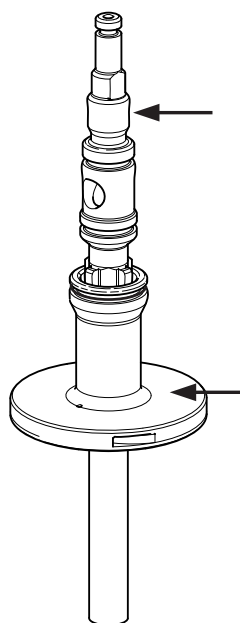
G0071611

*Use whetstone or scraper with great care*

### 5.3.7 Threads of inlet pipe, paring disc

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

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



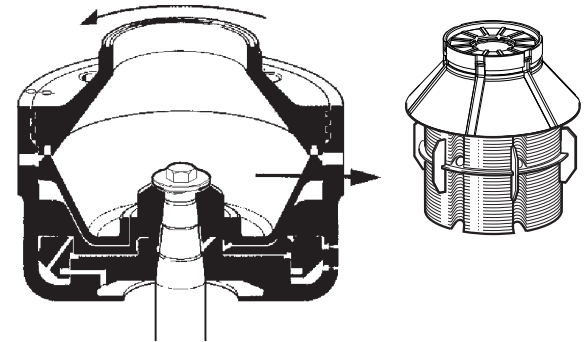
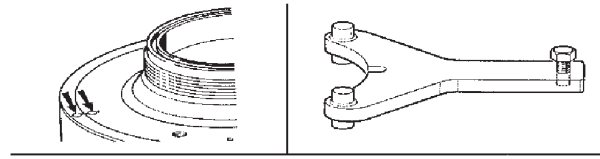
G0113041

### 5.3.8 Threads on bowl hood and bowl body

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

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

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



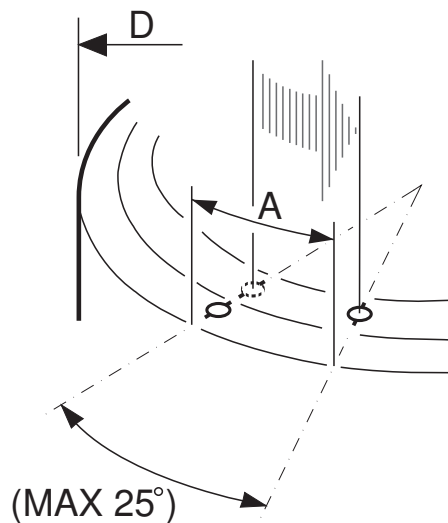
G0071391

#### Wear

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

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

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



G0578111



#### Disintegration hazards

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

### Damage

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

Examine for burrs and protrusions caused by impact.

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

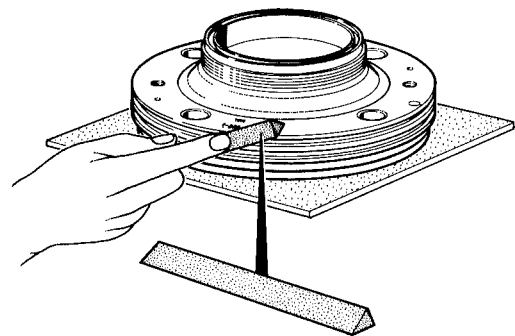
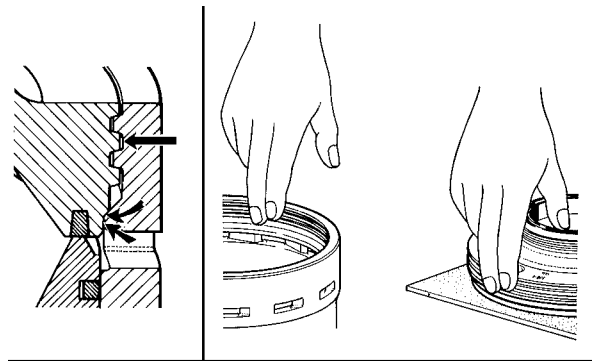


### Cut hazard

The threads have sharp edges which can cause cuts.

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

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



G0071511

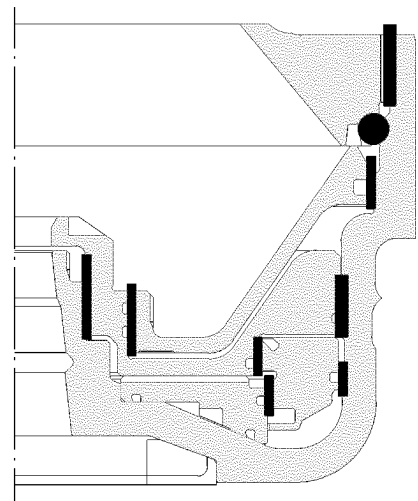
*Contact surfaces to inspect on the bowl*

## 5.3.9 Priming of bowl parts

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

Before assembly:

1. These surfaces should be sprayed with Molykote after a careful cleaning.
2. Air cure for 15 minutes.
3. Polish to an even, homogenous surface.
4. Spray a second time.
5. Air cure for 15 minutes.
6. Polish to a shiny surface, the surface should look like well polished leather when properly done.
7. Finish the treatment by lubricating the surfaces with lubricating paste see [5.9.2 Recommended lubricants on page 65](#).



G0687731

### 5.3.10 Disc stack pressure

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

#### NOTE

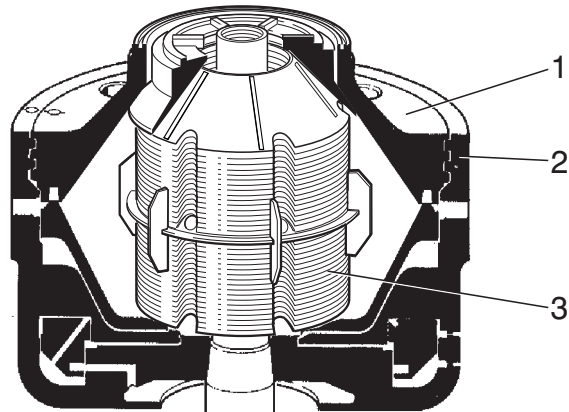
Insufficient pressure in the disc stack may affect the bowl balance, which in turn will cause abnormal vibration of the separator and shorten the life of ball bearings.

1. Place the bowl hood\* on the top of the disc stack and tighten it by hand. The assembly mark on the bowl hood should now be positioned at the angle  $a$  (see illustration),  $30^\circ - 60^\circ$  ahead of the corresponding mark on the bowl body.  
\* Also see [5.3.8 Threads on bowl hood and bowl body on page 50](#).
2. If the bowl hood can be tightened by hand without resistance until the marks are in line with each other, an extra disc must be added to the top of the disc stack beneath the top disc

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

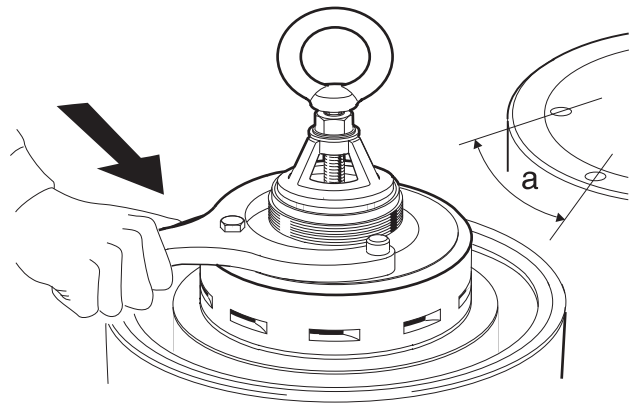
#### NOTE

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



G0071961

1. Bowl hood
  2. Bowl body
  3. Disc stack
- below wing insert: 39  
- above wing insert: at least 38



G0357651

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

## 5.4 Check points at Major Service

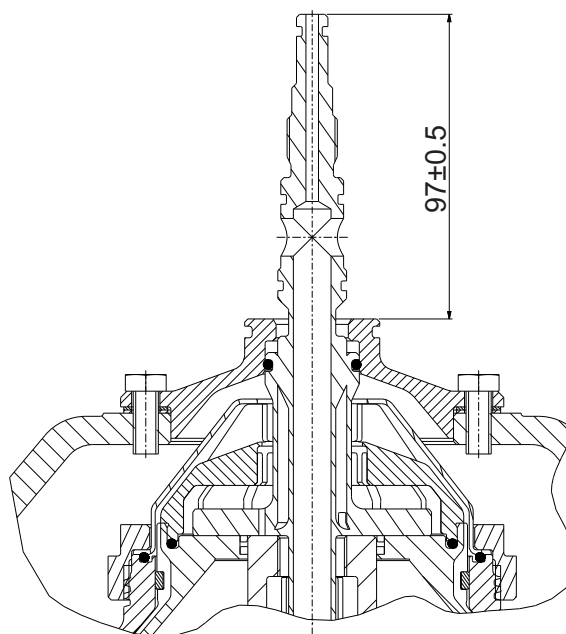
### 5.4.1 Paring disc height adjustment

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

#### NOTE

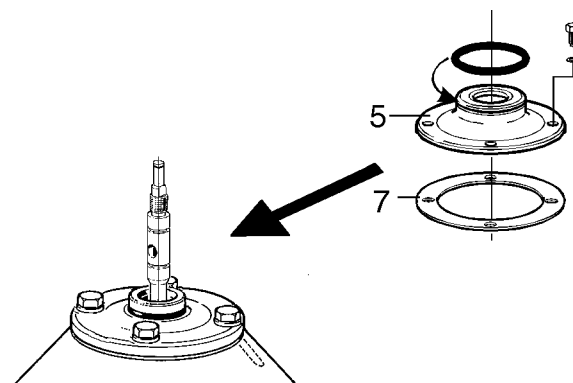
Incorrect height position can cause the paring disc (14) to scrape against the paring chamber cover.

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



G0883931

1. Assemble the bowl and frame hood as described in [6.1.2 Inlet/outlet and bowl - assembly on page 90](#).
2. Measure the distance according to the illustration above. Adjust the distance by adding or removing height adjusting rings (7).
3. Fit the support ring (5). Tighten screws with 29 Nm.

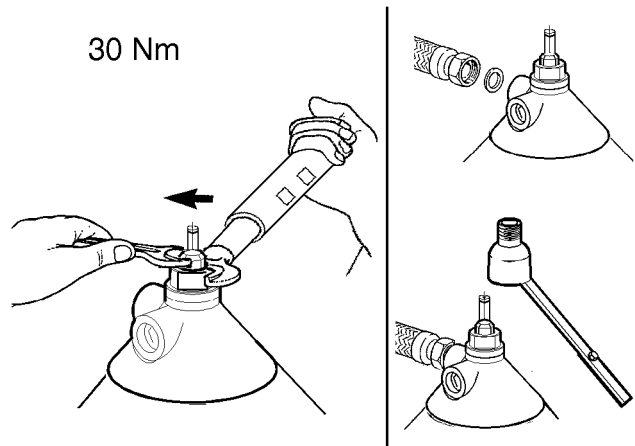


G00729A1

4. Fit the inlet/outlet housing. Tighten the nut with 30 Nm.

### Left-hand thread!

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



G0172951

### 5.4.2 Radial wobble of bowl spindle

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

#### NOTE

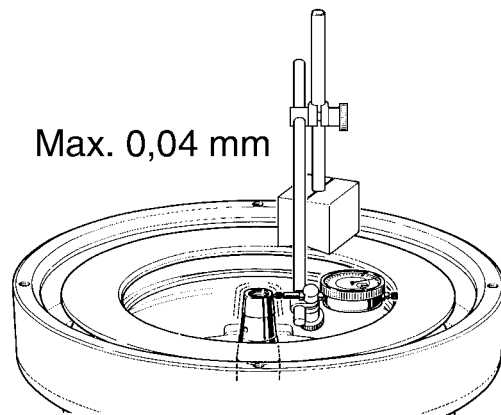
**Spindle wobble will cause rough bowl run. This leads to vibration and reduces lifetime of ball bearings.**

Check the wobble before removing the bowl spindle.

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

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

Max. 0,04 mm



G0121211

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

## 5.5 3-year service

### **Exchange of frame feet**

See [6.8.1 Mounting of new frame feet on page 135](#).

### **Friction coupling**

Exchange of ball bearings, see [6.3 Friction coupling on page 119](#).

### **Frame intermediate part**

Replace O-ring and gasket, see [6.2.2 Bowl spindle and frame - assembly on page 109](#).

## 5.6 Lifting instructions

1. Remove the inlet/outlet housings, the frame hood and the bowl according to the instructions in [6.1.1 Inlet/outlet and bowl - dismantling on page 84](#).

### NOTE

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

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

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

2. Disconnect the motor cables.
3. Tighten the frame hood.
4. Fit the lifting eyes. The two eyebolts must be fitted in the holes nearest to the electric motor.



### Crush hazards

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

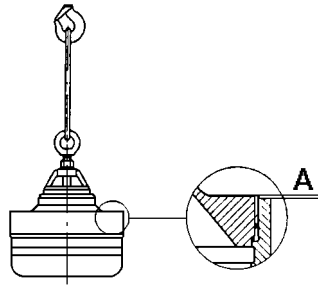
5. Use two endless slings to lift the separator. Length of each sling: minimum 1,5 metres. Thread the slings through the lifting eyes and fit them to the hook of the hoist.

### NOTE

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

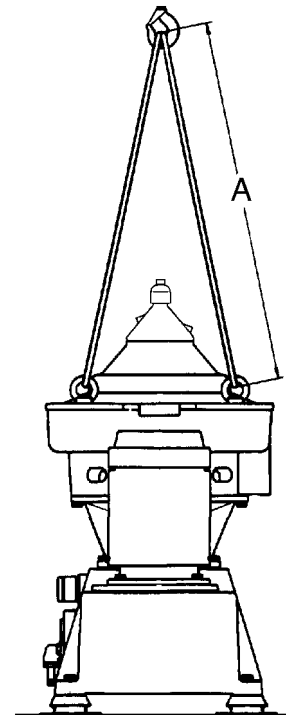
**Bowl:** Use lifting slings for WLL 100 kg

**Never lift the separator in any other way.**



G0507121

$A < 2 \text{ mm}$



G0820621

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

6. Unscrew the foundation bolts.
7. When lifting and moving the separator, obey normal safety precautions for lifting large heavy objects.

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

8. Remove the lifting eyes afterwards.

## 5.7 Cleaning

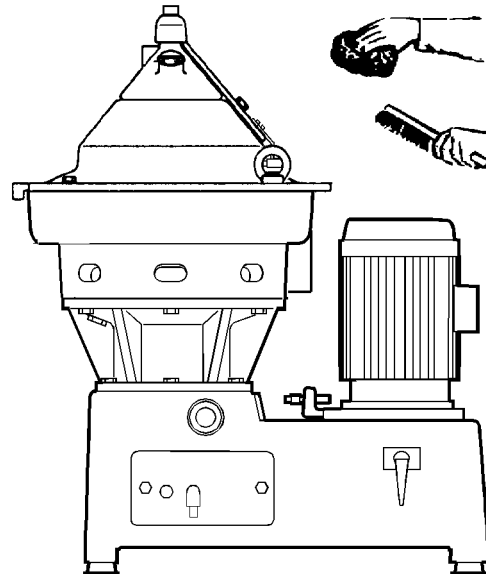
### External cleaning

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

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

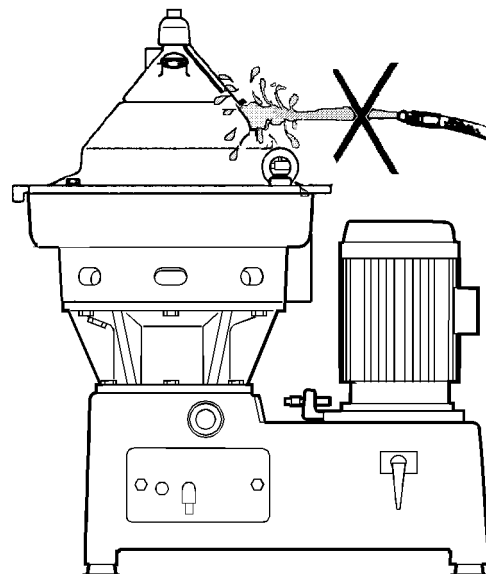
- Many operators believe that these motors are sealed, and normally they are not.
- A water jet played on these motors will produce an internal vacuum, which will suck the water between the metal-to-metal contact surfaces into the windings, and this water cannot escape.
- Water directed on a hot motor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

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



G0615361

*Use a brush and a sponge or cloth when cleaning.*



G0613661

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

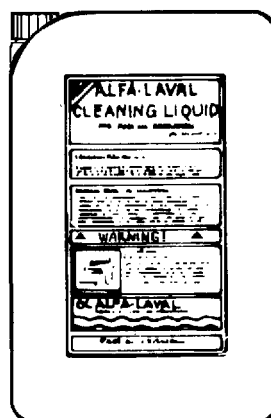
### 5.7.1 Cleaning agents

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

#### For separator bowl, inlet and outlet

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

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



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



#### Skin irritation hazard

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

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

#### For operating mechanism

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

#### For parts of the driving devices

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

### **Oiling (protect surfaces against corrosion)**

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

## 5.7.2 Cleaning of bowl discs

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



### Cut hazard

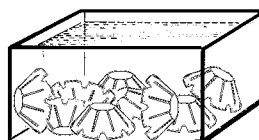
Sharp edges on the separator discs may cause cuts.



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

A gentle chemical cleaning is therefore preferable to mechanical cleaning.

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



g0065831

*Put the discs one by one into the cleaning agent*

2. Let the discs remain in the cleaning agent until the deposits have been dissolved. This will normally take between two and four hours.
3. Finally clean the discs with a **soft** brush.



g0065841

*Clean the discs with a soft brush*

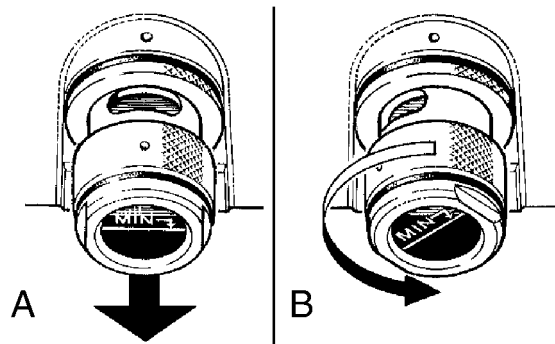
## 5.8 Oil change

### 5.8.1 Oil change procedure

#### NOTE

Before adding or renewing lubricating oil in the oil sump, the information concerning different oil groups, handling of oils, oil change intervals etc. given in chapter 5.9 Lubricants on page 64 must be well known.

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



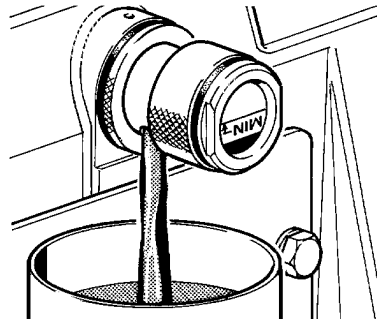
G0068911

3. Collect the oil in the vessel.



#### Burn hazards

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

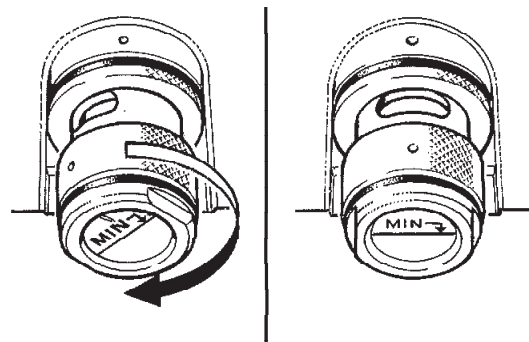


G0173811

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

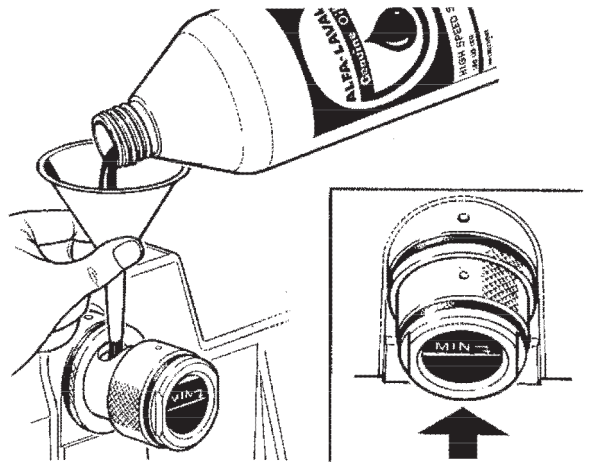
#### NOTE

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



G0069111

5. Fill the oil sump in the frame housing with new oil. The oil level should be slightly above middle of the sight glass. Information on volume see [7.3 Technical data on page 142](#).
6. Push in the oil filling device.



G0069211

## 5.9 Lubricants

### 5.9.1 Lubrication chart, general

Alfa Laval ref. 553216 01 Rev. 9



Check the oil level before start, top up when necessary and do not overfill.



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

#### Lubrication chart

| Lubricating point                                                                      | Lubrication                                                                                                                                                                    | Interval                                                                         |
|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| The oil bath.<br>Bowl spindle bearings are lubricated by oil splash from the oil bath. | Lubricate with oil.<br>For information on type of lubricant see <i>Recommended lubricating oils</i> .<br>For information on lubricating oil volume see <i>Technical data</i> . | For information on oil change interval see <i>Recommended lubricating oils</i> . |
| Bowl spindle taper.                                                                    | Lubricate with oil.<br>Only a few drops for rust protection.                                                                                                                   | At assembly.                                                                     |
| Bowl: Sliding contact surfaces, thread of lock nut and cap nut.                        | Lubricate with paste.<br>For information on pastes see <i>Recommended lubricants</i> .                                                                                         | At assembly.                                                                     |
| Rubber seal rings.                                                                     | Lubricate with grease.<br>For information on grease see <i>Recommended lubricants</i> .                                                                                        | At assembly.                                                                     |
| Friction coupling ball bearings.<br>Not valid for rigid coupling.                      | The bearings are sealed and packed with grease and need no extra lubrication.                                                                                                  | —                                                                                |
| Electric motor.                                                                        | Follow manufacturer's instructions.                                                                                                                                            | Follow manufacturer's instructions.                                              |
| Threads.                                                                               | Lubricate with oil, if not otherwise stated.                                                                                                                                   | At assembly.                                                                     |

## 5.9.2 Recommended lubricants

### Lubricant recommendation for hygienic and non-hygienic applications

Alfa Laval ref. 553217 01 Rev. 14

Lubricants with an Alfa Laval part number are approved and recommended for use.

The data in the tables below is based on supplier information.

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

#### Paste for assembly of metallic parts, non-hygienic applications

| Part no   | Quantity | Designation                 | Manufacturer    | Remark |
|-----------|----------|-----------------------------|-----------------|--------|
| 537086-02 | 1000 g   | Molykote 1000 Paste         | Dow Corning     | -      |
| 537086-03 | 100 g    | Molykote G-n plus Paste     | Dow Corning     | -      |
| 537086-06 | 50 g     |                             |                 |        |
| 537086-04 | 50 g     | Molykote G-rapid plus Paste | Dow Corning     | -      |
| -         | -        | Gleitmo 705                 | Fuchs Lubritech | -      |
| -         | -        | Wolfracoat C Paste          | Klüber          | -      |
| -         | -        | Dry Moly Paste              | Rocol           | -      |
| -         | -        | MTLM                        | Rocol           | -      |

#### Bonded coating for assembly of metallic parts, non-hygienic applications

| Part no   | Quantity | Designation          | Manufacturer    | Remark           |
|-----------|----------|----------------------|-----------------|------------------|
| 535586-01 | 375 g    | Molykote D321R Spray | Dow Corning     | -                |
| -         | -        | Gleitmo 900          | Fuchs Lubritech | Varnish or spray |

**Paste for assembly of metallic parts, hygienic applications (NSF registered H1 is preferred)**

| Part no   | Quantity | Designation            | Manufacturer    | Remark                                                               |
|-----------|----------|------------------------|-----------------|----------------------------------------------------------------------|
| -         | -        | Molykote D paste       | Dow Corning     | -                                                                    |
| 537086-07 | 50 g     | Molykote P-1900        | Dow Corning     | NSF Registered H1 (22 Jan 2004)                                      |
| -         | -        | Molykote TP 42         | Dow Corning     | -                                                                    |
| 561764-01 | 50 g     | Geralyn 2              | Fuchs Lubritech | NSF Registered H1 (3 Sep 2004)                                       |
| -         | -        | Geralyn F.L.A.         | Fuchs Lubritech | NSF Registered H1 (2 April 2007). German § 5 Absatz 1 LMBG approved. |
| 554336-01 | 55 g     | Gleitmo 1809           | Fuchs Lubritech | -                                                                    |
| -         | -        | Gleitmo 805            | Fuchs Lubritech | DVGW (KTW) approval for drinking water (TZW prüfzeugnis)             |
| -         | -        | Klüberpaste 46 MR 401  | Klüber          | White, contains no lead, cadmium, nickel, sulphur nor halogens.      |
| -         | -        | Klüberpaste UH1 84-201 | Klüber          | NSF Registered H1 (26 Aug 2005)                                      |
| -         | -        | Klüberpaste UH1 96-402 | Klüber          | NSF Registered H1 (25 Feb 2004)                                      |
| -         | -        | 252                    | OKS             | NSF Registered H1 (23 July 2004)                                     |
| -         | -        | Foodlube Multi Paste   | Rocol           | NSF Registered H1 (13 April 2001)                                    |

**Silicone grease/oil for rubber rings, hygienic and non-hygienic applications**

| Part no   | Quantity | Designation                       | Manufacturer    | Remark                                                                                                                                                                                                                 |
|-----------|----------|-----------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -         | -        | No-Tox Food Grade Silicone grease | Bel-Ray         | NSF Registered H1 (16 December 2011)                                                                                                                                                                                   |
|           |          | Dow Corning 360 Medical Fluid     | Dow Corning     | Tested according to and complies with all National Formulary (NF) requirements for Dimethicone and European Pharmacopeia (EP) requirements for Dimeticone or Silicone Oil Used as a Lubricant, depending on viscosity. |
| 569415-01 | 50 g     | Molykote G 5032                   | Dow Corning     | NSF Registered H1 (3 June 2005)                                                                                                                                                                                        |
| -         | -        | Geralyn SG MD 2                   | Fuchs Lubritech | NSF Registered H1 (30 March 2007)                                                                                                                                                                                      |
| -         | -        | Chemplex 750                      | Fuchs Lubritech | DVGW approved according to the German KTW-recommendations for drinking water.                                                                                                                                          |
| -         | -        | Paraliq GTE 703                   | Klüber          | NSF Registered H1 (25 Feb 2004). Approved according to WRAS.                                                                                                                                                           |
| -         | -        | Unisilikon L 250 L                | Klüber          | Complies with German Environmental Agency on hygiene requirements for tap water. Certified by DVGW-KTW, WRAS, AS4020, ACS.                                                                                             |
| -         | -        | ALCO 220                          | MMCC            | NSF Registered H1 (25 March 2002)                                                                                                                                                                                      |
| -         | -        | Foodlube Hi-Temp                  | Rocol           | NSF Registered H1 (18 April 2001)                                                                                                                                                                                      |

Always follow the lubrication recommendations of the bearing manufacturer.

### Grease for ball and roller bearings in electric motors

| Part no | Quantity | Designation       | Manufacturer        | Remark                          |
|---------|----------|-------------------|---------------------|---------------------------------|
| -       | -        | Energrease LS2    | BP                  | -                               |
| -       | -        | Energrease LS-EP2 | BP                  | -                               |
| -       | -        | Energrease MP-MG2 | BP                  | -                               |
| -       | -        | APS 2             | Castrol             | -                               |
| -       | -        | Spheerol EPL 2    | Castrol             | -                               |
| -       | -        | Multifak EP2      | Chevron             | -                               |
| -       | -        | Multifak AFB 2    | Chevron             | -                               |
| -       | -        | Molykote G-0101   | Dow Corning         | -                               |
| -       | -        | Molykote Multilub | Dow Corning         | -                               |
| -       | -        | Unirex N2         | ExxonMobil          | -                               |
| -       | -        | Mobilith SHC 460  | ExxonMobil          | -                               |
| -       | -        | Mobilux EP2       | ExxonMobil          | -                               |
| -       | -        | Lagermeister EP2  | Fuchs Lubritech     | -                               |
| -       | -        | Rembrandt EP2     | Q8/Kuwait Petroleum | -                               |
| -       | -        | Alvania EP2       | Shell               | -                               |
| -       | -        | LGEP 2            | SKF                 | -                               |
| -       | -        | LGMT 2            | SKF                 | -                               |
| -       | -        | LGFP 2            | SKF                 | NSF Registered H1 (17 Aug 2007) |
| -       | -        | Multis EP2        | Total               | -                               |

### 5.9.3 Recommended lubricating oils

Alfa Laval ref. 553219 09 Rev. 4

#### Selection of lubricating oil for belt drive HSS

Select lubricating oil type with regards to ambient temperature.

| Ambient temperature (°C) | Frame temp and cooling | Oil type (see Recommended oil brands)                                                                                                                                                                                                                                                  | Oil change interval (operating hours) |
|--------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| +5 to +45                | N/A                    | Mineral lubricating oil AL 116 3157<br>ISO-L-HM 150<br>Viscosity grade: VG150<br>Viscosity index: VI > 90<br>Alfa Laval oil types:<br>Art no 546098-81 4 litre<br>Art no 546098-83 1 litre                                                                                             | 1500                                  |
| +2 to +65                | N/A                    | Synthetic lubricating oil<br>AL 116 3146<br>ISO-L-CTPR 220<br>Viscosity grade: VG220<br>Viscosity index: VI > 140<br>Alfa Laval oil types:<br>Art no 542690-80 20 litre<br>Art no 542690-81 4 litre                                                                                    | 2000                                  |
| +2 to +65                | N/A                    | Hygienic synthetic lubricating oil<br>AL 116 3158: ISO-L-CTPR 220<br>Viscosity grade: VG220<br>Viscosity index: VI > 140<br>Registered as NSF H1 for use in the food processing industry<br>Conform to FDA CFR 21 178.3570, 178.3620 and/or generally regarded as safe (US 21 CFR 182) | 2000                                  |

#### General requirements for HSS lubricating oils

- Compatible with non-ferrous metals
- Compatible with most paints and conventional sealing materials

#### Oil change interval

Oil change interval is dependent on operating conditions.

| Operating conditions                              | Oil change interval              |
|---------------------------------------------------|----------------------------------|
| In a new installation.                            | 200 hours                        |
| After change of gear transmission.                |                                  |
| Continuous operation.                             | See Selection of lubricating oil |
| When the separator is operated for short periods. | 12 months                        |
| Seasonal operation                                | Before every operating period    |

### **Other information**

Check and prelubricate spindle bearings on separators which have been out of service for 6 months or longer.

## 5.10 Vibration

### 5.10.1 Vibration analysis

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

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

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

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

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

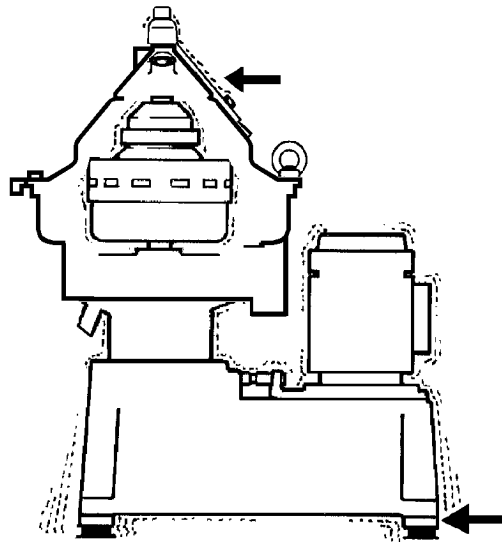


#### Disintegration hazards

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

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

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



G00752a1

## 5.10.2 Vibration switch (optional)

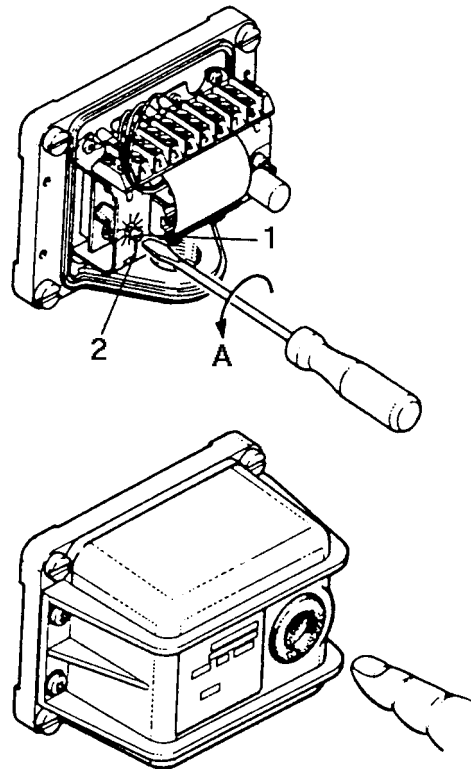
### Adjustment of setpoint

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

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

#### NOTE

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



G0546521

#### Setpoint adjustment

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

## 5.11 General directions

### 5.11.1 Ball and roller bearings

#### Specially designed bearings for the bowl spindle

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

Only Alfa Laval genuine spare parts should be used.

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

#### NOTE

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

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

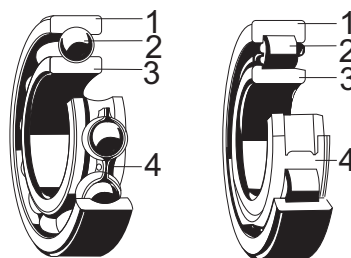
#### Dismantling

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

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

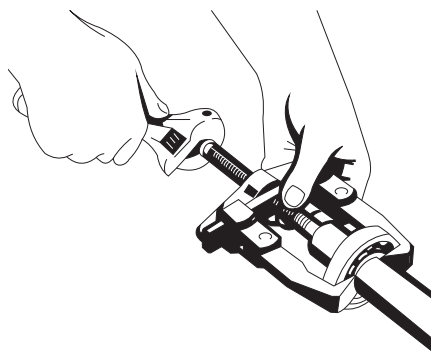
#### NOTE

Do not hit with a hammer directly on the bearing.



G0587321

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



G0587411

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

## Cleaning and inspection

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

## Assembly

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

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

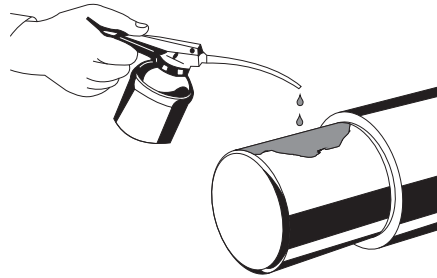
- When assembling ball bearings, the bearings must be heated in oil to maximum 125 °C.

### NOTE

Heat the bearing in a clean container with a cover.

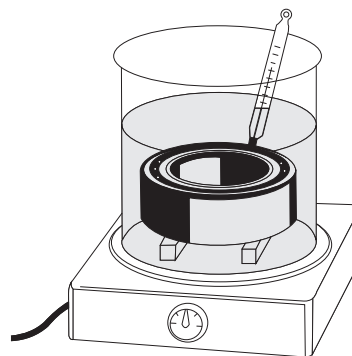
Use only clean oil with a flash point above 250 °C.

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



G0587511

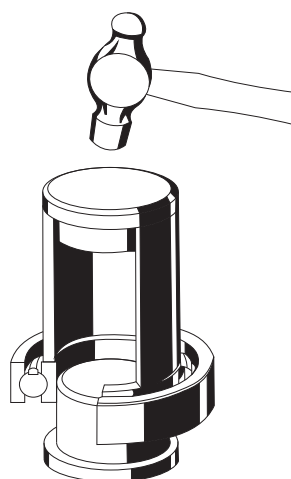
*Clean and smear the bearing seating before assembly.*



G0587611

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

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

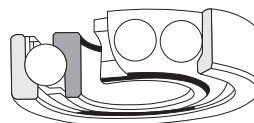


G0587711

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

### Angular contact ball bearings

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



G0587211

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

### 5.11.2 Before shut-downs

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

- Remove the bowl, according to instructions in chapter 6 [Dismantling & Assembly on page 77](#)
- Protect parts in contact with process liquid from corrosion by applying a thin layer of oil.
- Remove the O-rings.

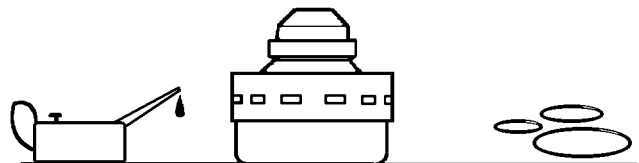
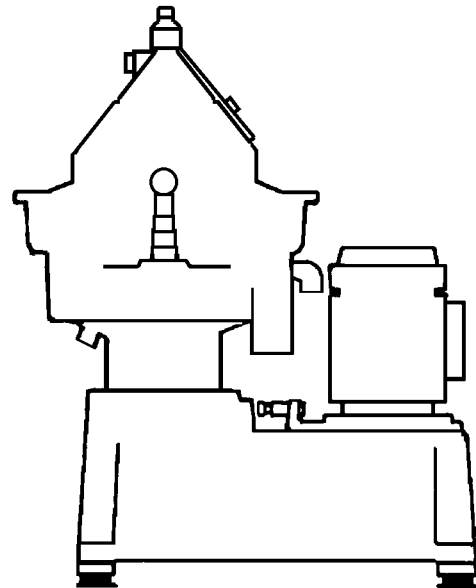
Protect cleaned carbon steel parts against corrosion by oiling. Separator parts that are not assembled after cleaning must be wiped and protected against dust and dirt.

#### NOTE

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

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

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



G0466851

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

# 6 Dismantling & Assembly

## References to check points

In the text you will find references to the check point instructions in chapter [5 Service instructions on page 35](#). The references appear in the text as in the following example:

**Check point 5.3.10 Disc stack pressure on page 52.** In this example, look up check point Disc stack pressure for further instructions.



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

## Tools

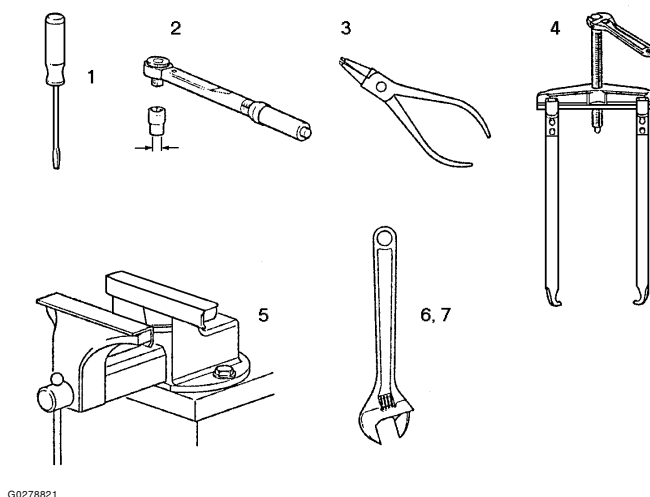
Special tools from the tool kit must be used for dismantling and assembly. The special tools are specified in the Spare Parts Catalogue.

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

For bowl and bowl spindle

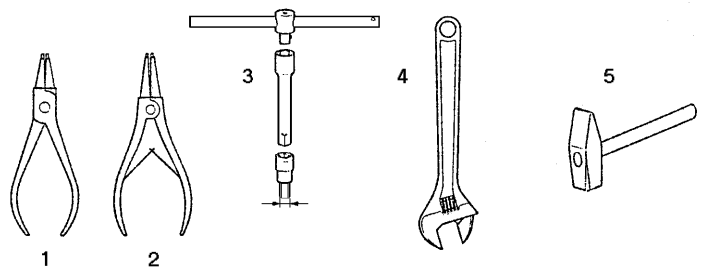
1. Screwdriver
2. Torque wrench (50 Nm) with socket 16 mm
3. Pliers for internal snap ring
4. Ball bearing puller
5. Screw vice with copper liners
6. Adjustable wrench, length approx. 400 mm
7. Adjustable wrench or spanner, width of jaws 24 mm

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



For friction coupling and flat belt

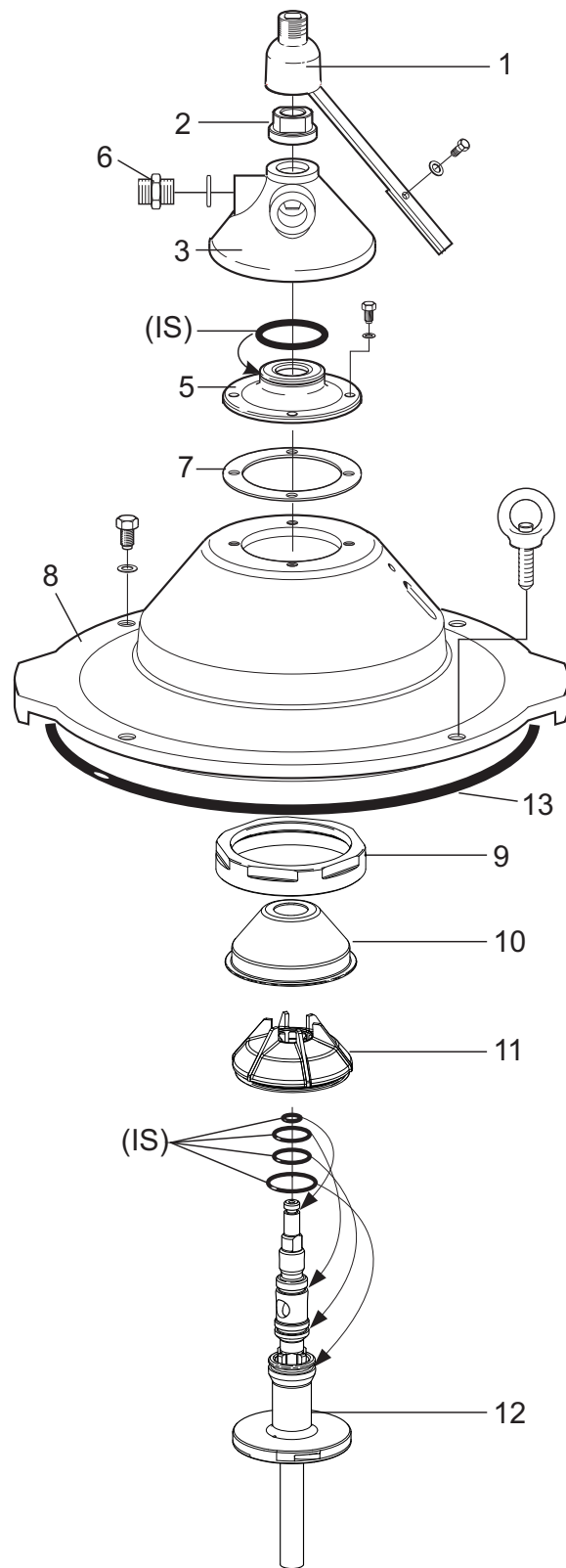
1. Pliers for internal snap ring
2. Pliers for external snap ring
3. T-handle, extension rod and socket 16 mm
4. Adjustable wrench or spanner, width of jaws 36 mm
5. Hammer



G0278921

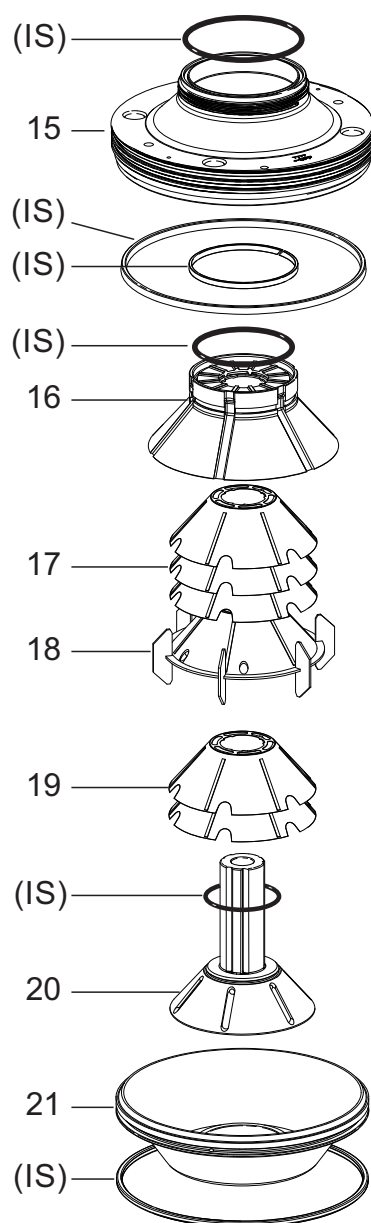


## 6.1 Inlet/outlet and bowl



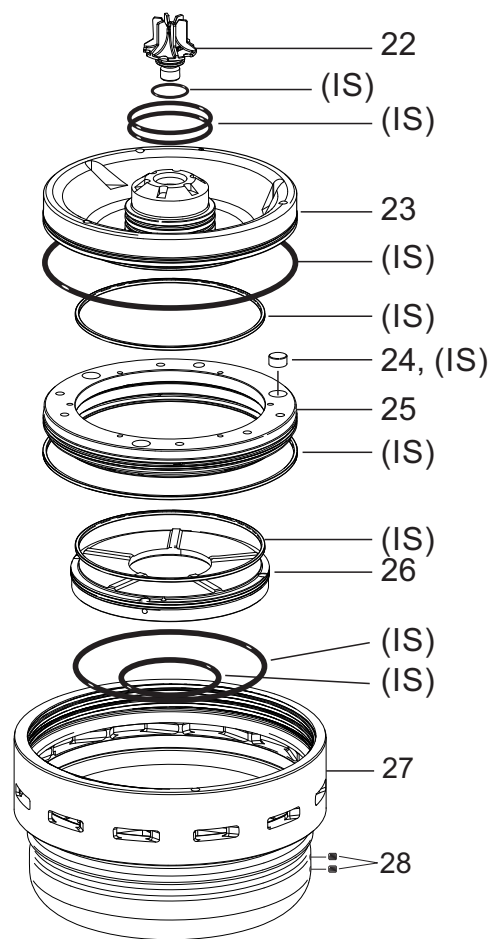
G00737b1

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



G08877A1

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



G0074271

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

### 6.1.1 Inlet/outlet and bowl - dismantling

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

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



#### Entrapment hazard

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

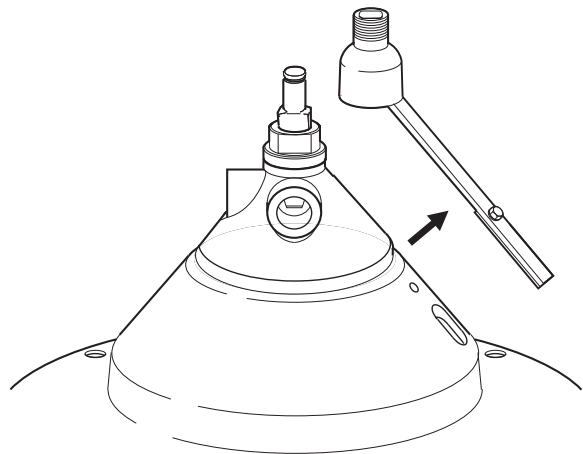
1. Remove safety device and look through the slot in the frame hood to see if the bowl still rotates.



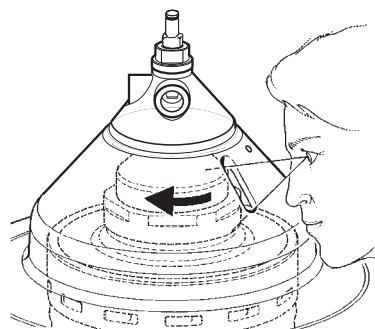
#### Entrapment hazard

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

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



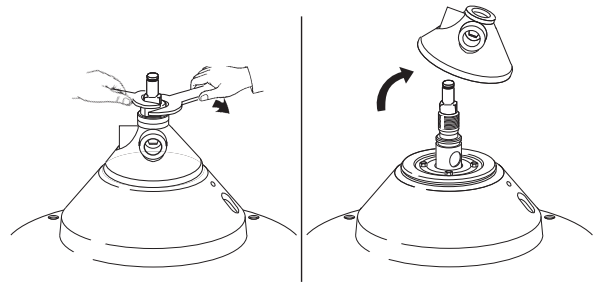
G0819751



G0467361

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

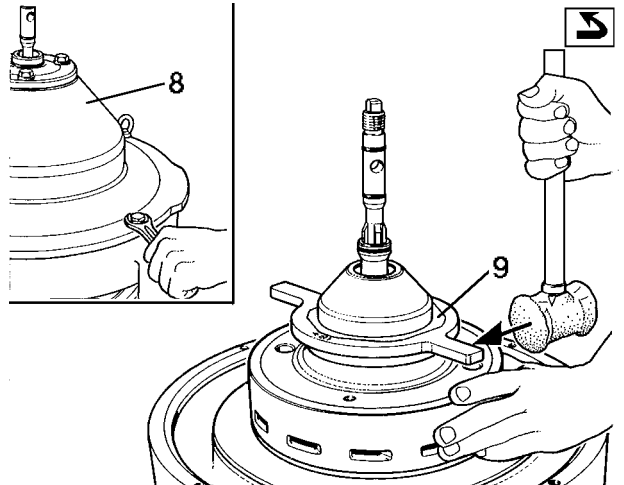
**Left-hand thread!**



G0821531

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

**Left-hand thread!**

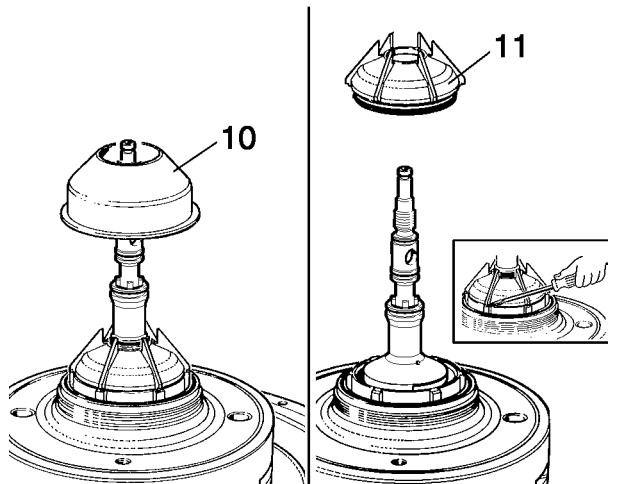


G0070021

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

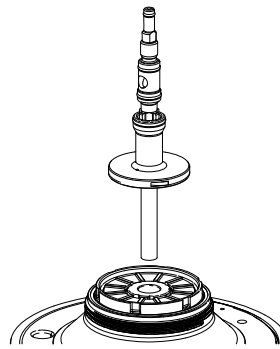
**NOTE**

If the gravity disc has to be replaced owing to changed operating conditions, see [8.3.3 Gravity disc nomogram on page 181](#).



G0070141

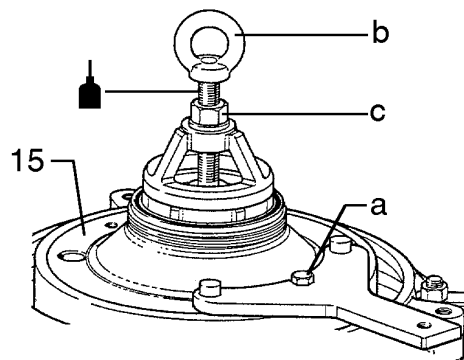
7. Lift out inlet pipe with the paring disc.



G0070241

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

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



G0167121

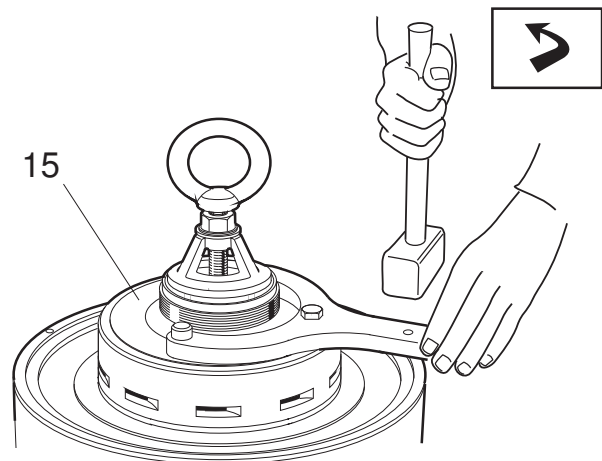
### NOTE

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

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

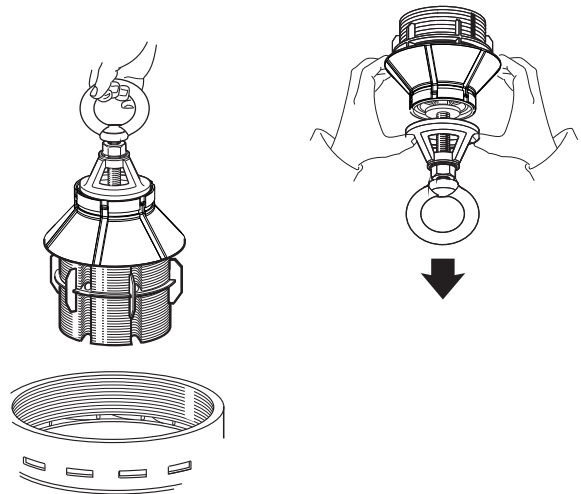
**Left-hand thread!**

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



G0357411

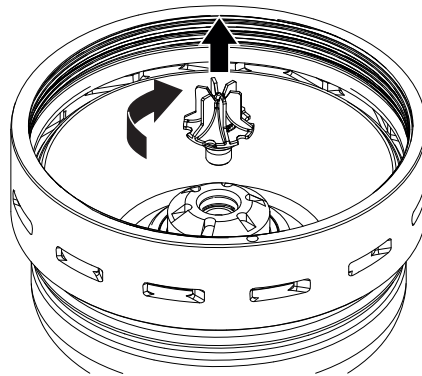
11. Lift out the top disc, the bowl discs with wing insert and the distributor. Screw the nut of the compression tool up against the eye bolt, turn the unit with the tool still attached upside down and hit it against a firm base. This will facilitate loosening of the top disc.



G03575a1

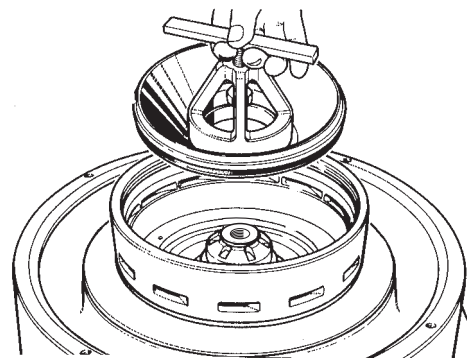
12. Unscrew the cap nut.

**Note: Left-hand thread!**



G0072061

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

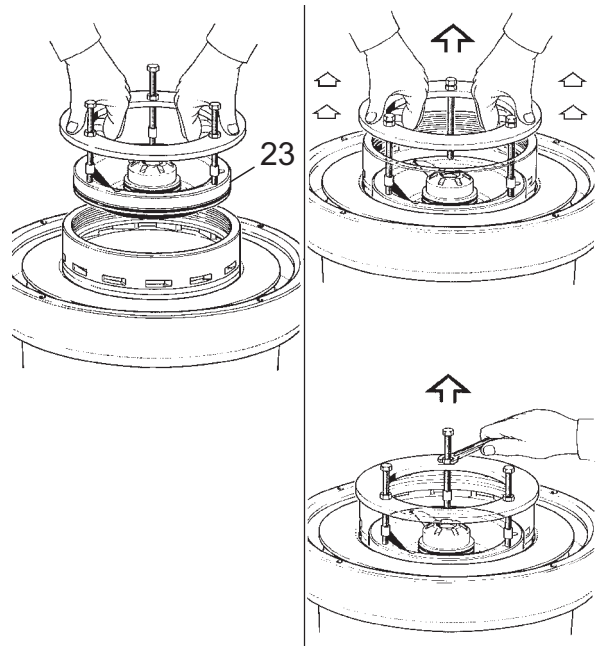


G0072051

14. Unscrew cap nut (22).

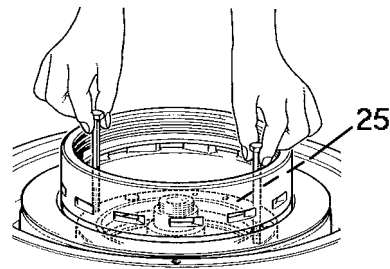
**Left-hand thread!**

15. Remove upper distributing ring (23) using the special tool. Detach the distributing ring either:
- by jerking, or
  - by tightening the nuts equally



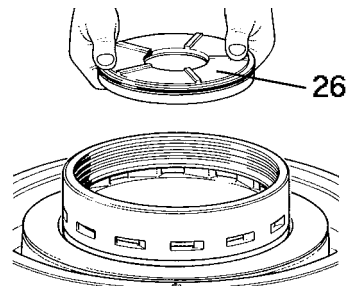
G0070651

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



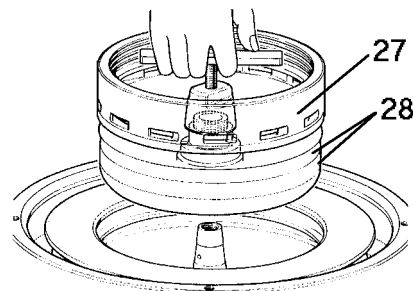
G0070721

17. Lift out lower distributing ring (26).



G0070821

18. Lift out bowl body (27) using the special tool.
19. Ease the bowl body off with the central screw of the tool. If necessary, knock on the handle.
20. Soak and clean all parts thoroughly in suitable cleaning agent, see [5.7 Cleaning on page 58](#).
21. Clean nozzles (28) in bowl body (27) using soft iron wire of maximum 1,2 mm diameter,



G0070922

see [5.3.4 Discharge mechanism on page 46](#).



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

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

## 6.1.2 Inlet/outlet and bowl - assembly

**NOTE**

Be sure bowl parts are not interchanged.

Out of balance vibration will reduce ball bearing life.

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

### Check point

Corrosion

[5.3.1 Corrosion on page 42](#)

[5.3.3 Cracks on page 45](#)

[5.3.4 Discharge mechanism on page 46](#)

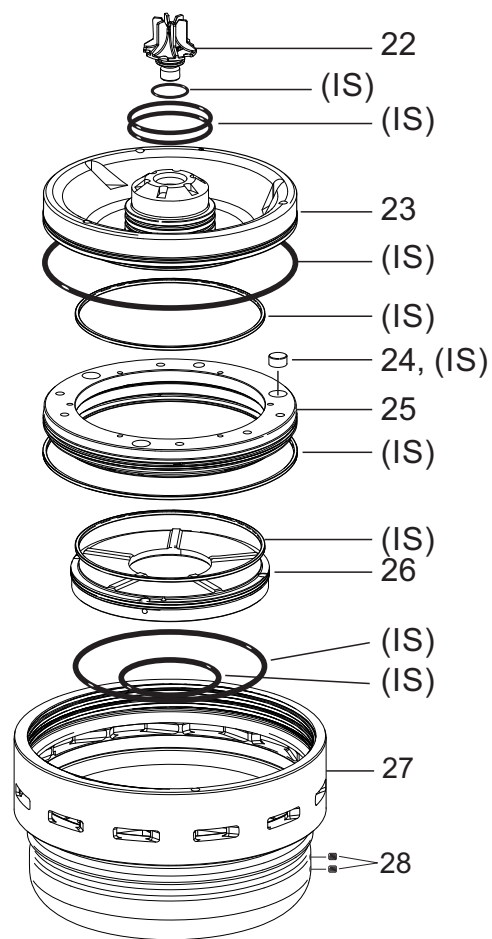
[5.3.6 Spindle top cone and bowl body nave on page 49](#)

[5.3.7 Threads of inlet pipe, paring disc on page 49](#)

[5.3.8 Threads on bowl hood and bowl body on page 50](#)

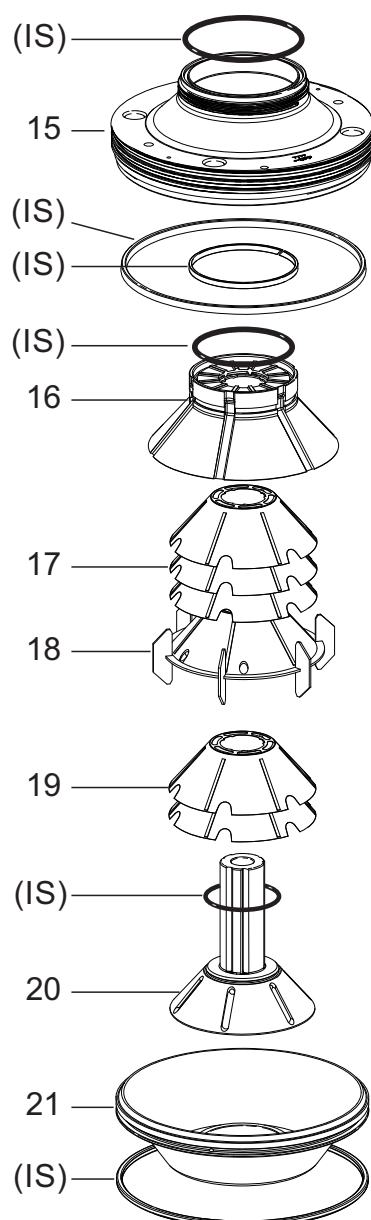
[5.3.10 Disc stack pressure on page 52](#)

[5.4.1 Paring disc height adjustment on page 53](#)



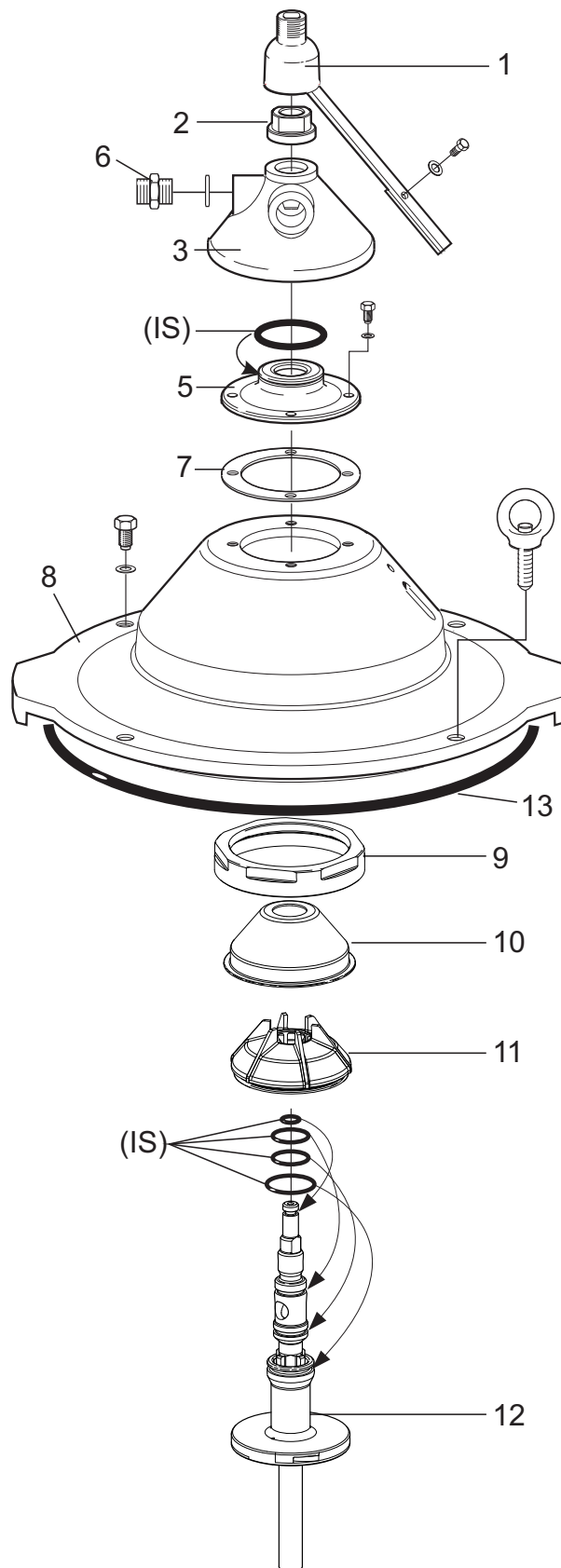
G0074271

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



G08877A1

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



G00737B1

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

1. Clean the hollow part (b) of the spindle top and the radial hole (a). Wipe clean the spindle top and nave bore in the bowl body. Apply oil to the tapered end of the spindle, smear the oil over the surface and wipe off surplus with a clean cloth.
2. Clean the nozzles in the bowl body, see [5.3.4 Discharge mechanism on page 46](#).

**Check point**

[5.3.6 Spindle top cone and bowl body nave on page 49](#) and [5.3.9 Priming of bowl parts on page 51](#).

3. Fit the bowl body (27) on the spindle. Avoid damaging the spindle cone.

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

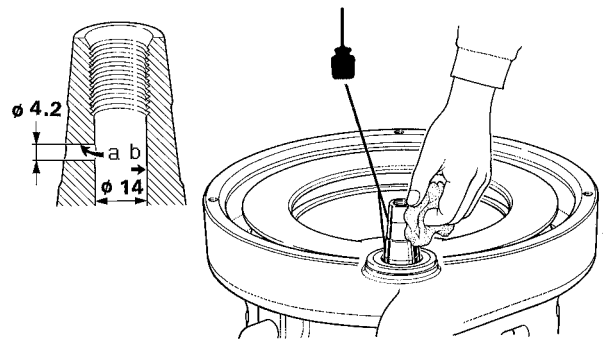
4. Fit o-rings and rectangular ring onto lower distributing ring.
5. Place the lower distributing ring (26) in the bowl body.

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

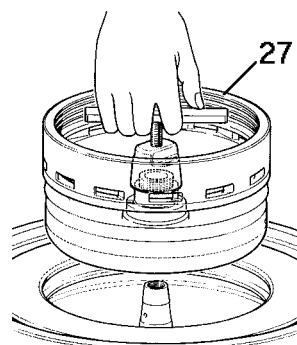
Fit rectangular ring to operating slide.

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

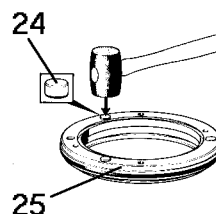
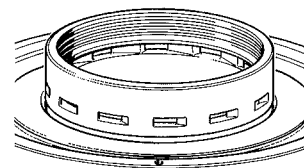
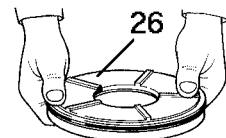
Make sure that the seal rings lie concentrically in their grooves.



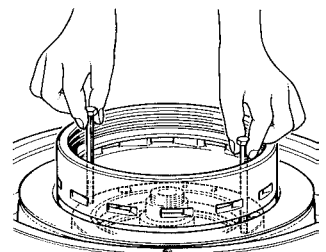
G0071721



G0071831



G0071841

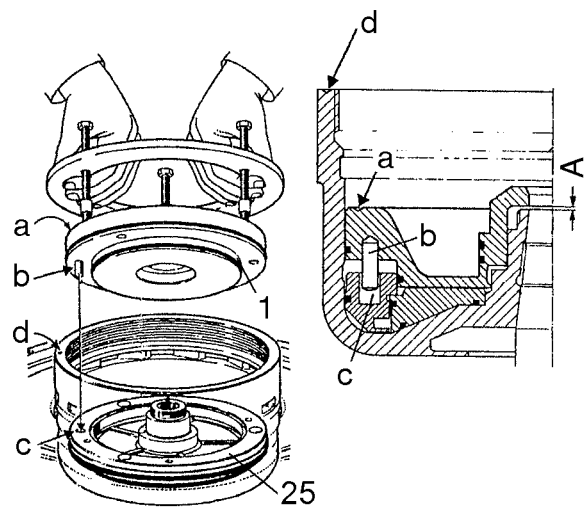


6. Fit the upper distributing ring so that drill mark (a) is in line with hole (c) on the distributing ring. When the distributing ring is in correct position the guide pin (b) will enter hole (c).

**NOTE**

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

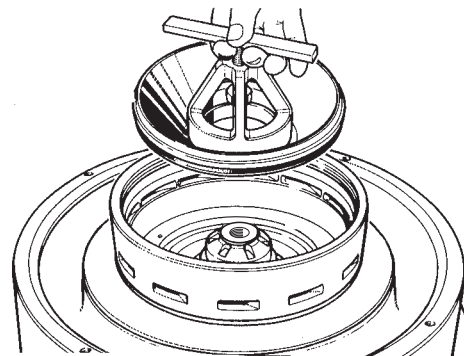
Check the distance "A". If the play is larger than 2 mm the guide pins have not entered the hole properly.



G0378031

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

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

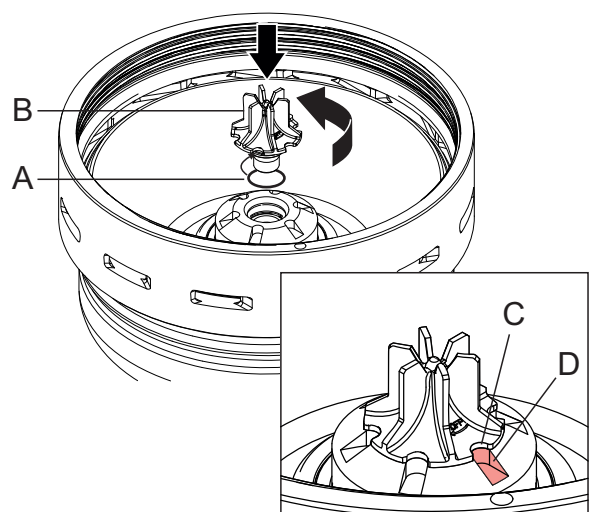


G0072051

8. Fit the O-ring (A) onto cap nut (B). Screw cap nut counter-clockwise onto the spindle, Tighten firmly by hand.

**Left-hand thread!**

Make sure the groove (C) in cap nut align with slot (D) in distributing ring. If not aligned rotate the distributing ring and tighten cap nut (B).



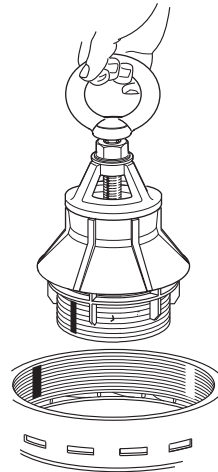
G0072071

## 9. Check point

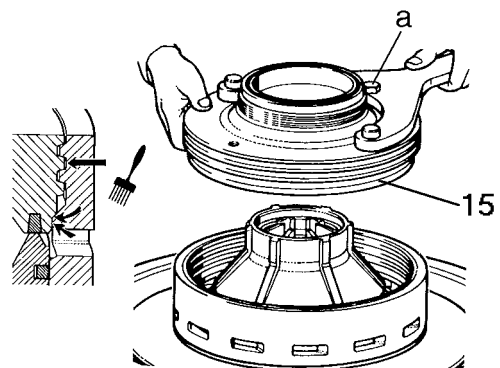
Before assembling the bowl discs, check the threads of the bowl hood and bowl body, see [5.3.8 Threads on bowl hood and bowl body on page 50](#).

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

**Left-hand thread!**



G0357561



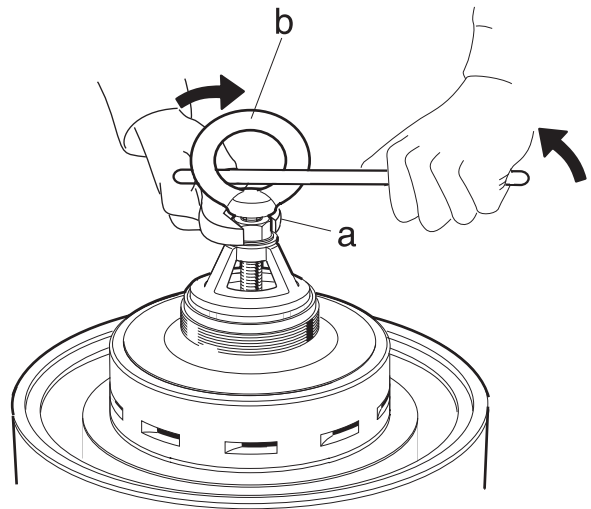
G0072231

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

**NOTE**

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

**Check point** [5.3.10 Disc stack pressure on page 52.](#)



G0072361

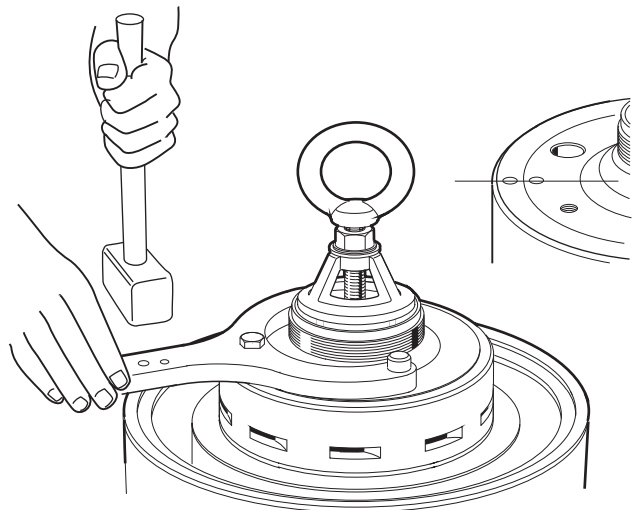
16. Attach the spanner and tighten the bowl hood by using a tin hammer. Strike the spanner handle until the bowl hood lies tightly against the bowl body. In a new bowl, the assembly marks now will be in line with each other.



**Disintegration hazard**

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

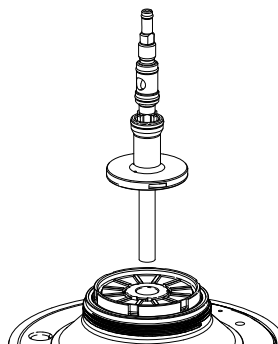
Also see [5.3.8 Threads on bowl hood and bowl body on page 50.](#)



G0357711

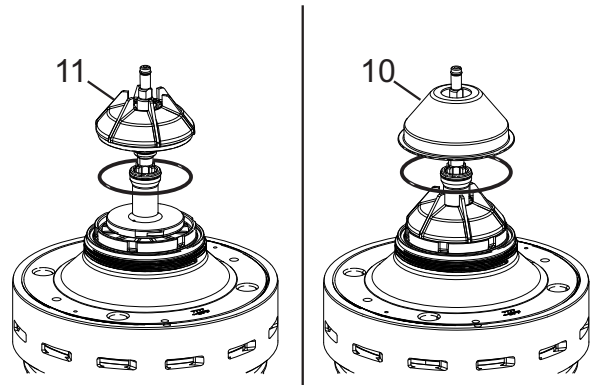
17. Remove the compression tool and spanner.
18. Place inlet pipe in the bowl.

**Check point** [5.3.7 Threads of inlet pipe, paring disc on page 49.](#)



G0070241

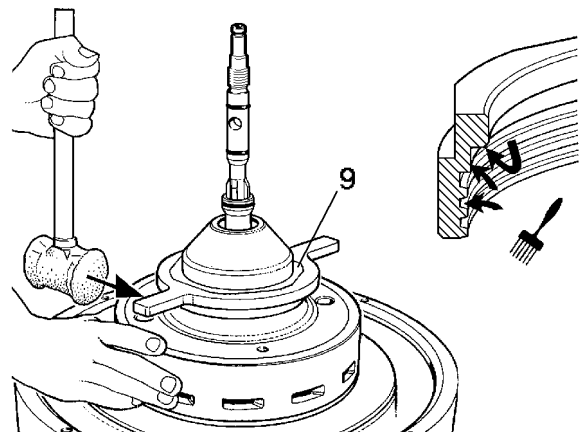
19. Fit O-ring in groove in top disc and fit paring chamber cover (11) by pressing it down gently.
20. Fit O-ring in groove in frame hood and fit gravity disc / clarifier disc (10).



G0073361

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

**Left-hand thread!**

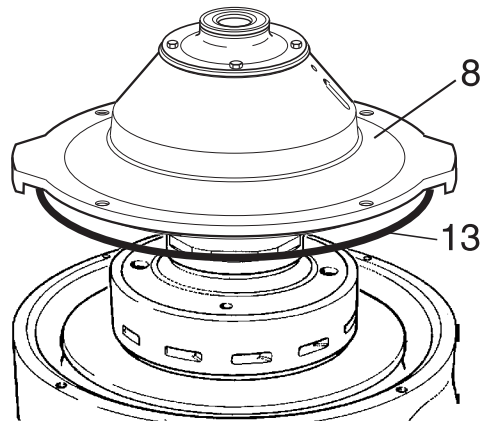


G0074331

22. Fit frame hood (8) and O-ring (13). The two eye-bolts must be fitted in the holes nearest to the electric motor.

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

**Check point 5.4.1** [Paring disc height adjustment on page 53](#). To be performed at Major Service and if the bowl spindle has been dismantled.



G00735a1

23. Fit inlet/outlet housing. Tighten nut.

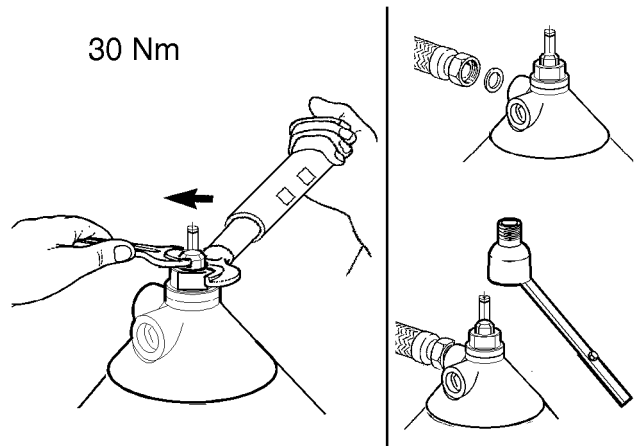
**Left-hand thread!**

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



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

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



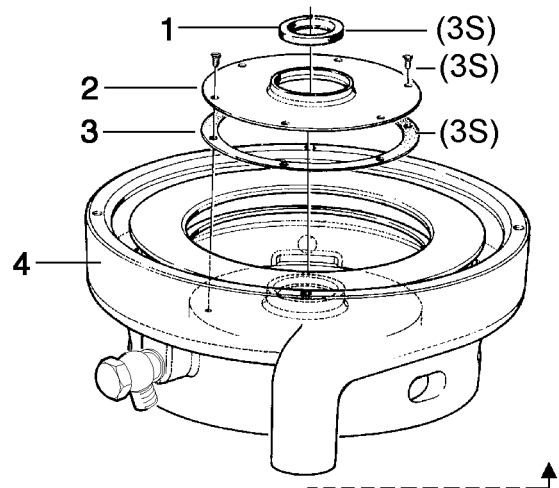
G0172951

## 6.2 Bowl spindle and frame

### 6.2.1 Bowl spindle and frame - dismantling

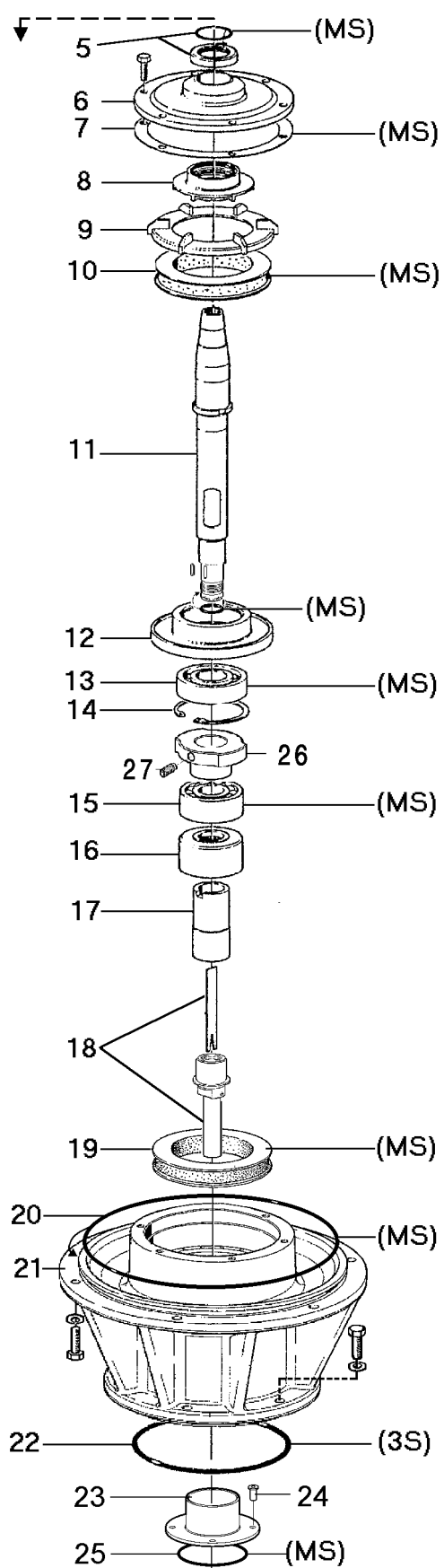
Before dismantling the bowl spindle, the inlet and outlet housing, frame hood and bowl as well as the flat belt must be removed.

Before dismantling, in the case of Major Service, or if the separator vibrates while running, see **Check point 5.4.2 Radial wobble of bowl spindle on page 54.**



G01132d1

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

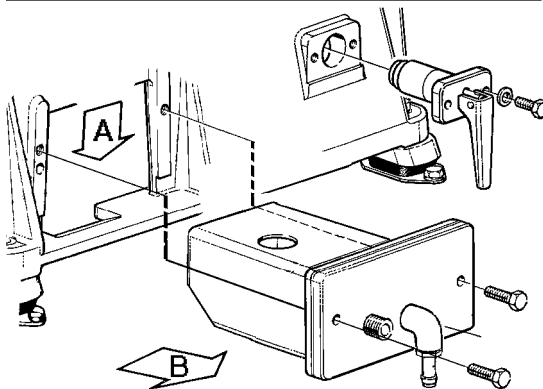
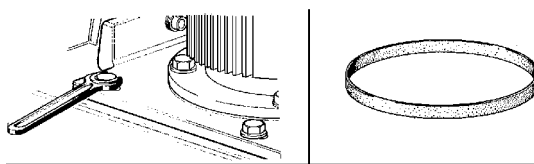


G01131L1

5. *Deflector ring*
  6. *Top bearing cover*
  7. *Gasket*
  8. *Fan*
  9. *Buffer holder*
  10. *Rubber buffer*
  11. *Bowl spindle*
  12. *Ball bearing holder*
  13. *Ball bearing*
  14. *Snap ring*
  15. *Ball bearing*
  16. *Oil pump*
  17. *Belt pulley*
  18. *Pump sleeve*
  19. *Rubber buffer*
  20. *O-ring*
  21. *Frame, intermediate*
  22. *O-ring*
  23. *Sleeve*
  24. *Screw*
  25. *O-ring*
  26. *Indicator ring*
  27. *Stop screw*
- MS. Parts to be renewed at Major Service*
- 3S. Parts to be renewed at 3-year service*

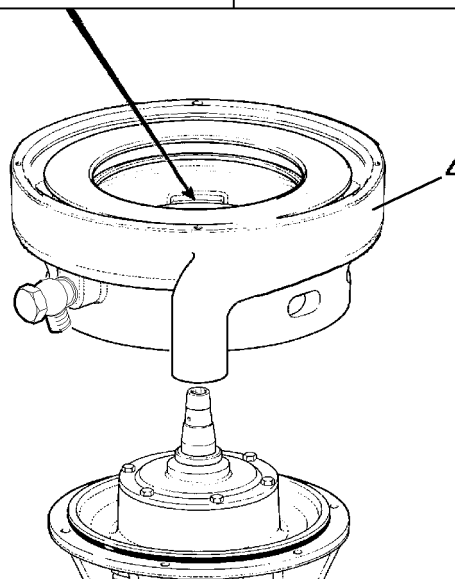
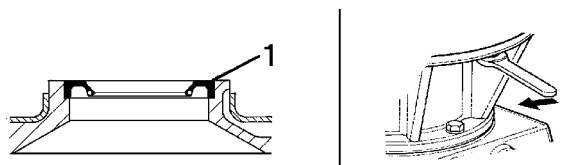
## 6 Dismantling & Assembly

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



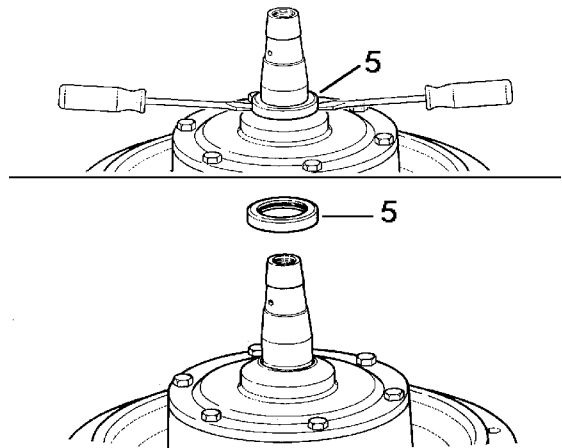
G01133E1

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



G0113461

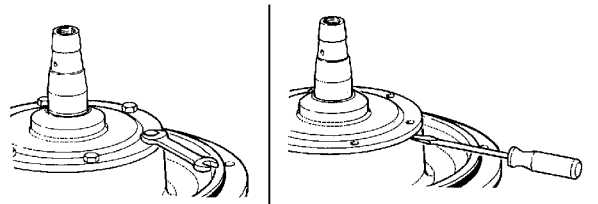
6. Clean the bowl spindle cone in place and remove deflector ring (5).



G0113521

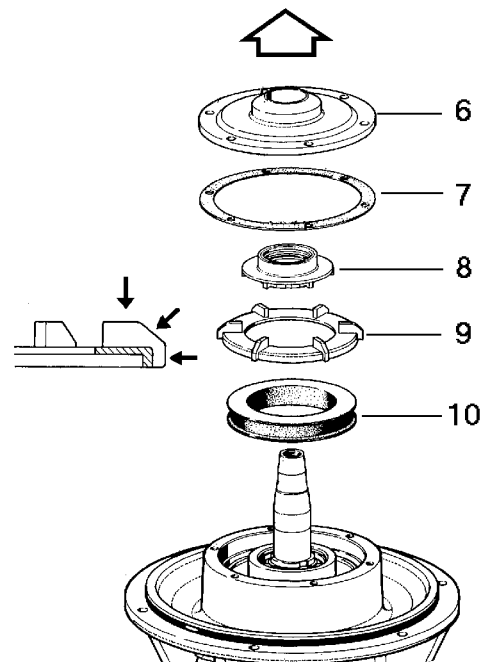
7. Remove, in the following sequence:

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



**NOTE**

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

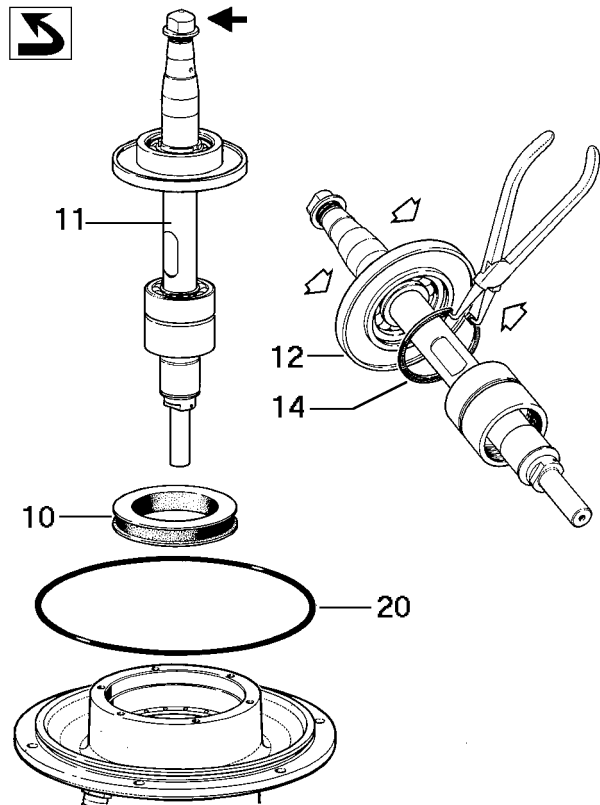


G0113621

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

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

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



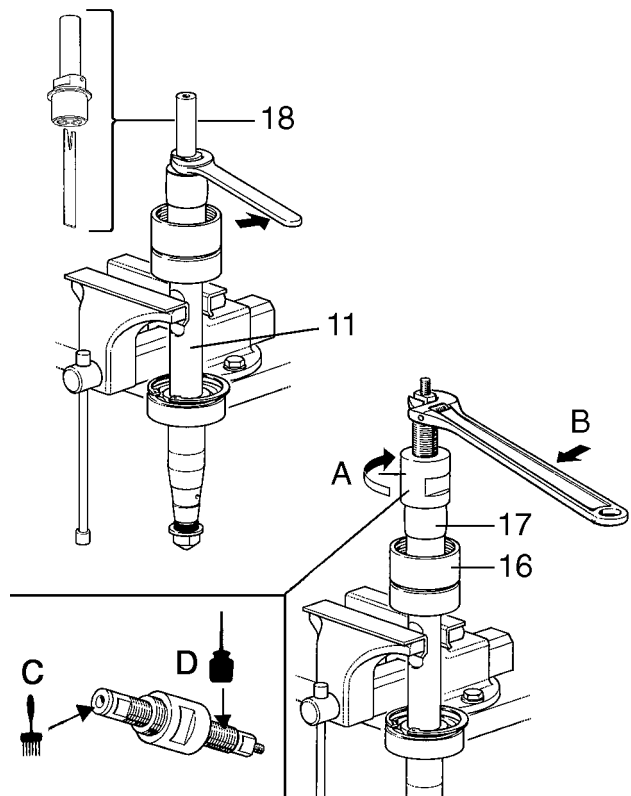
G0076132

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

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

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

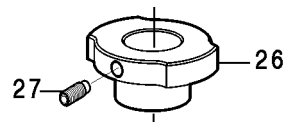
Remove the oil pump (16) by hand, do not loose the flat key.



G0076271

C. Molykote 1000 paste  
D. Oil

12. Unscrew stop screw (27) and remove the indicator ring (26).

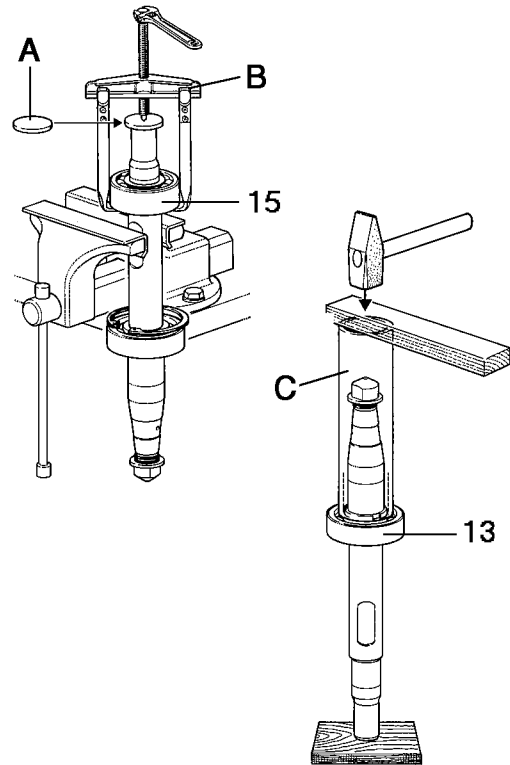


G01131n1

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

**NOTE**

Always discard a used bearing.



G0076351

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

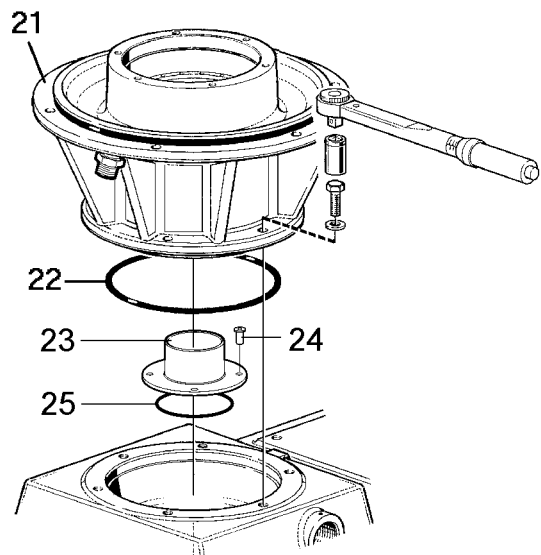
15. **In case of 3-year-service**

Discard the O-ring (22).

16. Unscrew screws (24) and remove sleeve (23) together with O-ring (25).

**NOTE**

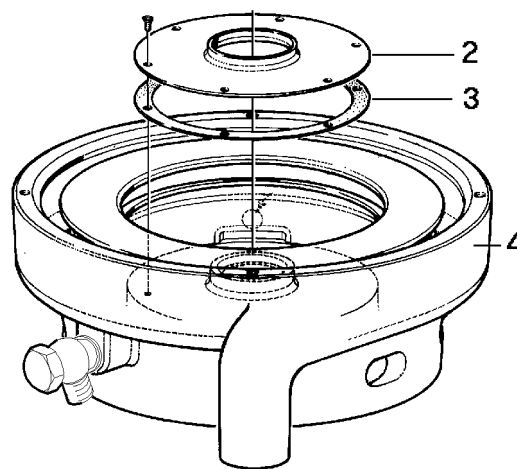
Disconnect speed sensor to avoid damaging cable.



G00937d1

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

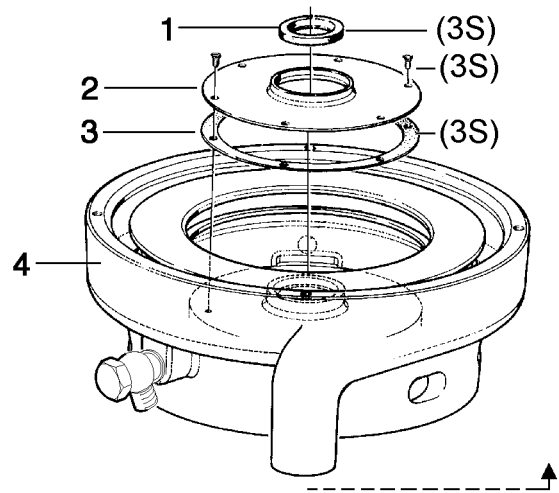
Replace all parts supplied in the spare parts kits.



G0113771

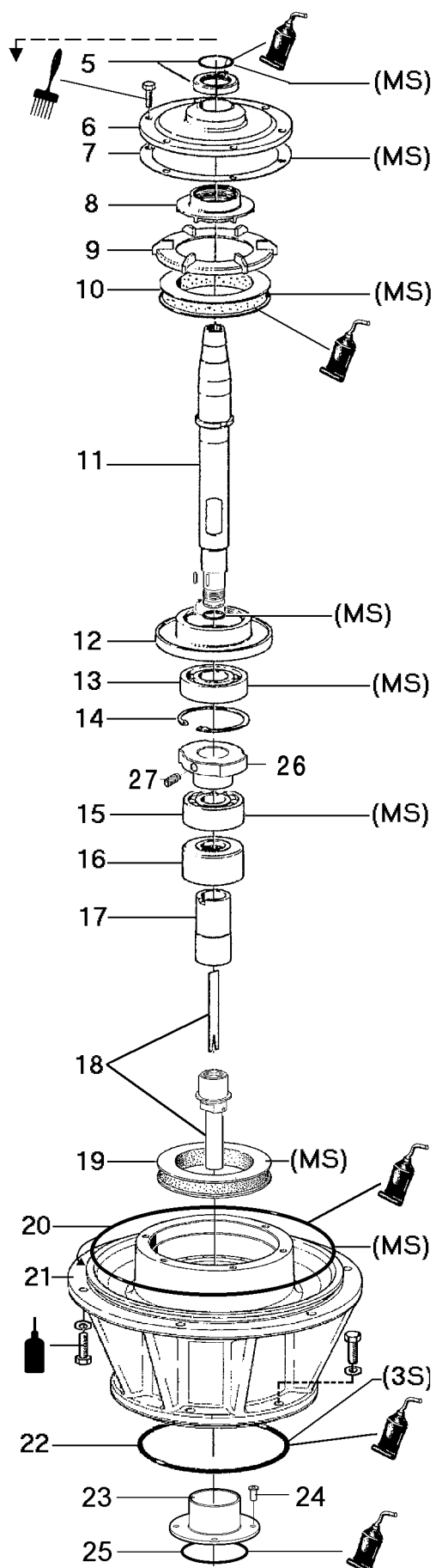
### 6.2.2 Bowl spindle and frame - assembly

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



G01132d1

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



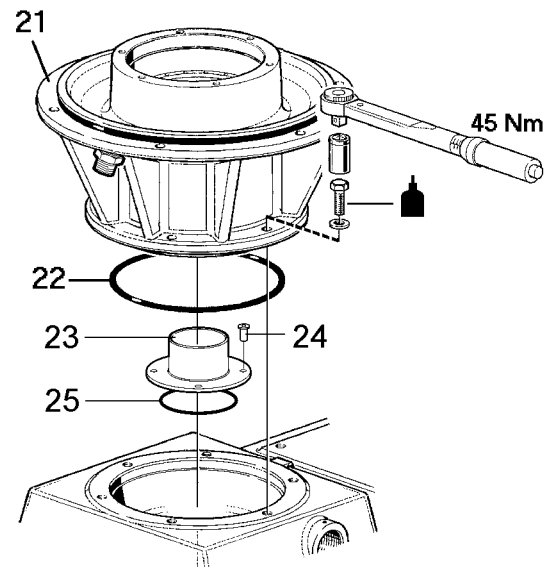
G01131m1

5. *Deflector ring*
  6. *Top bearing cover*
  7. *Gasket*
  8. *Fan*
  9. *Buffer holder*
  10. *Rubber buffer*
  11. *Bowl spindle*
  12. *Ball bearing holder*
  13. *Ball bearing*
  14. *Snap ring*
  15. *Ball bearing*
  16. *Oil pump*
  17. *Belt pulley*
  18. *Pump sleeve*
  19. *Rubber buffer*
  20. *O-ring*
  21. *Frame, intermediate*
  22. *O-ring*
  23. *Sleeve*
  24. *Screw*
  25. *O-ring*
  26. *Indicator ring*
  27. *Stop screw*
- MS. Parts to be renewed at Major Service*
- 3S. Parts to be renewed at 3-year service*
- A. *Molykote 1000 paste (thin layer to be rubbed into surface)*
  - B. *Silicone grease (thin layer)*
  - C. *Loctite 242*

1. Fit O-ring (25) and sleeve (23) with screws (24).
2. **In case of 3-year-service.**  
Fit a new O-ring (22).
3. Fit the frame intermediate part (21). Use a torque wrench and tighten the screws lightly crosswise at first. Then tighten all around to 45 Nm. Secure the screws with Loctite 242.

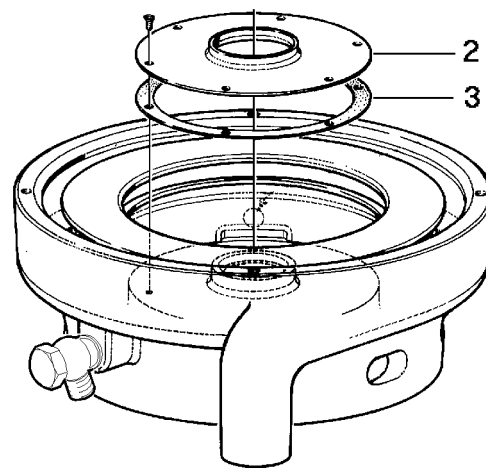


Connect speed sensor if it has been disconnected.



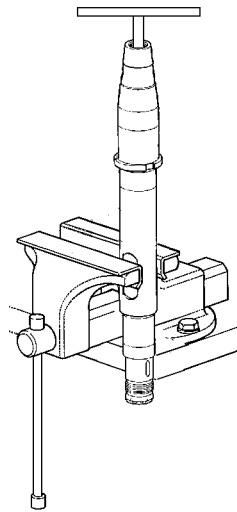
G00937c1

4. Fit a new gasket (3).  
Fit the screen (2).



G0113761

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



G0076341

6. Inspect the tapered end and the hollow part of the bowl spindle for wear and clean if necessary. Start with mounting ball bearing (15).

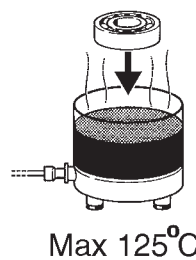
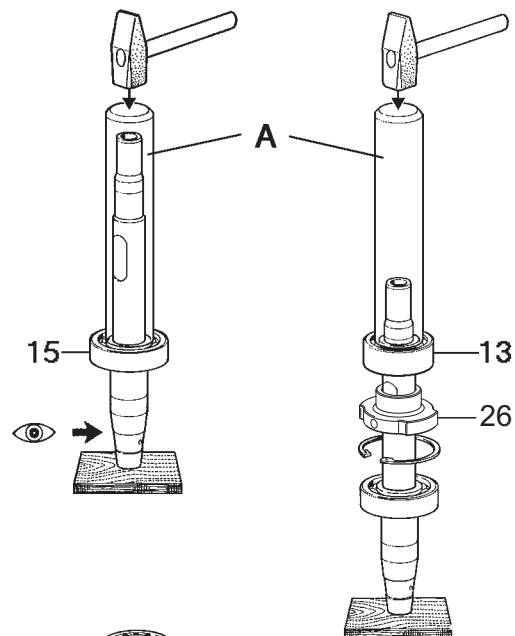
After fitting ball bearing (15) place the indicator ring (26) loosely on the spindle and continue mounting ball bearing (13).

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

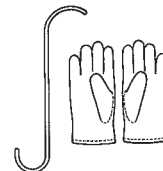


**Always fit new bearings.**

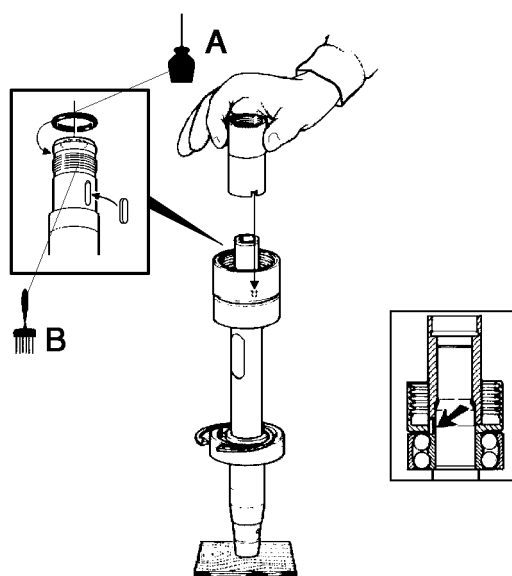
If in doubt how to install roller bearings in a correct way, please see the detailed description in [5.11.1 Ball and roller bearings on page 73](#).



G0113861



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

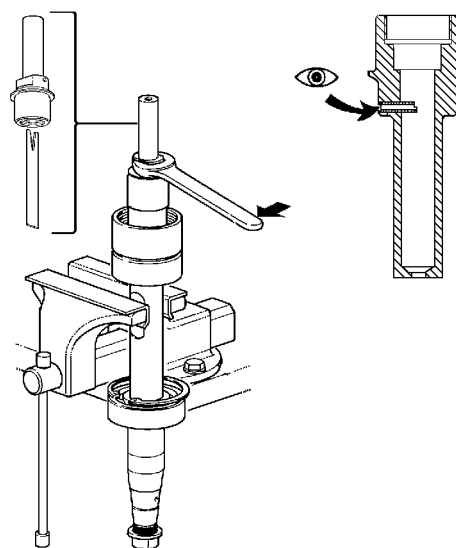


G0113961

A. Oil

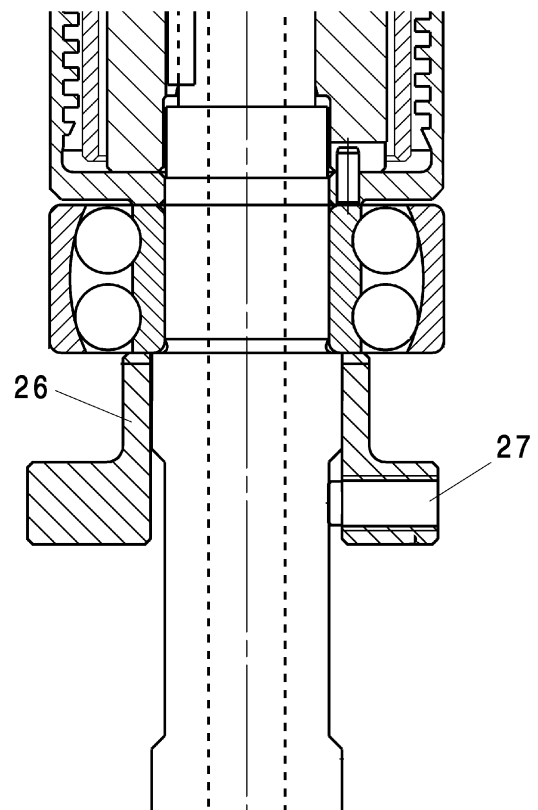
B. Molykote 1000 paste (Thin layer to be rubbed into surface)

8. Check that the radial hole (Ø 1 mm) in the pump sleeve is clean, and fit the pump.



G0114341

9. Fit the indicator ring (26) in its place with stop screw (27).

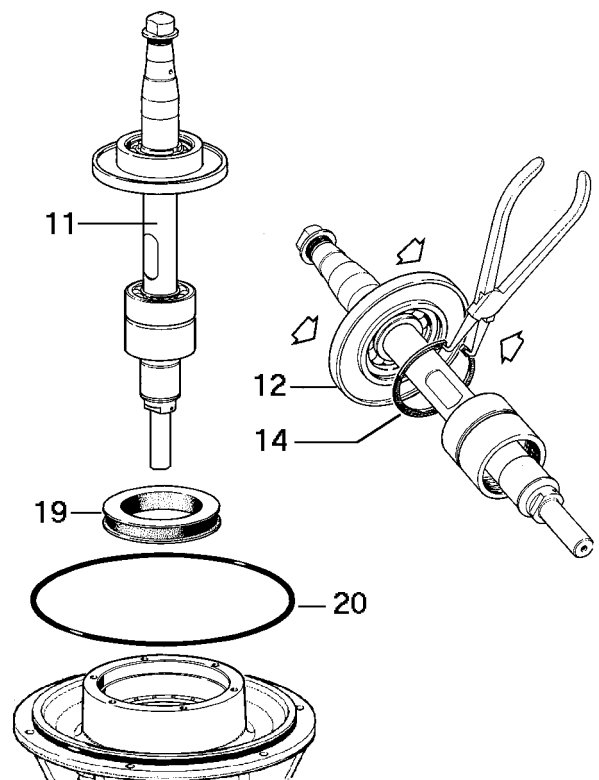


G0114361

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

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

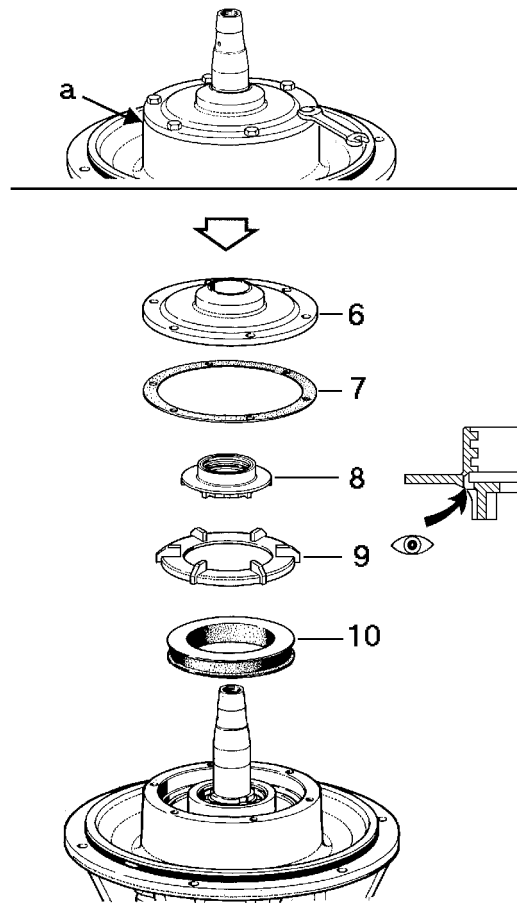
Lower spindle assembly (11) carefully into the separator intermediate frame.



G0076122

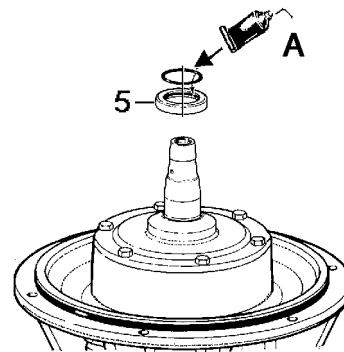
11. Assemble, in the following sequence:

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



G0114421

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



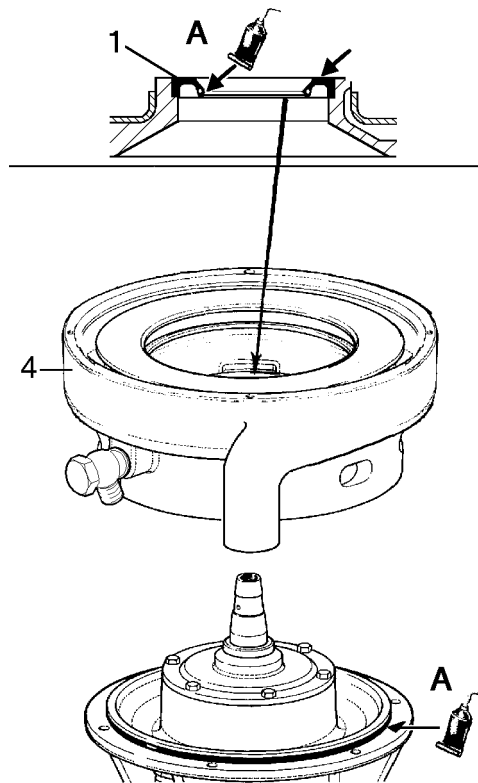
G0114541

A. Silicone grease (thin layer)

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

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

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



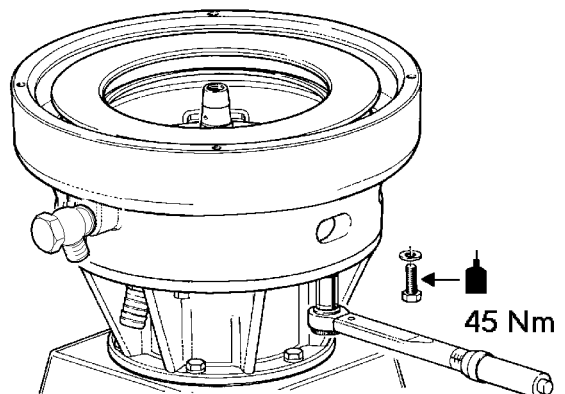
G0114681

A. Silicone grease (thin layer)

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

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

Secure the screws with Loctite 242.



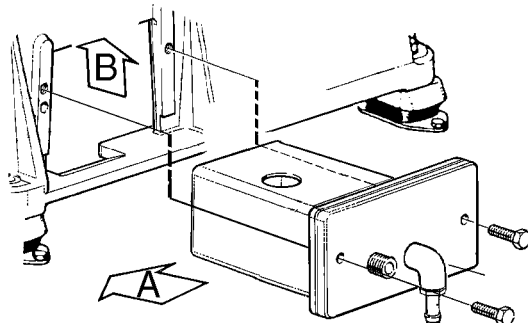
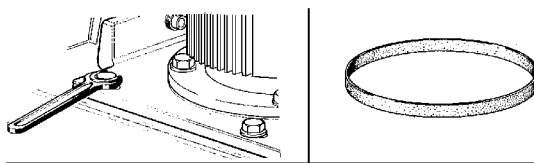
G0114751

15. Fit and adjust the flat belt, see [on page 130](#).

**Check point**

[5.4.2 Radial wobble of bowl spindle on page 54](#)

16. Fit the water tank and tighten the screws.



G01133A1

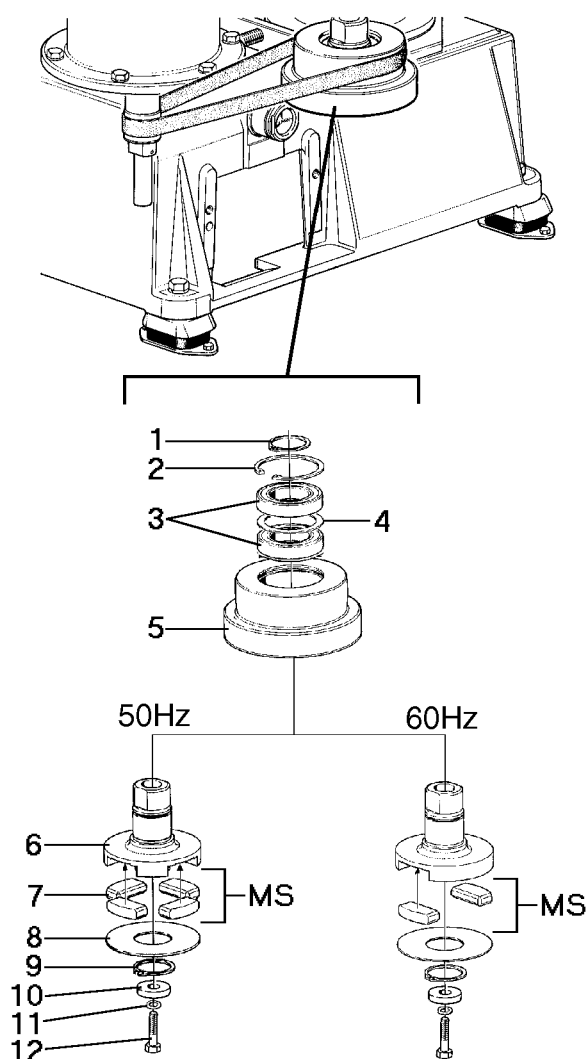
## 6.3 Friction coupling

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



### **Entrapment hazards**

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



G0372121

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

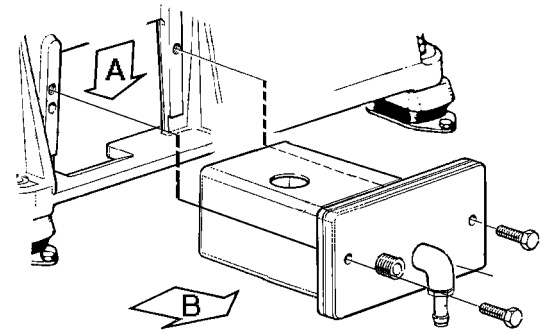
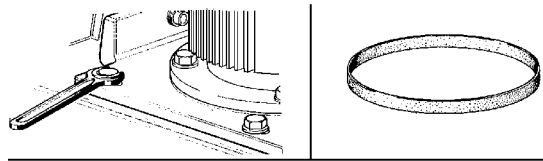
MS. Set of friction elements included in the Major service Kit for 50 Hz or 60 Hz

### 6.3.1 Friction coupling - dismantling

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

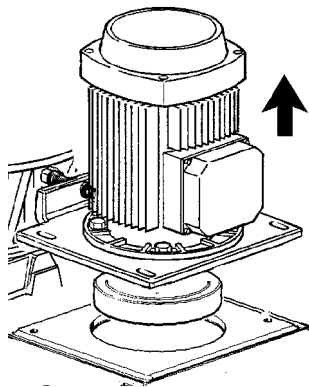
Note that the tank must be lowered past spindle end (A) before it can be withdrawn (B).

4. Remove the flat belt.



G0113391

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

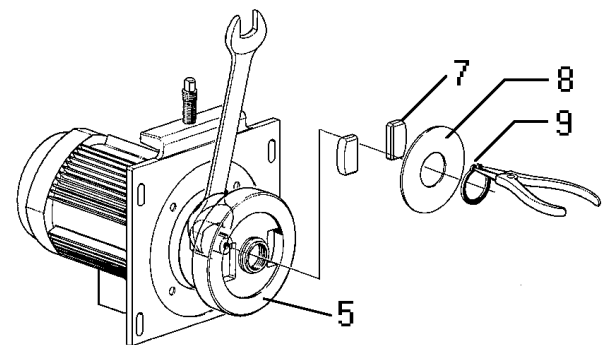


G0077331

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

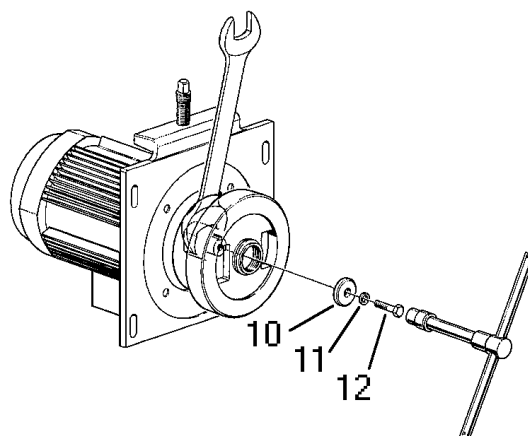
If the friction elements are worn, fit new ones. Replace all friction elements even if only one is worn.

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



G0170841

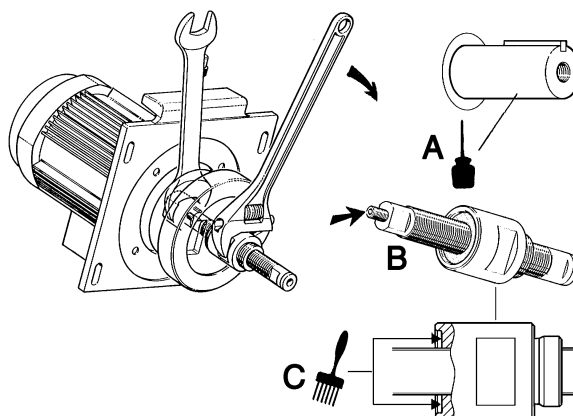
7. Remove the screw (12), spring washer (11) and washer (10) from the friction coupling.



G0170921

### Complete dismantling of the friction coupling

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



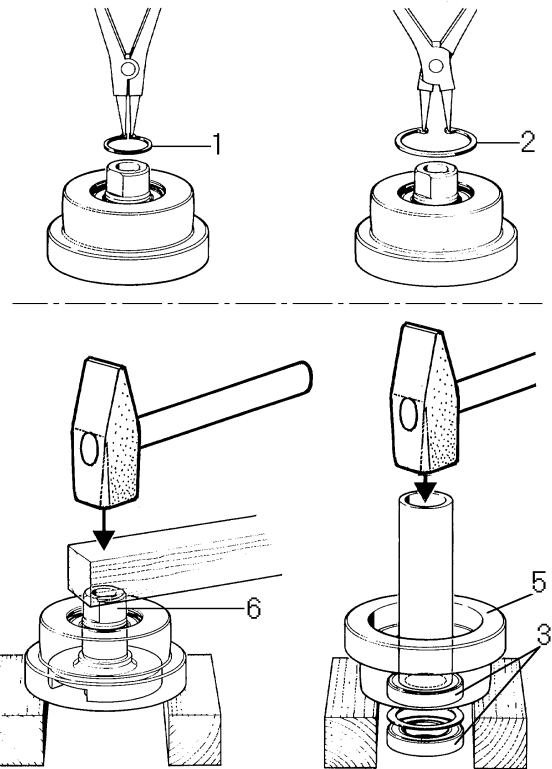
G0171051

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

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

**NOTE**

Always discard a used bearing.



G0171131

### 6.3.2 Friction coupling - assembly

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

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

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

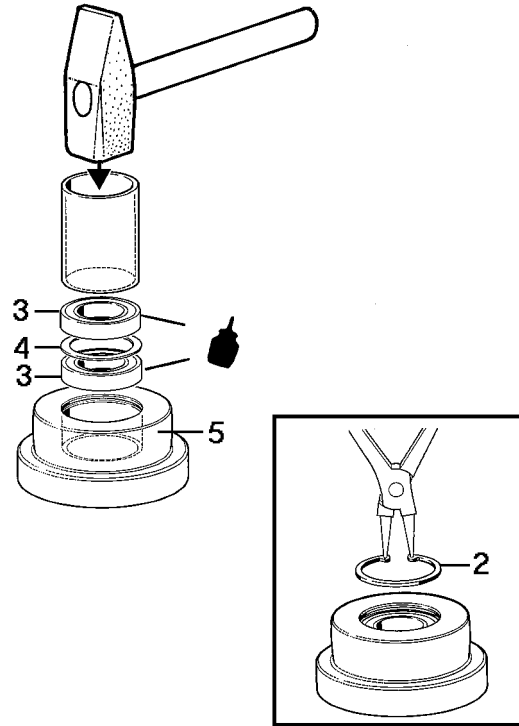
Knock down the bearings carefully (do not forget washer 4) by using the tube which must rest on the outer race of the bearing.

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

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

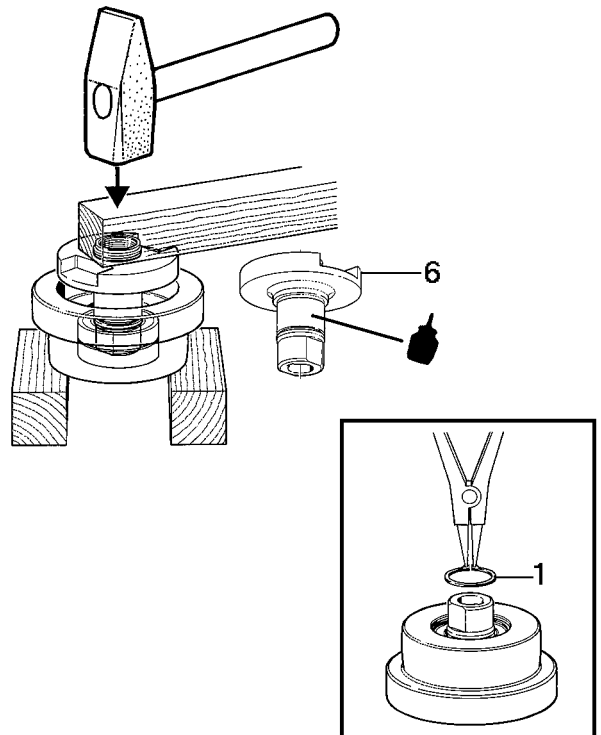
#### NOTE

Do not refit used bearings.



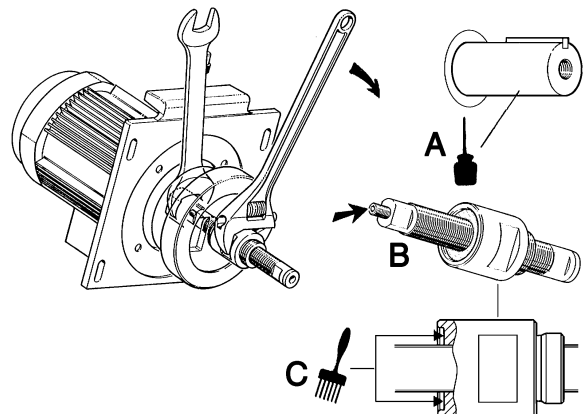
G0171231

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



G0171321

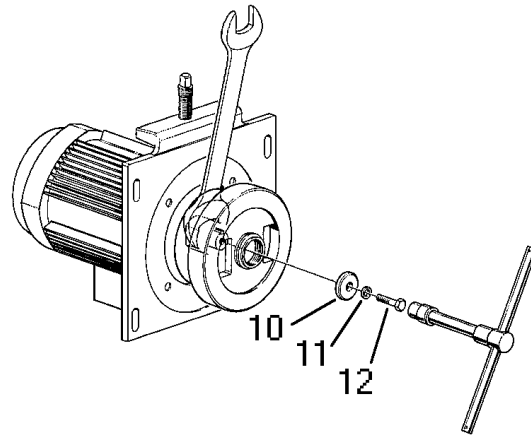
4. Wipe clean the motor shaft and apply a thin oil film on it. Fit the special mounting and dismantling tool to the motor shaft (by means of the small screw on one end of the tool) and press the friction coupling onto the shaft.



G0171051

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

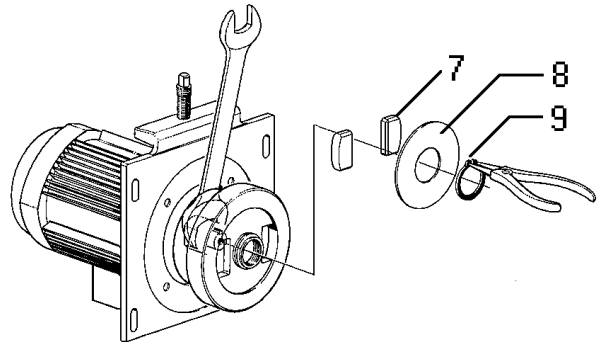
5. Fit the screw (12) with the washer (11) and spring washer (10) to secure the friction coupling.



G0170921

### Assembly of friction elements

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

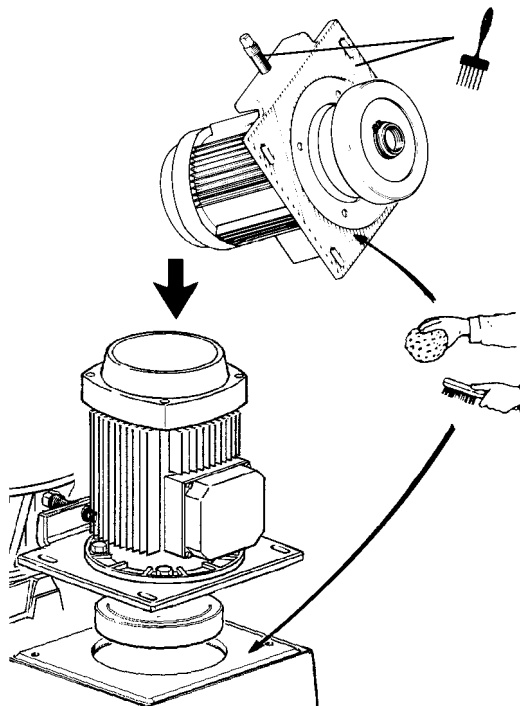


G0170831

2. Degrease and clean the contact surfaces of frame and motor adapter. Lubricate the contact surfaces with Molykote 1000 paste. Then fit the electric motor with adapter and friction coupling in position. Also lubricate the threads of the belt tightener with Molykote 1000 paste or similar.
3. Fit and tighten the flat belt, see [on page 130](#).
4. Install the water tank and the cover.

### NOTE

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



G0077341

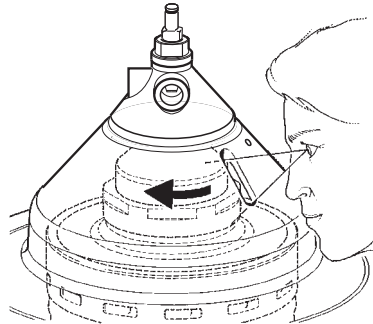
## 6.4 Change of belt



### Entrapment hazards

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

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



G0467361

Alfa Laval ref. 9007861 Rev. 2

### Remove water tank or cover and brake

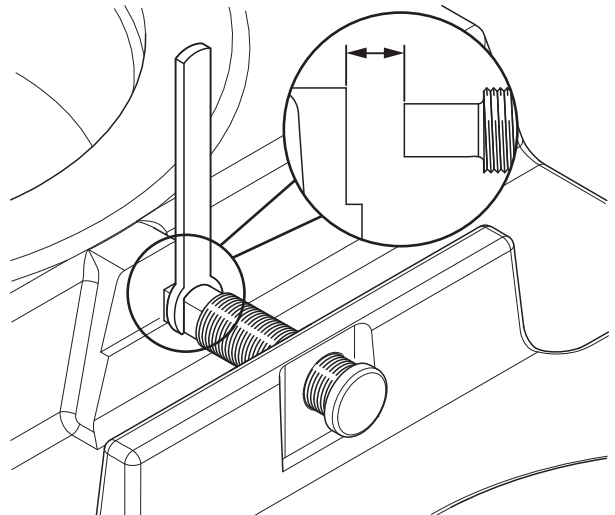
1. For separators with water tank: Remove the water tank by lowering the back end of the tank and then pulling it out of the frame.

For separators without water tank: Remove the cover.

2. Remove the brake.

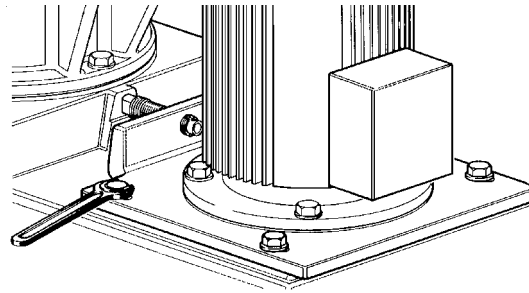
### Remove belt

1. Adjust the belt tightener to make sure there is a gap between frame pad and belt tightener.



G1058411

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



G0076622

3. Remove the belt.
4. Clean the raceways and the friction coupling.

Clean the raceways of the bowl spindle and the friction coupling using a degreasing agent.

Wipe the raceways with a clean rag after cleaning.

### NOTE

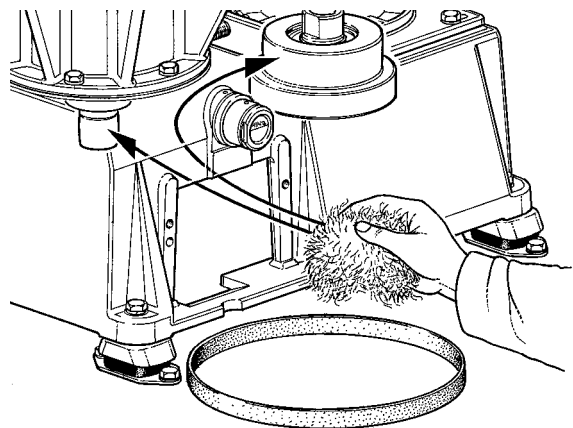
**Make sure there is no dirt, oil or grease on the raceways.**

5. Remove the motor adapter screws.
6. Remove the motor and the friction coupling.

Lift the motor together with adapter and friction coupling.

### NOTE

**The capacity of the lifting equipment should be at least 50 kg.**



G0171531

7. Lubricate the adapter and the frame surface.

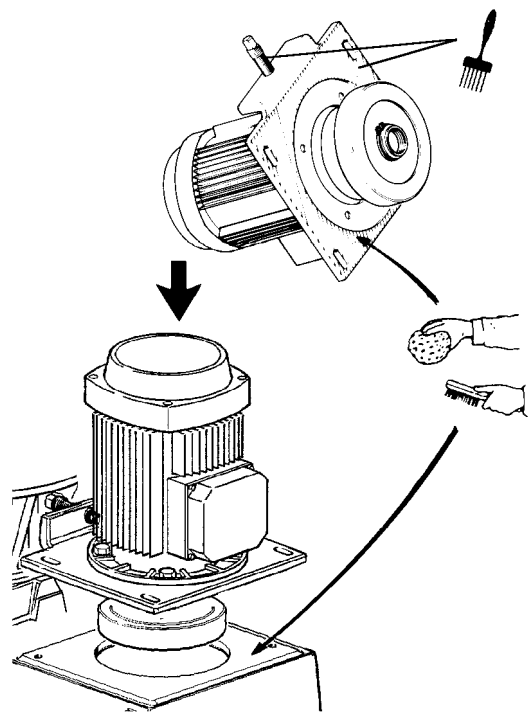
Make sure there is a sufficient film of lubricating paste between the adapter and the frame surface.

For more information regarding lubricants refer to the lubrication instructions for the product.

8. Install motor and friction coupling.
9. Fit the motor adapter screws but do not tighten them.
10. Lubricate the threads of the belt tightener.

Make sure there is a sufficient film of lubricating paste on the threads of the belt tightener.

For more information regarding lubricants refer to the lubrication instructions for the product.



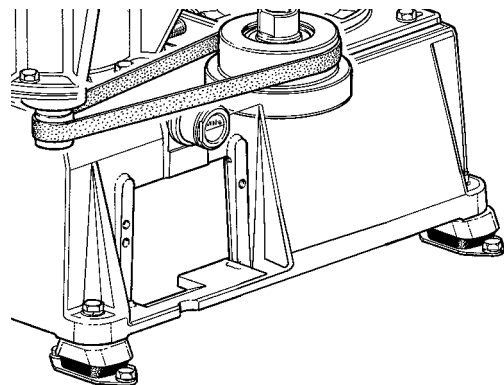
G0077341

### Install belt

1. Assemble the belt on the motor side first and then on to the spindle.

Tighten the belt by moving the motor backwards by hand.

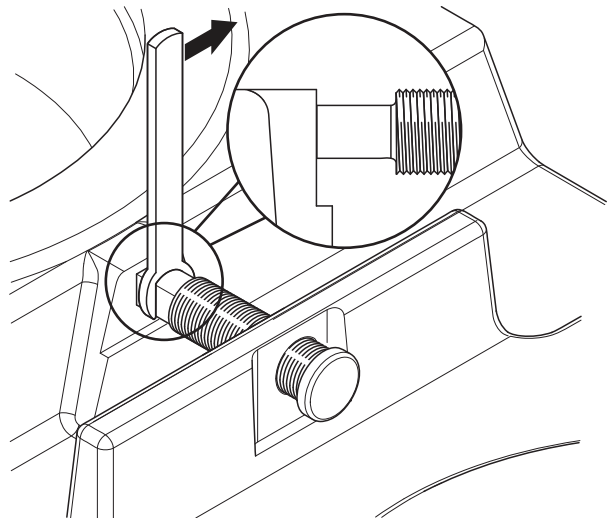
Pull the belt around a few turns by hand.



G0171661

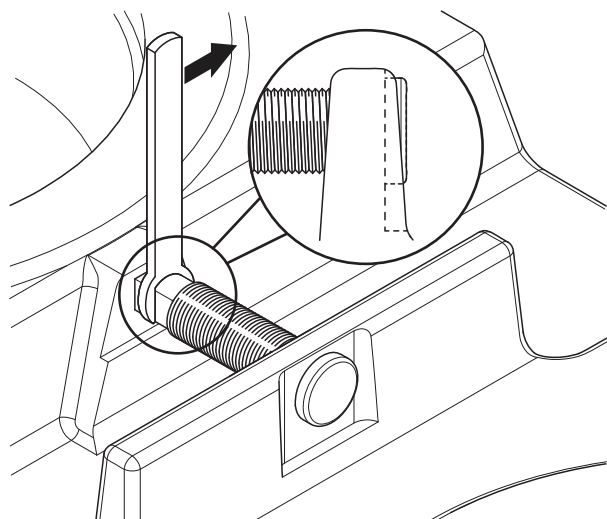
### 2. Tighten belt

Rotate the belt tightener until it makes contact with the frame pad.



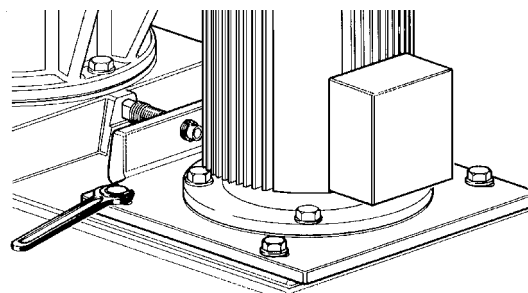
G1058611

Tighten the belt by rotating the belt tightener until the end lug of the screw is in contact with the motor adapter.



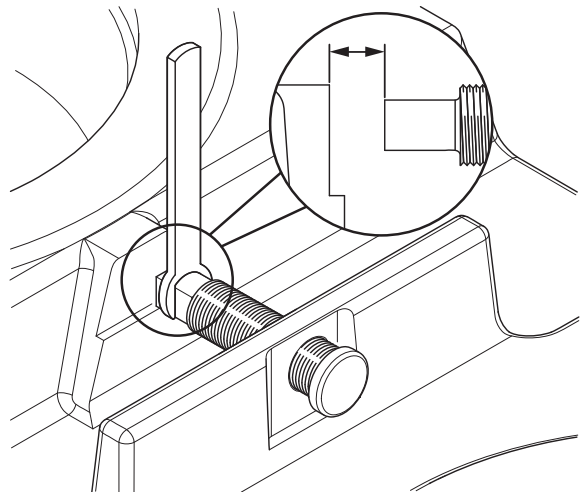
G1058511

### 3. Tighten the motor adapter screws.



G0076622

4. Loosen the belt tightener.



G1058411

#### **Install water tank or cover and brake**

1. For separators with water tank: Install the water tank.

For separators without water tank: Install the cover.

2. Install the brake.

#### **Before starting the separator**

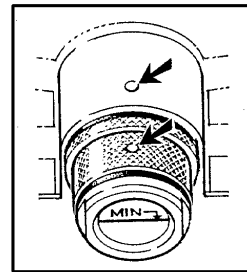
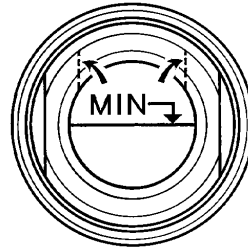
Wait at least 30 minutes before starting the separator.

## 6.5 Oil filling device

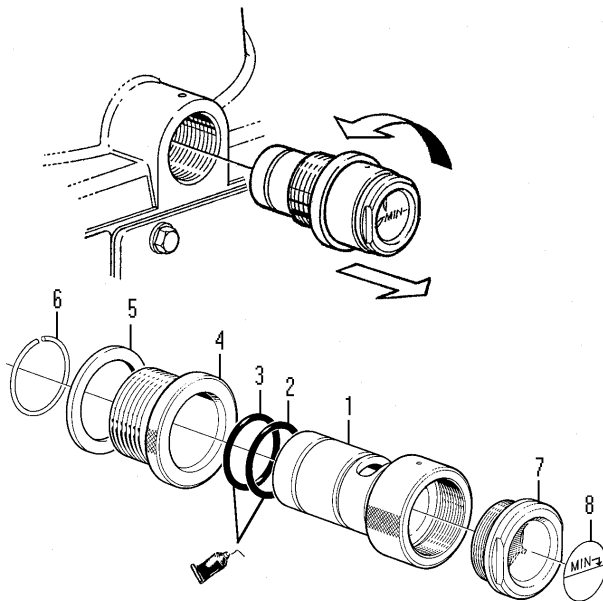
### 6.5.1 Dismantling/assembly

Drain off the oil, see [5.8 Oil change on page 62](#).

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



G0155811



G0155911

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

## 6.6 Water tank

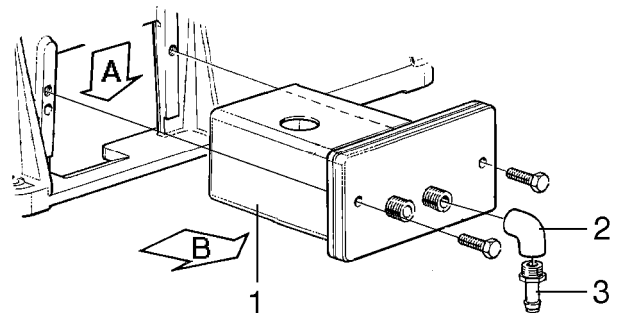
Remove the water tank (1).

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

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

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

- Seal the water inlet pipe with Loctite 573.

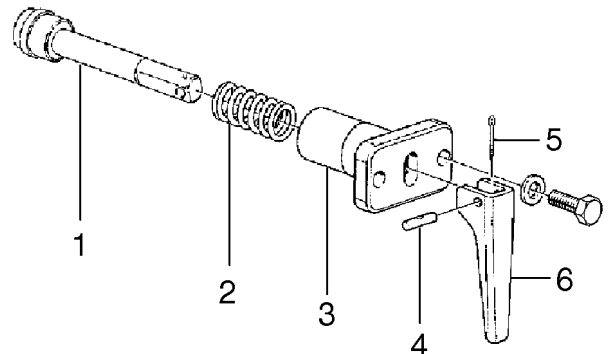


G0884711

1. Water container
2. Elbow
3. Pipe

## 6.7 Brake

### 6.7.1 Exploded view



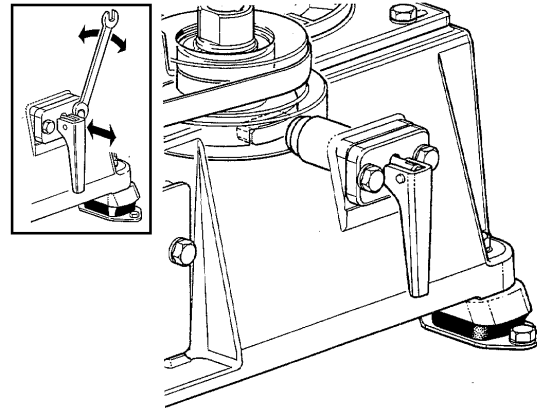
G0171731

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

### 6.7.2 Checking of friction element

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

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

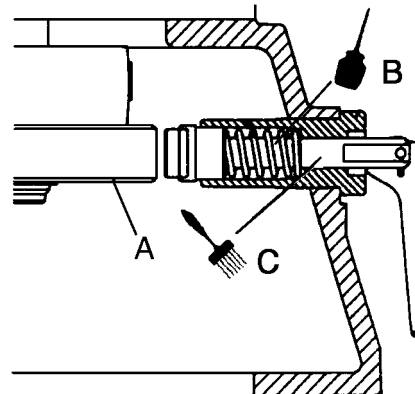


G0171821

#### Checking of bracket, spindle and spring

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

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



G0171941

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

#### Checking the brake

After the brake assembly has been fitted, release the brake and rotate the bowl slowly by hand. If a scraping noise is heard, the friction element is probably touching the coupling pulley surface (A). If so, it is necessary to adjust the position of the motor adapter and re-tighten the flat belt, see [on page 130](#).

## 6.8 Frame feet

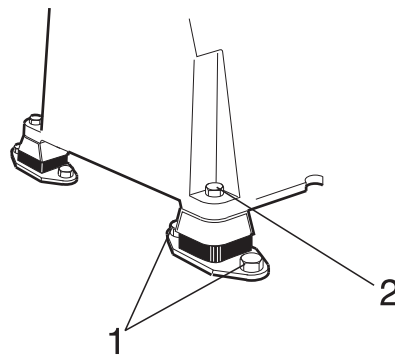
### 6.8.1 Mounting of new frame feet

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

Remove the bowl before lifting the separator.

Follow the Lifting instructions.

1. Loosen the foundation bolts and lift the separator.
2. Remove the existing frame feet.
3. Mount the new feet.
4. Place the separator in its original position and fasten the foundation bolts.
5. Remove the two lifting eye bolts.
6. Assemble the separator bowl, see [6.1.2 Inlet/outlet and bowl - assembly on page 90](#).



G0358351

1. Foundation bolts
2. Bolt



---

# 7 Technical reference

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## NOTE

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

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

## 7.1 Product description

*Alfa Laval ref. 9056646 Rev. 1*

**Product specification:** 881100-08-01  
**Commercial name:** S 817  
**Application:** Mineral oil  
**Technical Design:** Clarifier (alternative Purifier).  
Partial discharge  
Machine bottom part for belt drive  
Intended for marine and land applications.  
Color of finish painting of painted parts according to order.  
Quality of painting according to specifications on drawings.  
Sealings available in Nitrile.

**Operational limits:**

Discharge interval: 2 to 60 minutes  
Feed temperature: 0 °C to +100 °C  
Ambient temperature: +5 °C to +55 °C  
Not to be used for liquids with flashpoint below 60 °C.  
Maximum allowed density of operating liquid: 1000 kg/m<sup>3</sup>.  
Risk for corrosion and erosion have to be investigated in each case.

## 7.2 Declaration

### Declaration EU

Alfa Laval ref. 591985 Rev. 12

This declaration is issued under the sole responsibility of the manufacturer.

Manufacturer: Alfa Laval Technologies AB  
 Manufacturer address: Alfa Laval Technologies AB, Box 74. SE-221 00 Lund- Sweden.  
 Type: .....  
 Product specification: .....  
 Configuration number: .....  
 Serial number: .....

### Declaration of Incorporation of Partly Completed Machinery

The machinery complies with the relevant, essential health and safety requirements of:

| Designation                                                                                                                                                                                                                                                                                        | Description         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 2006/42/EC                                                                                                                                                                                                                                                                                         | Machinery Directive |
| The following essential requirements of 2006/42/EC are applied and fulfilled:<br>1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.2.3, 1.2.4, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.7, 1.3.8, 1.3.9,<br>1.5.1, 1.5.2, 1.5.4, 1.5.5, 1.5.6, 1.5.8, 1.5.9, 1.5.11, 1.5.15, 1.6.1, 1.6.3, 1.6.4, 1.6.5, 1.7 |                     |

To meet the requirements the following standards have been applied:

| Designation       | Description                                                                              |
|-------------------|------------------------------------------------------------------------------------------|
| EN 60204-1:2018   | Safety of machinery - Electrical equipment of machines. Part 1: General requirements     |
| EN ISO 12100:2010 | Safety of machinery - General principles for design - Risk assessment and risk reduction |
| EN ISO 3744:2010  | Acoustics - Determination of sound power levels of noise sources using sound pressure    |

### EU Declaration of Conformity

The machinery complies with the following Directives:

| Designation | Description                                                                                   |
|-------------|-----------------------------------------------------------------------------------------------|
| 2014/30/EU  | Electromagnetic Compatibility Directive                                                       |
| 2011/65/EU  | Restriction of the use of certain hazardous substances in electrical and electronic equipment |

To meet the requirements the following standards have been applied:

| Designation       | Description                                                                                                                              |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| EN IEC 63000:2018 | Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances |

The technical construction file for the machinery is compiled and retained by the authorized person Fredrik Nytomt within the Business Unit High Speed Separators, Alfa Laval Technologies AB, Box 74. SE-221 00 Lund, Sweden. By reasoned request all relevant technical documentation will be sent by post to national authorities.

This machinery is to be incorporated into other equipment and must not be put into service until it has been completed with starting/stopping equipment, control equipment, auxiliary equipment. e.g. valves, according to the instructions in the technical documentation, and after the completed machinery has been declared in conformity with the directives mentioned above, in order to fulfill the EU-requirements.

Signed for and on behalf of: Alfa Laval Technologies AB

Place: .....

Date of issue: .....

Signature: .....

Name: .....

Function: .....

Entity: .....

## Declaration UK

*Alfa Laval ref. 591985 Rev. 12*

This declaration is issued under the sole responsibility of the manufacturer.

Manufacturer: Alfa Laval Technologies AB  
 Manufacturer address: Alfa Laval Technologies AB, Box 74. SE-221 00 Lund- Sweden.  
 Type: .....  
 Product specification: .....  
 Configuration number: .....  
 Serial number: .....

## Declaration of Incorporation of Partly Completed Machinery

The machinery complies with the relevant, essential health and safety requirements of:

Supply of Machinery (Safety) Regulations 2008.

The following essential requirements are applied and fulfilled:

1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.2.3, 1.2.4, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.7, 1.3.8, 1.3.9, 1.5.1, 1.5.2, 1.5.4, 1.5.5, 1.5.6, 1.5.8, 1.5.9, 1.5.11, 1.5.15, 1.6.1, 1.6.3, 1.6.4, 1.6.5, 1.7

To meet the requirements the following standards have been applied:

| Designation       | Description                                                                              |
|-------------------|------------------------------------------------------------------------------------------|
| EN 60204-1:2018   | Safety of machinery - Electrical equipment of machines. Part 1: General requirements     |
| EN ISO 12100:2010 | Safety of machinery - General principles for design - Risk assessment and risk reduction |
| EN ISO 3744:2010  | Acoustics - Determination of sound power levels of noise sources using sound pressure    |

## UK Declaration of Conformity

The machinery complies with the following Regulations:

| Designation                                                                                                        | Description |
|--------------------------------------------------------------------------------------------------------------------|-------------|
| Electromagnetic Compatibility Regulations 2016                                                                     |             |
| The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 |             |

To meet the requirements the following standards have been applied:

| Designation       | Description                                                                                                                              |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| EN IEC 63000:2018 | Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances |

The technical construction file for the machinery is compiled and retained by the authorized person Fredrik Nytomt within the Business Unit High Speed Separators, Alfa Laval Technologies AB, Box 74. SE-221 00 Lund, Sweden. By reasoned request all relevant technical documentation will be sent by post to national authorities.

This machinery is to be incorporated into other equipment and must not be put into service until it has been completed with starting/stopping equipment, control equipment, auxiliary equipment. e.g. valves, according to the instructions in the technical documentation, and after the completed machinery has been declared in conformity with the regulations mentioned above, in order to fulfill the UK-requirements.

Signed for and on behalf of: Alfa Laval Technologies AB

Place: .....

Date of issue: .....

Signature: .....

Name: .....

Function: .....

Entity: .....

## 7.3 Technical data

Alfa Laval ref. 9056634 Rev. 0

|                                   |                                                                |                                                  |
|-----------------------------------|----------------------------------------------------------------|--------------------------------------------------|
| Maximum density                   | feed<br>sediment                                               | 1100 kg/m <sup>3</sup><br>2332 kg/m <sup>3</sup> |
| Power consumption                 | idling<br>running (at max. capacity)<br>max. power consumption | 0,9 kW<br>2,0 kW<br>2,8 kW (at starting-up)      |
| Bowl speed synchronous            | 9512 / 9307                                                    | r/min. 50Hz/60Hz                                 |
| Motor speed synchronous           | 3000 / 3600                                                    | r/min. 50Hz/60Hz                                 |
| Gear ratio (pulleys)              | 130:41 (50 Hz)<br>106:41 (60 Hz)                               |                                                  |
| Starting time min./max.           | 2,2 - 3,6 minutes                                              |                                                  |
| Stopping time                     | Running down without brake<br>With brake                       | average 19 minutes<br>min. 3, max. 4 minutes     |
| Maximum running time without flow | Empty bowl / Filled bowl                                       | 180 minutes                                      |
| Sludge volume total/efficient     | 1,0 / 0,3 litres                                               |                                                  |
| Fixed discharge bowl volume       | 1,2 ± 0,1 litres                                               |                                                  |
| Max. density of operating liquid  | 1000 kg/m <sup>3</sup>                                         |                                                  |
|                                   |                                                                |                                                  |
| Lubricating oil volume            | 0,5 litres                                                     |                                                  |
| Bowl liquid volume                | 2,2 litres                                                     |                                                  |
| Sound pressure level              | 75 dB(A)                                                       |                                                  |
| Sound power                       | 8,9 Bel(A)                                                     |                                                  |
| Min./Max. feed temperature:       | 0 / 100 °C                                                     |                                                  |
| Vibration level                   | Separator in use                                               | Max. 9 mm/sec                                    |
| Weight                            | Separator without motor<br>Motor<br>Complete bowl              | Net weight approx. 193 kg<br>21-32 kg<br>37 kg   |
| Motor power                       | 3 / 3,7 Kw                                                     |                                                  |
| Jp reduced to motor shaft, 50 Hz: | 2,9 kg/m <sup>3</sup>                                          |                                                  |
| Jp reduced to motor shaft, 60 Hz: | 1,9 kg/m <sup>3</sup>                                          |                                                  |
| Bowl material                     | AL 111 2377-02                                                 |                                                  |

### NOTE

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

## 7.4 Connection list

Alfa Laval ref. 9035028 Rev. 0

### 200 - Connections for process flows

|            |                             |                                               |                   |
|------------|-----------------------------|-----------------------------------------------|-------------------|
| <b>201</b> | <b>Inlet process liquid</b> |                                               |                   |
|            | Remark                      | -                                             |                   |
|            | Flow                        | See "Performance data in- and outlet device". |                   |
|            | Inlet pressure              | See "Performance data in- and outlet device". | kg/m <sup>3</sup> |

|            |                                                  |                                    |       |
|------------|--------------------------------------------------|------------------------------------|-------|
| <b>206</b> | <b>Inlet liquid seal and displacement liquid</b> |                                    |       |
|            | Remark                                           | -                                  |       |
|            | Quality requirements                             | See "Quality specification water". |       |
|            | Flow, set value                                  | 1.3                                | l/min |

|            |                                             |                                               |     |
|------------|---------------------------------------------|-----------------------------------------------|-----|
| <b>220</b> | <b>Outlet light phase, clarified liquid</b> |                                               |     |
|            | Remark                                      | -                                             |     |
|            | Counter pressure                            | See "Performance data in- and outlet device". | kPa |
|            | Capacity                                    | See "Performance data in- and outlet device". |     |

|              |                           |                                                 |  |
|--------------|---------------------------|-------------------------------------------------|--|
| <b>(221)</b> | <b>Outlet heavy phase</b> |                                                 |  |
|              | Remark                    | Should be possible to drain liquids by gravity. |  |

|            |                           |                                                                                                                 |  |
|------------|---------------------------|-----------------------------------------------------------------------------------------------------------------|--|
| <b>222</b> | <b>Outlet solid phase</b> |                                                                                                                 |  |
|            | Remark                    | The outlet from the sludge cover must always be arranged to prevent the cover from being filled up with sludge. |  |
|            | Discharge volume          | See "Technical data".                                                                                           |  |

### 300 - Connections for flushing, CIP, and operating systems

|            |                               |                                    |       |
|------------|-------------------------------|------------------------------------|-------|
| <b>372</b> | <b>Inlet discharge liquid</b> |                                    |       |
|            | Remark                        | -                                  |       |
|            | Quality requirements          | See "Quality specification water". |       |
|            | Flow, set value               | 18                                 | l/min |

|            |                             |                                    |                  |
|------------|-----------------------------|------------------------------------|------------------|
| <b>373</b> | <b>Inlet make-up liquid</b> |                                    |                  |
|            | Remark                      | -                                  |                  |
|            | Quality requirements        | See "Quality specification water". |                  |
|            | Flow, set value             | 0.9                                | l/min            |
|            | Consumption                 | 0.9                                | litre/dis-charge |

|            |                                |                                                 |  |
|------------|--------------------------------|-------------------------------------------------|--|
| <b>377</b> | <b>Outlet operating liquid</b> |                                                 |  |
|            | Remark                         | Should be possible to drain liquids by gravity. |  |

**400 - Connections for liquids**

|            |                                       |                                                 |  |
|------------|---------------------------------------|-------------------------------------------------|--|
| <b>462</b> | <b>Drain of frame top part, lower</b> |                                                 |  |
|            | Remark                                | Should be possible to drain liquids by gravity. |  |

|            |                                       |                                                 |  |
|------------|---------------------------------------|-------------------------------------------------|--|
| <b>463</b> | <b>Drain of frame top part, upper</b> |                                                 |  |
|            | Remark                                | Should be possible to drain liquids by gravity. |  |

**700 - Connections for electricity**

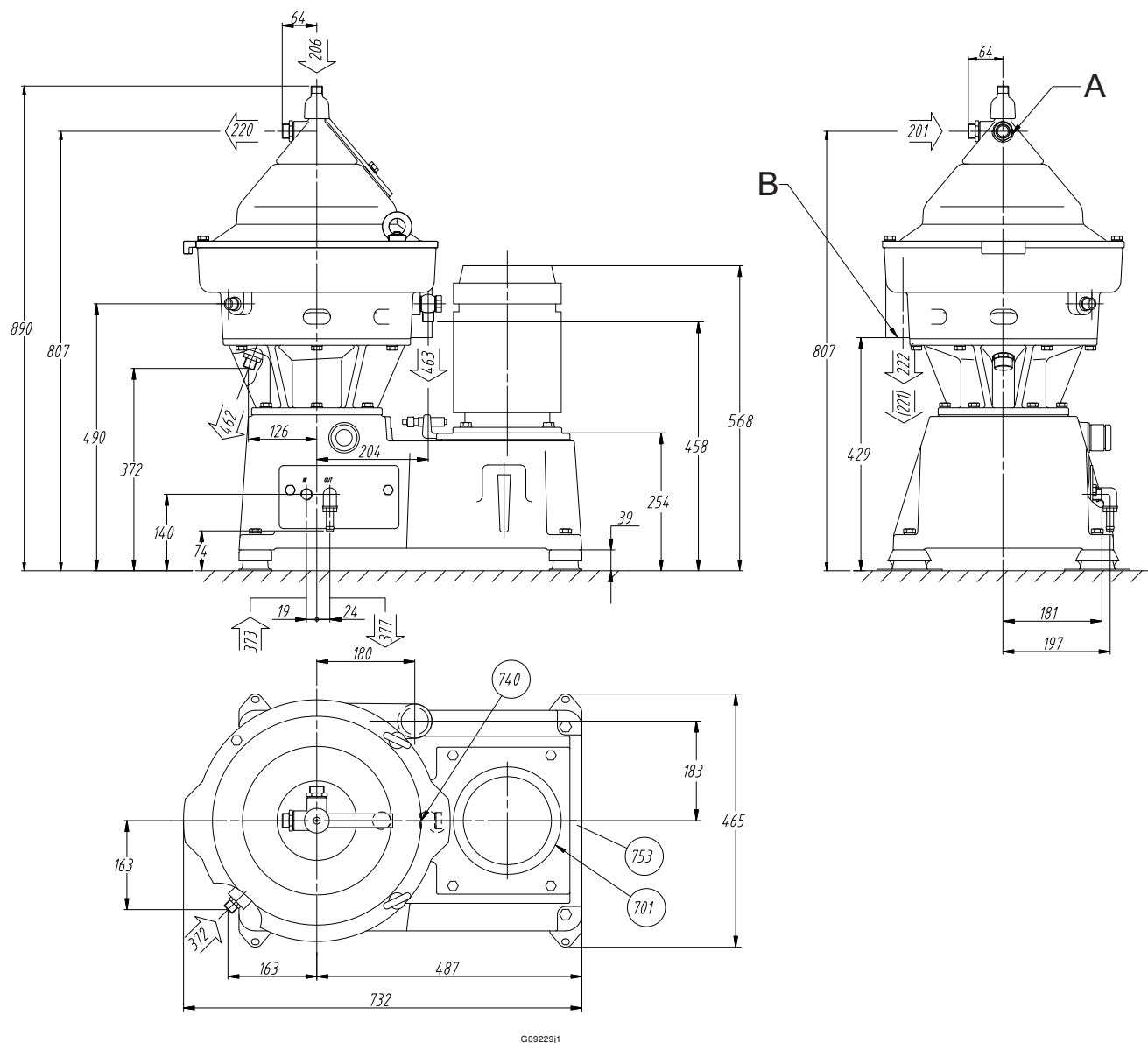
|            |                                                                  |          |   |
|------------|------------------------------------------------------------------|----------|---|
| <b>701</b> | <b>Motor for separator</b>                                       |          |   |
|            | Remark                                                           | -        |   |
|            | Allowed frequency variation                                      | $\pm 5$  | % |
|            | Allowed frequency variation momentarily during maximum 5 seconds | $\pm 10$ | % |

|            |                                            |                                          |    |
|------------|--------------------------------------------|------------------------------------------|----|
| <b>740</b> | <b>Speed sensor for bowl spindle</b>       |                                          |    |
|            | Remark                                     | -                                        |    |
|            | Type                                       | NAMUR, inductive proximity switch        | -  |
|            | Supply voltage, nominal                    | 8                                        | V  |
|            | With sensor activated (near metal)         | $\leq 1$                                 | mA |
|            | With sensor not activated (far from metal) | $\geq 3$                                 | mA |
|            | Maximum speed                              | See <a href="#">"7.3 Technical data"</a> |    |
|            | Pulses per revolution                      | 2                                        |    |

|            |                                         |             |      |
|------------|-----------------------------------------|-------------|------|
| <b>753</b> | <b>Unbalance sensor, vibration</b>      |             |      |
|            | Remark                                  | -           |      |
|            | Mechanical switch                       |             | -    |
|            | – Frequency range                       | 300         | Hz   |
|            | – Vibration measurement range           | 4.5         | g    |
|            | – Internal impedance                    | 4 $\pm 5\%$ | kOhm |
|            | – Reset coil voltage                    | 48          | V DC |
|            | – Maximum reset coil power              | 14          | W    |
|            | – Switch rating, maximum resistive load | 2 (24 V DC) | A    |

## 7.5 Basic size drawing

Alfa Laval ref. 9035033 Rev. 1



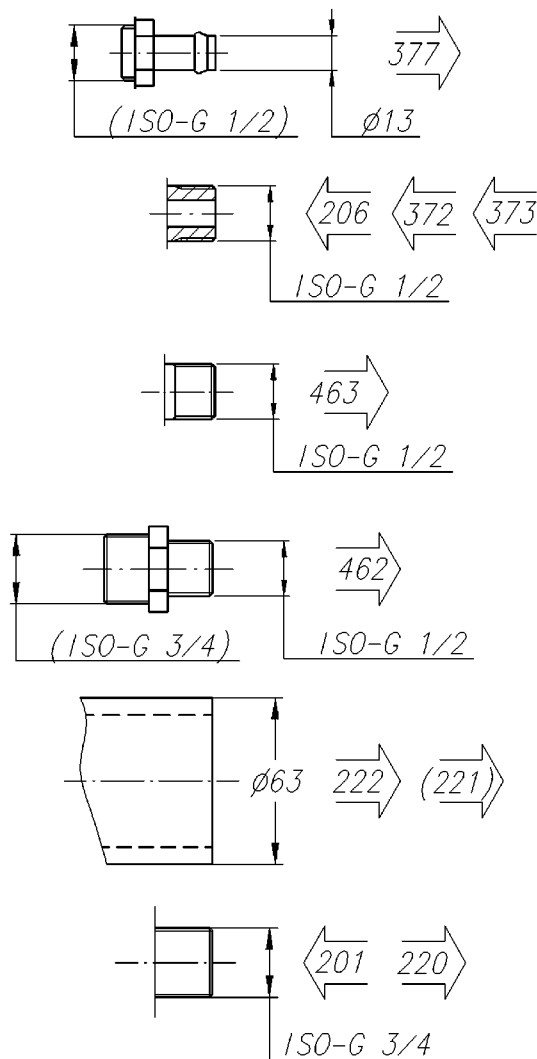
G09229j1

Connections 201 and 220 are turnable  $90^\circ$ .

- A. Maximum horizontal displacement during operation  $\pm 20$  mm.
- B. Maximum vertical displacement during operation  $\pm 10$  mm.

## 7.5.1 Dimensions of connections

Alfa Laval ref. 9035033 Rev. 0



G0922981

All dimensions are nominal.

Reservation for individual deviations due to tolerance.

All connections to be installed non-loaded and flexible.

Data for connections see [7.4 Connection list on page 143](#)

## 7.6 Interface description

Alfa Laval ref. 9034968 Rev. 1

### 7.6.1 Scope

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

### 7.6.2 References

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

- Interconnection Diagram
- Connection List
- Technical data

#### **Standards referred to are:**

- EN ISO 13850 Safety of machinery - Emergency stop equipment, functional aspects - Principles of design
- EN ISO 14118 Safety of machinery - Prevention of unexpected start-up
- EN 954-1 Safety of machinery – Safety related parts of control systems  
- Part 1 General principles for design

### 7.6.3 Definitions

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

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

### 7.6.4 Goal

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

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

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

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

### 7.6.5 Description of separator modes

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

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

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

**Stand still means:**

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

**Starting means:**

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

**Running means:**

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

**Stopping means:**

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

## 7.6.6 Handling of connection interfaces

### Electrical connections

#### *701 Separator motor.*

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

The separator can also be started by a Y/D starter, but then the time in Y-position must be maximized to 5 seconds.

There shall be an emergency stop circuit designed according to EN ISO 13850 and a power isolation device according to EN ISO 14118.

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

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

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

#### *740 Speed sensor*

A proximity sensor of inductive type according to Namur standard is giving a number of pulses per revolution of the bowl ( see [7.4 Connection list](#)).

Signal processing in *STARTING*:

- The separator should be stopped automatically according to *NORMAL STOP* procedure and an alarm should be given when the accumulated time for acceleration is longer than the maximum time specified in Technical data. An abnormal start time indicates some malfunction of the separator equipment and should be investigated.
- If the speed exceeds "Bowl speed, synchronous" in Technical data with more than 5 % the separator shall be stopped automatically by *NORMAL STOP* and a high speed alarm shall be given.

- The speed monitoring system shall be checked continuously (e.g. by checking that pulses are coming). In case of failure indication the separator shall be stopped automatically by *NORMAL STOP* with a timer controlled stop sequence and an alarm for speed monitoring system failure shall be given.
- The acceleration should be supervised to ensure that a certain speed (e.g. 250 r/min) has been reached within a certain time (e.g. 30 seconds).

Signal processing in *RUNNING*:

- If the speed exceeds "Bowl speed, synchronous" in Technical data with more than 5 % for a period longer than 1 minute or momentarily during maximum 5 seconds more than 10 % the separator shall be stopped automatically by *NORMAL STOP* and a high speed alarm shall be given.
- If the speed falls more than 10 % below the synchronous speed for a period longer than 1 minute or 15 % during more than 5 seconds a low speed alarm should be given. Low speed indicates some malfunction of the separator equipment and shall be investigated.
- The speed monitoring system shall be checked continuously (e.g. by checking that pulses are coming). In case of a failure indication an alarm for speed monitoring system failure shall be given. If there is a risk of too high speed the separator shall be stopped by *NORMAL STOP*.
- The speed drop during **DISCHARGE**, compared to the measured speed immediately before, should be between 3-8 % which will indicate a proper discharge.

Signal processing in *STOPPING*:

- *STAND STILL* shall be indicated when no pulses are detected within 30 seconds.
- Stopping the separator when alarm for speed monitoring system failure is active, shall cause a timer controlled stop. (See "Stop time" in Technical data.)

### *753 Unbalance sensor, (Option).*

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

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

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

Signal processing in *STARTING*:

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

Signal processing in *RUNNING*:

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

Signal processing in *STOPPING*:

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

Signal processing in *NORMAL STOP*:

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

### **Fluid connections**

Complementary information is given in the document Connection List.

### *201 Inlet for process liquids (feed).*

Processing in *STAND STILL*:

- Shall be closed.

Processing in *STARTING*:

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

Processing in *RUNNING*:

- Could be closed or open.
- Shall be closed before a discharge. See [8.2.1 Operating water interface on page 178](#) or [8.3.1 Operating water interface on page 179](#).

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

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

Processing in *SAFETY STOP*:

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

*206 Inlet to liquid seal.*

Processing in *STAND STILL*:

- Shall be closed.

Processing in *STARTING*:

- Shall be closed.

Processing in *RUNNING*:

- Supplying a liquid seal prior to opening the feed: See Operating water interface.
- Displacing (the interface) before a discharge: See [8.2.1 Operating water interface on page 178](#) or [8.3.1 Operating water interface on page 179](#).

*220 and 221 Outlets*

Processing in *STAND STILL*:

- Could be closed or open.

Processing in other modes

- Shall be open.

*372 Inlet for discharge liquid.*

Processing in *STAND STILL*:

- Shall be closed.

Processing in *STARTING*:

- Shall be closed.

Processing in *RUNNING*:

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

*373 Inlet for make-up liquid.*

Processing in *STAND STILL*:

- Shall be closed.

Processing in *STARTING*:

- Shall be closed.

Processing in *RUNNING*:

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

## 7.7 Water quality

Alfa Laval ref. 574487 Rev. 2

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

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

### NOTE

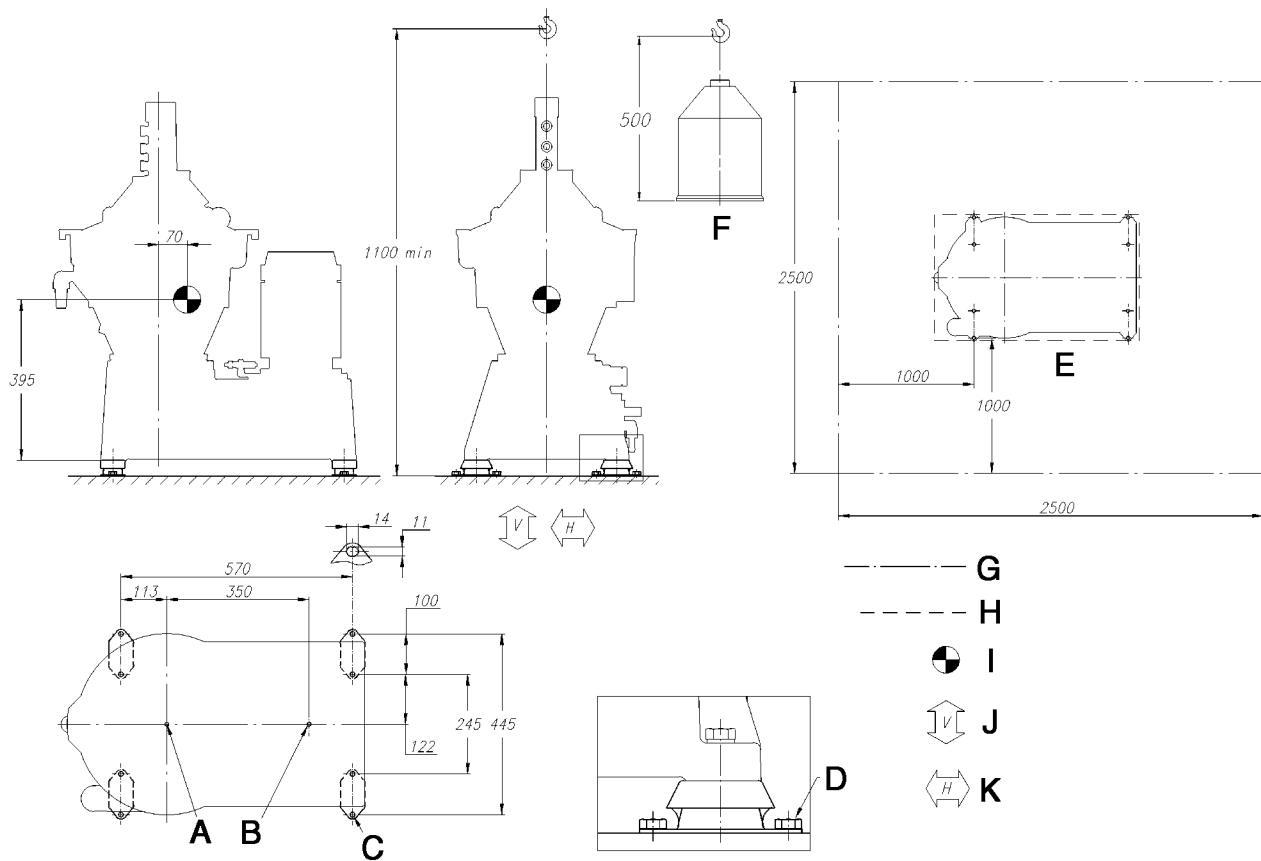
**Alfa Laval accepts no liability for consequences arising from unsatisfactorily purified operating water supplied by the customer.**

The following conditions must be fulfilled:

1. Turbidity free water, solids content <0.001% by volume.  
Deposits must not be allowed to form in certain areas in the separator.
2. A maximum particle size of 50 µm.
3. A total hardness of <180 mg CaCO<sub>3</sub> per litre, which corresponds to 10 °dH or 12.5 °E.  
Hard water may with time form deposits in the operating mechanism. The precipitation rate is accelerated with increased operating temperature and low discharge frequency. These effects become more severe as the hardness of the water increase.
4. A chloride content of maximum 100 ppm NaCl (equivalent to 60 mg Cl/l).  
A chloride concentration above 60 mg/l is not recommended.  
Chloride ions contribute to corrosion on the separator surface in contact with the operating water, including the spindle. Corrosion is a process that is accelerated by increased separating temperature, low pH, and high chloride ion concentration.
5. 6.5 < pH < 9  
Increased acidity (lower pH) increases the risk for corrosion; this is accelerated by increased temperature and high chloride ion content.
6. A bicarbonate content (HCO<sub>3</sub>) of minimum 70 mg HCO<sub>3</sub> per litre, which corresponds to 3.2 °dKH.

## 7.8 Foundation drawing

Alfa Laval ref. 548711 Rev. 3



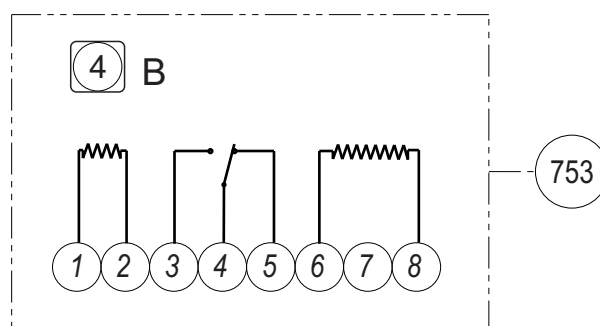
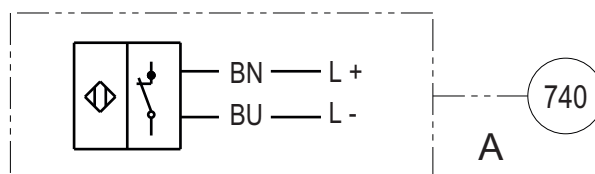
G0645731

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

## 7.9 Interconnection diagram

Alfa Laval ref. 9034944 Rev. 0

|                                                                                                                    |                             |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------|
| 1                                                                                                                  | Reset Coil                  |
| 2                                                                                                                  |                             |
| 3                                                                                                                  | NO                          |
| 4                                                                                                                  | Common                      |
| 5                                                                                                                  | NC                          |
| 6                                                                                                                  |                             |
| 7                                                                                                                  | Heater                      |
| 8                                                                                                                  |                             |
| A                                                                                                                  | Wiring without junction box |
| B                                                                                                                  | Reset button                |
| Wire colour codes:<br>BN = Brown<br>BU = Blue<br>Item shown in this document is not included<br>in all separators. |                             |

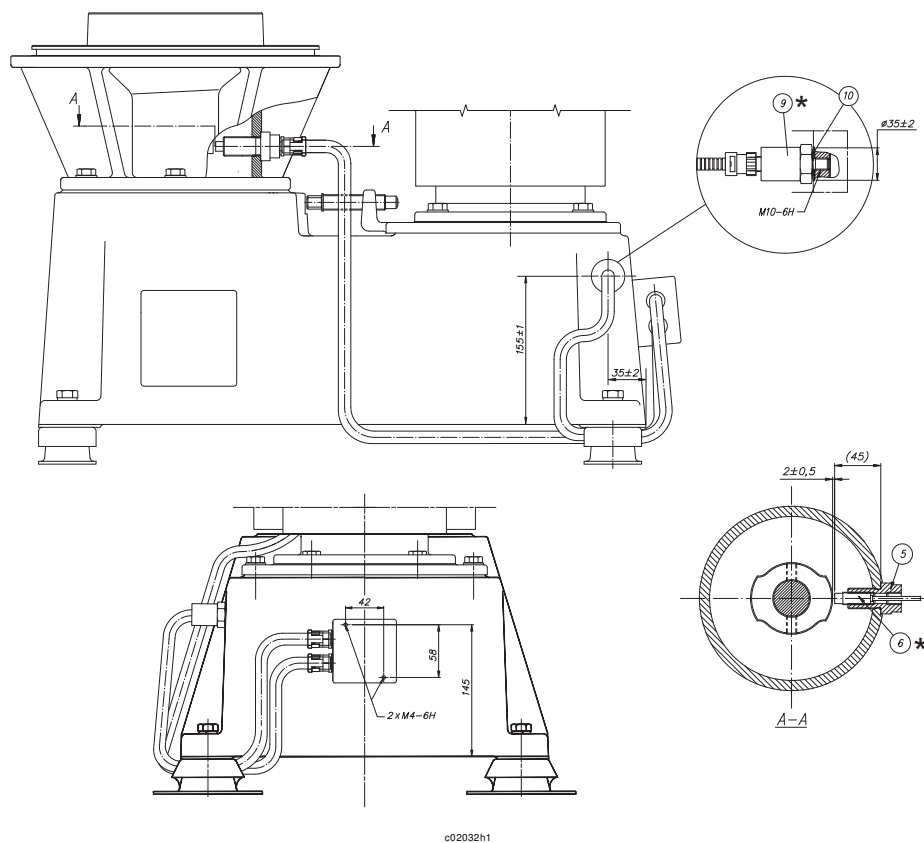


G0931751

753. Vibration sensor (mechanical switch)  
740. Speed sensor

## 7.10 Monitoring kit

Alfa Laval ref. 9027521 Rev. 4

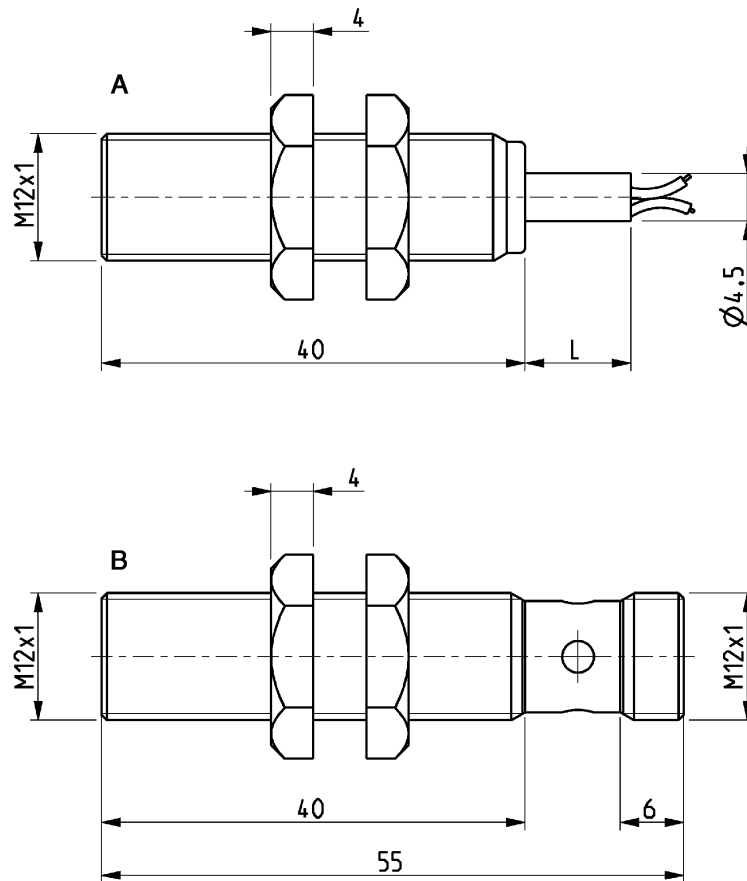


For details see the Spare parts catalogue

- 5. Sleeve
- 6. Speed sensor
- \*. Secured with locking liquid

### 7.10.1 Speed sensor

Alfa Laval ref. 552042 Rev. 10

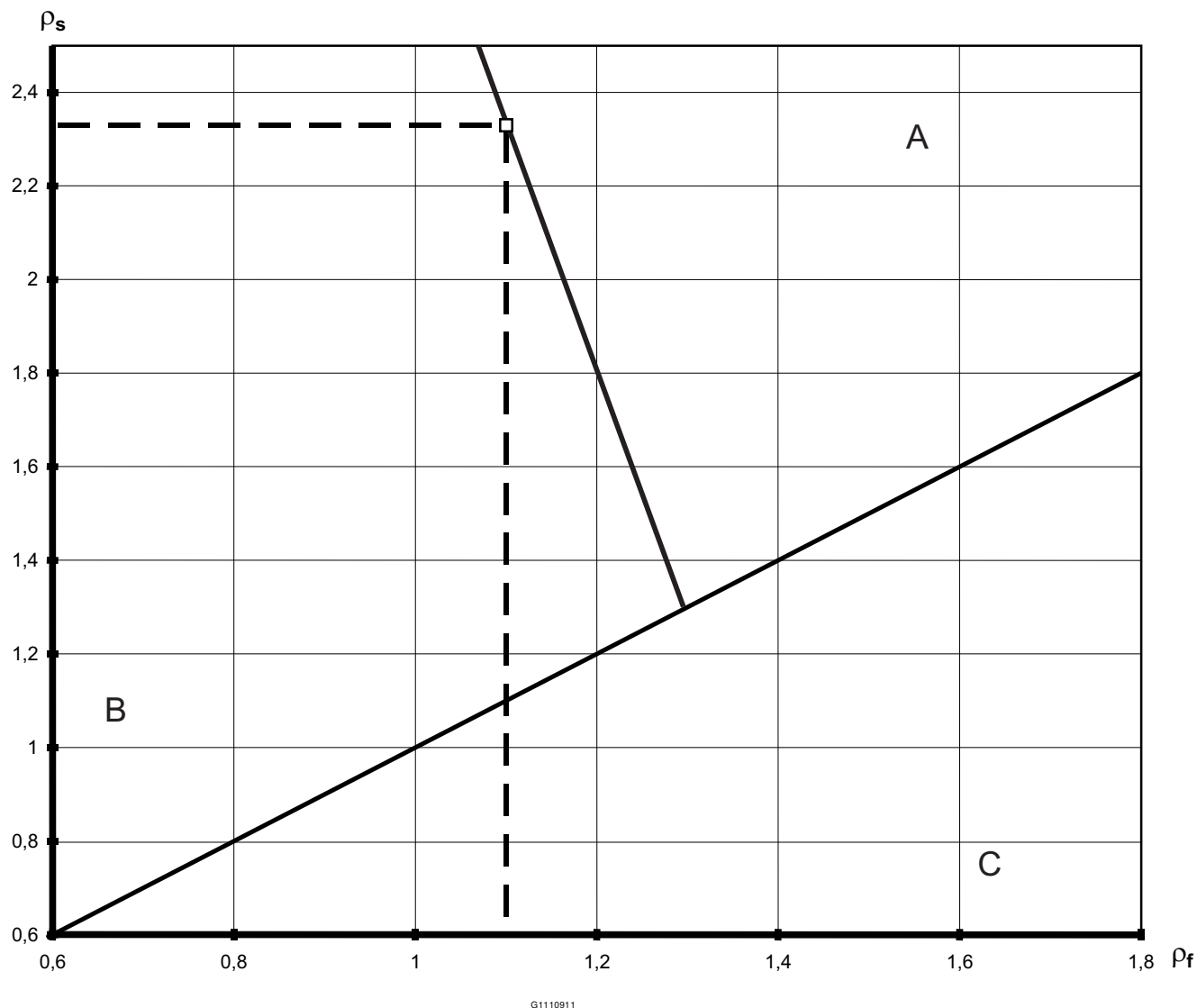


G06361K1

- A. Cable, 2 or 10 meters
- B. V1 connector/M12

## 7.11 PX sealing diagram

Alfa Laval ref. 561543 Rev. 1



- A. No sealing
- B. Operational envelope
- C. Non physical

Separator bowl speed: 9510 r/min

Separator bowl number: 561137-01, 561137-04, 561137-05

References density for Feed: 1100 kg/m<sup>3</sup>

References density for Wet solids: 2332 kg/m<sup>3</sup>

### NOTE

Max. allowed operating liquid density: 1000 kg/m<sup>3</sup>

## 7.12 Electric motor

For information regarding motor specifications, see motor plate.

For further information see motor manufacturer's documentation.



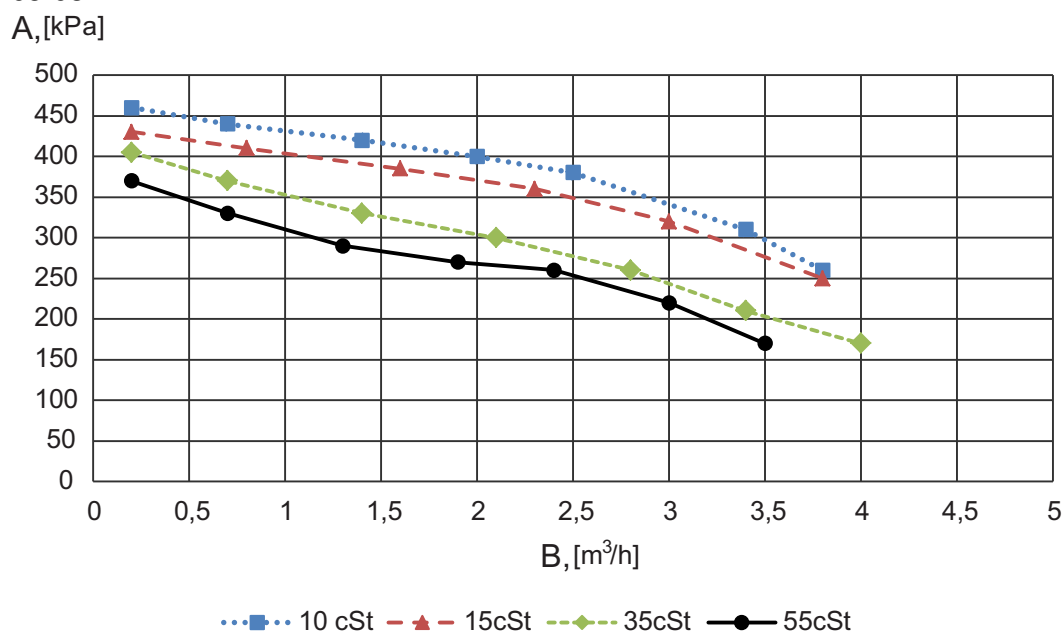
**For complete information about motor variants, please contact your Alfa Laval representative.**

## 7.13 Performance data, in- and outlet device

The counter pressure levels causing overflow are shown in diagrams below. Counter pressure as a function of throughput for the different in- and outlet devices.

Alfa Laval ref. 9056651 Rev. 1

### Counter pressure, In- and outlet device 9054265 03



G1250831

A. Counter pressure, kPa

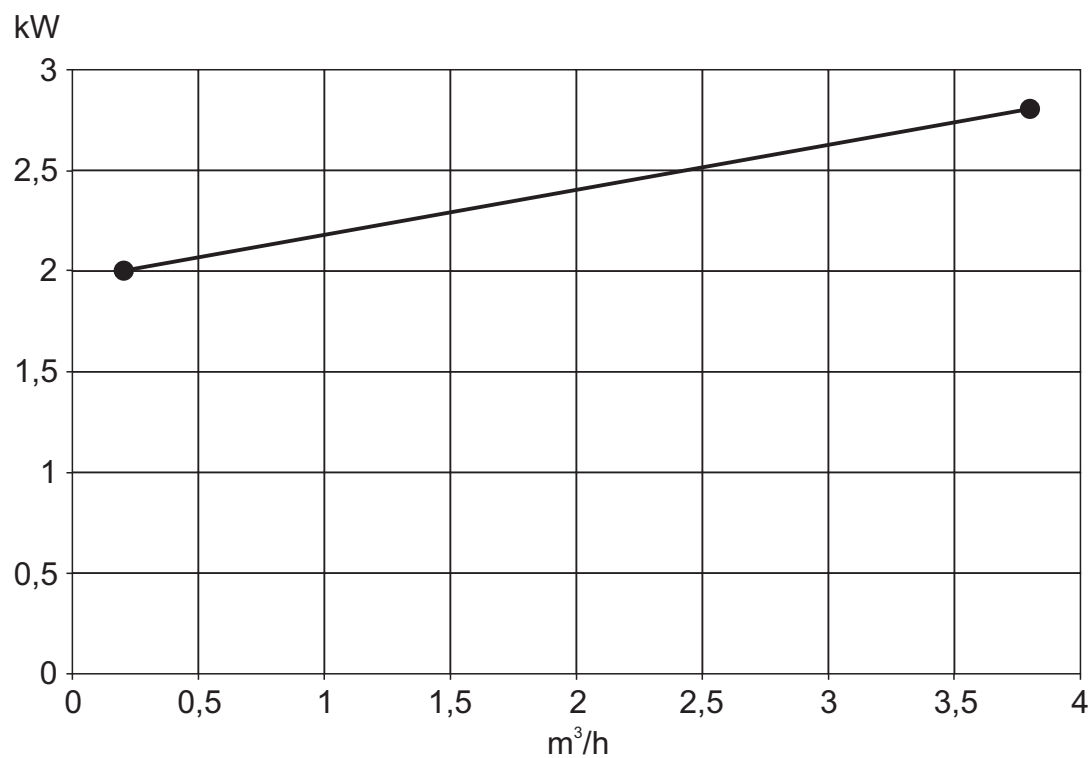
B. Volume flow, m³/h

## 7.14 Power consumption

Alfa Laval ref. 9056649 Rev. 1

Power consumption as a function of throughput for the different In- and outlet devices.

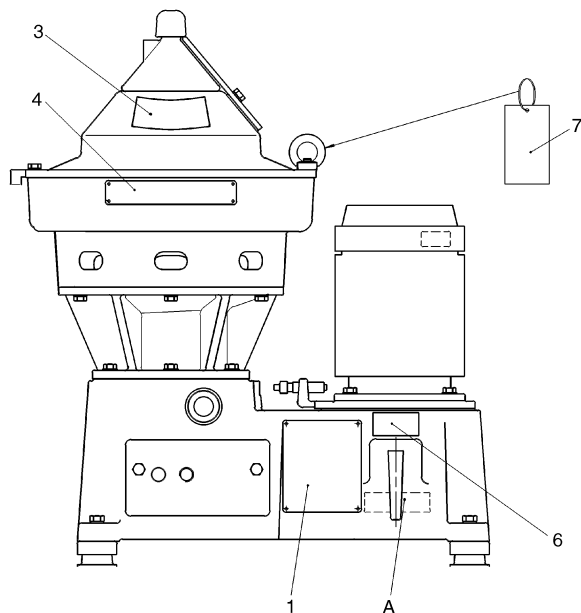
**Power consumption, In- and outlet device  
9054265 03:**



g1250631

## 7.15 Machine plates and safety labels

Alfa Laval ref. 556430 Rev. 3



G0635141

### 1. Machine plate

Separator type

Serial No / Year

Product No

Main group no

Configuration no

Designation

Max allowed speed (bowl)

Direction of rotation (bowl)

Speed motor shaft

El. current frequency

Recommended motor power

Max. density of feed

Max. density of sediment

Max. density of operating liquid

Process temperature min./max.

Inside diameter of bowl body

Manufacturer

Service enquiries

[www.alfalaval.com](http://www.alfalaval.com)



### 3. Safety label

Text on label:

#### Warning

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

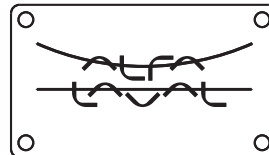
Failure to strictly follow instructions can lead to fatal injury.

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

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



### 4. Name plate

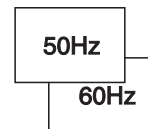


### 5. Arrow

Indicating direction of rotation.



### 7. Power supply frequency

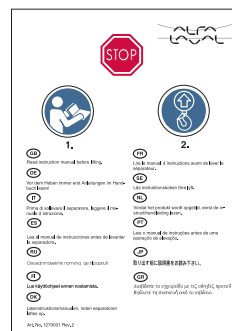


### 8. Lifting instructions

Text on label:

Read instruction manual before lifting.

\* Space reserved for plate indicating representative



## 7.16 Storage and Installation

### 7.16.1 Introduction

These installation specifications are valid for the separator.

The installation instructions are specifications, which are compulsory requirements.

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

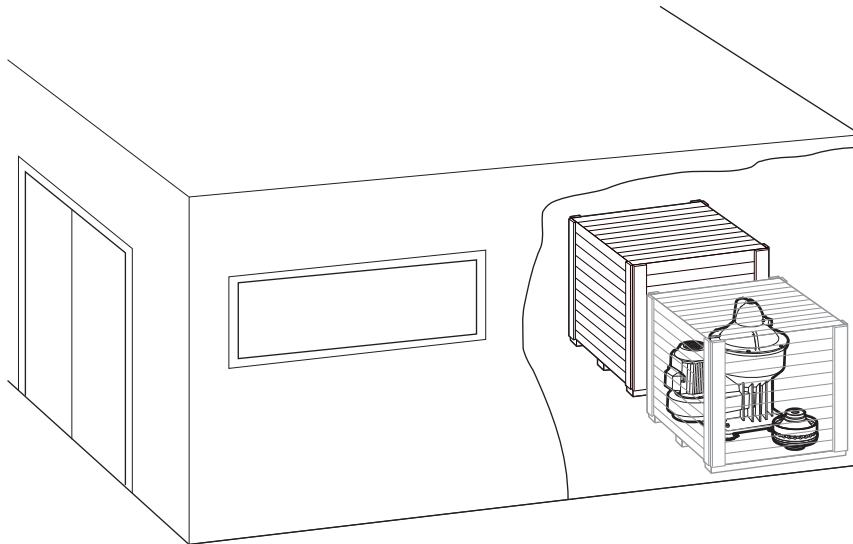
A blue rectangular box with a black border and the word "NOTE" in white, bold, uppercase letters.

#### NOTE

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

### 7.16.2 Protection and storage of goods

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



G08736B1

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

**The following protection products are recommended:**

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

### 7.16.3 Storage at out of operation

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

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

For details see [7.16.2 Protection and storage of goods on page 167](#)

### 7.16.4 Before start-up

If the separator has been out of operation for:

#### 1 months or longer

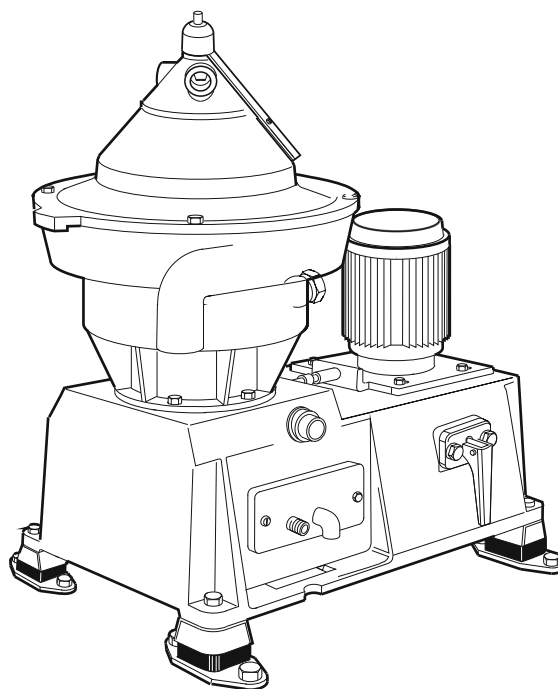
- Pre-lubricate the spindle bearings.

#### 6 months or longer

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

#### 18 months or longer

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



G04648f1

## 7.16.5 Connections to surrounding equipment

### Local safety regulations

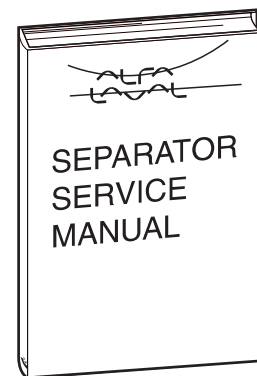
If the local safety regulations prescribe that the installation has to be inspected and approved by responsible authorities before the plant is put into service, consult with such authorities before installing the equipment and have the projected plant design approved by them.



G0873911

### Service media

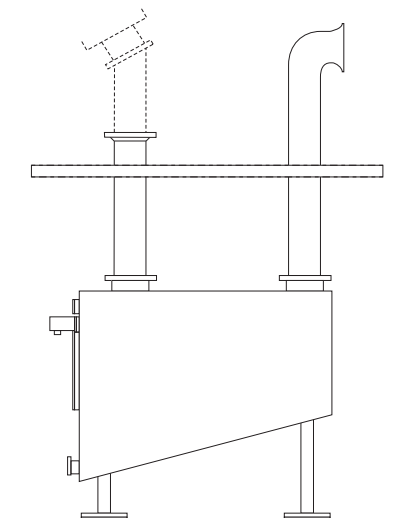
Ensure that all service media (electric power, operating and safety liquids etc.) required for the separator have the correct quality and capacity.



G0874021

### Sludge discharge tank

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



G0874311

**Valves, Pipes and Similar Equipment**

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

**7.16.6 Reassembly and Start up**

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

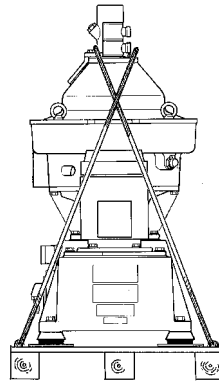
**7.16.7 Storage and transport of goods****Storage***Specification*

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

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

A separator can be delivered with different types of protection:

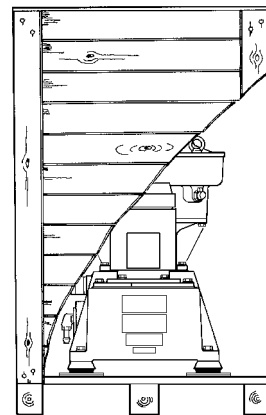
- Fixed on a pallet.  
The separator must be stored in a storage room well protected from mechanical damage as well as from rain and humidity.



G0057111

*Fixed on a pallet*

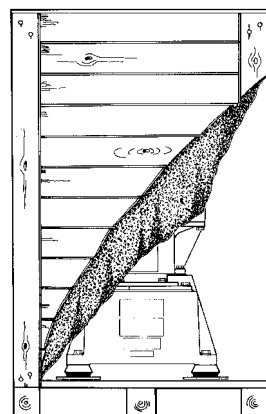
- In a wooden box which is not water tight.  
The separator must be stored dry and protected from rain and humidity.



G0057211

*In a wooden box which is not water tight*

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



G0057311

*In a special water-resistant box for outdoor storage*

## Transport

### Specification

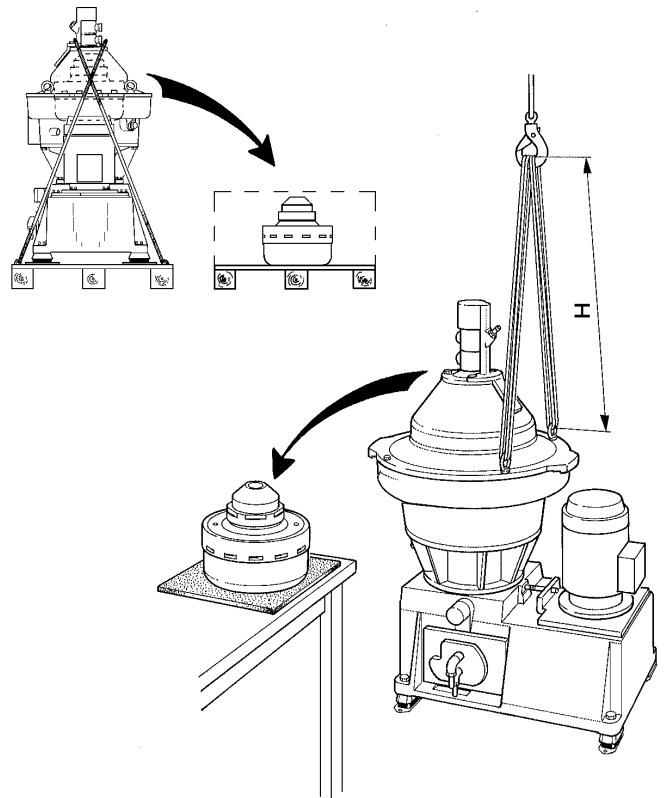
- During transport of the separator, the frame hood and bowl **must always be removed from the machine**.
- When lifting a separator it must always be **hung securely**. See chapter [Lifting instructions on page 56](#).



### Crush hazards

Use correct lifting tools and follow lifting instructions.

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



G0057581

$H = \text{minimum } 750 \text{ mm}$

## 7.16.8 Planning of installation

### Space for separator

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

The space required for one or more separators can be calculated by consulting the drawings in the chapters [Basic size drawing on page 145](#), [Foundation drawing on page 156](#) and instructions for ancillary equipment, electrical and electronic equipment and cables.



G0020611

*Check the drawings when planning the installation*

### Specification

- See chapter [Foundation drawing on page 156](#) for the service space required with the separator installed. The spanner for the large lock ring should have sufficient space to make a complete turn without touching any of the ancillary equipment surrounding the separator.

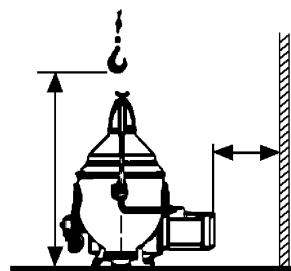
### Recommendation

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

### Important measurements

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

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



G0020721

**Lifting height for transport of bowl***Specification*

- A minimum height is required to lift the bowl, bowl parts and the bowl spindle, see chapter [Foundation drawing on page 156](#).

*Recommendation*

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

**Space for oil changing***Specification*

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

*Recommendation*

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

## 7.16.9 Foundations

**NOTE**

When lifting a separator it must always be **hung securely**. See chapter [Lifting instructions on page 56](#).

- See [7.8 Foundation drawing on page 156](#).
- The separator must be installed on a strong and rigid foundation to reduce the influence of vibrations from adjacent machinery.
- The foundation should be provided with a cofferdam.
- Fit the separator frame on the foundation as follows:
  - Check that the bolts do not press against the edges of the holes, otherwise the elasticity of the mounting of the separator frame will be impeded.
  - Fit height adjusting washers required.
  - Check that the separator frame is horizontal and that all feet rest on the foundation.
  - Tighten the screws.

---

# 8 *Operating*

---

## 8.1 **Operating routine**

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

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

## 8.2 ALCAP operation

### 8.2.1 Operating water interface

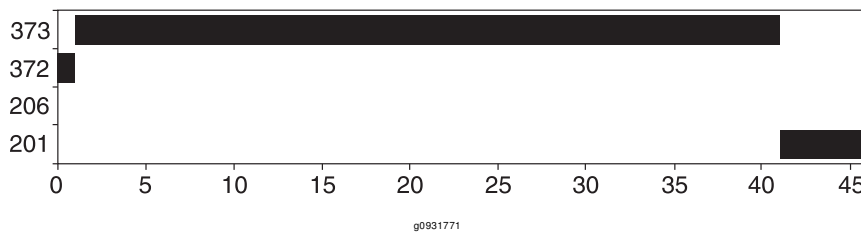
*Alfa Laval ref. 565849 Rev. 1*

Proposed operation of operating water interface.

#### Closing the bowl:

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

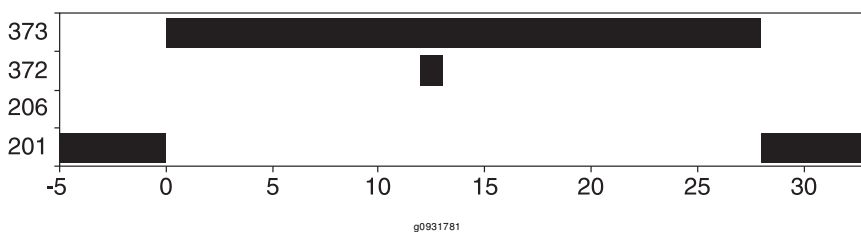
Starting sequence illustrated graphically:



#### Performing a discharge:

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

Starting sequence illustrated graphically:



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

## 8.3 Emergency operation

### 8.3.1 Operating water interface

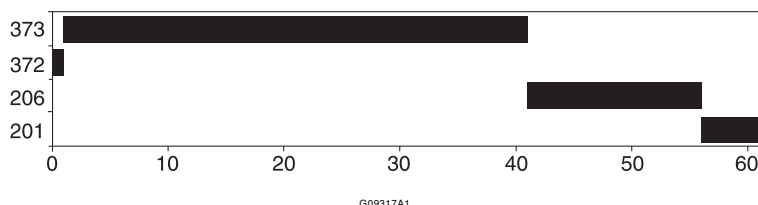
Alfa Laval ref. 565808 Rev. 0

Proposed operation of operating water interface for purifier execution.

#### Closing the bowl and supplying liquid seal:

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

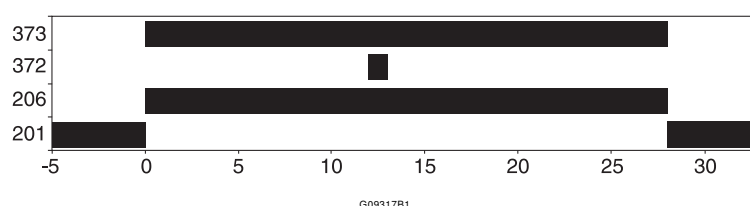
Starting sequence illustrated graphically:



#### Performing a discharge:

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

Starting sequence illustrated graphically:



### 8.3.2 Selection of gravity disc

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

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

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

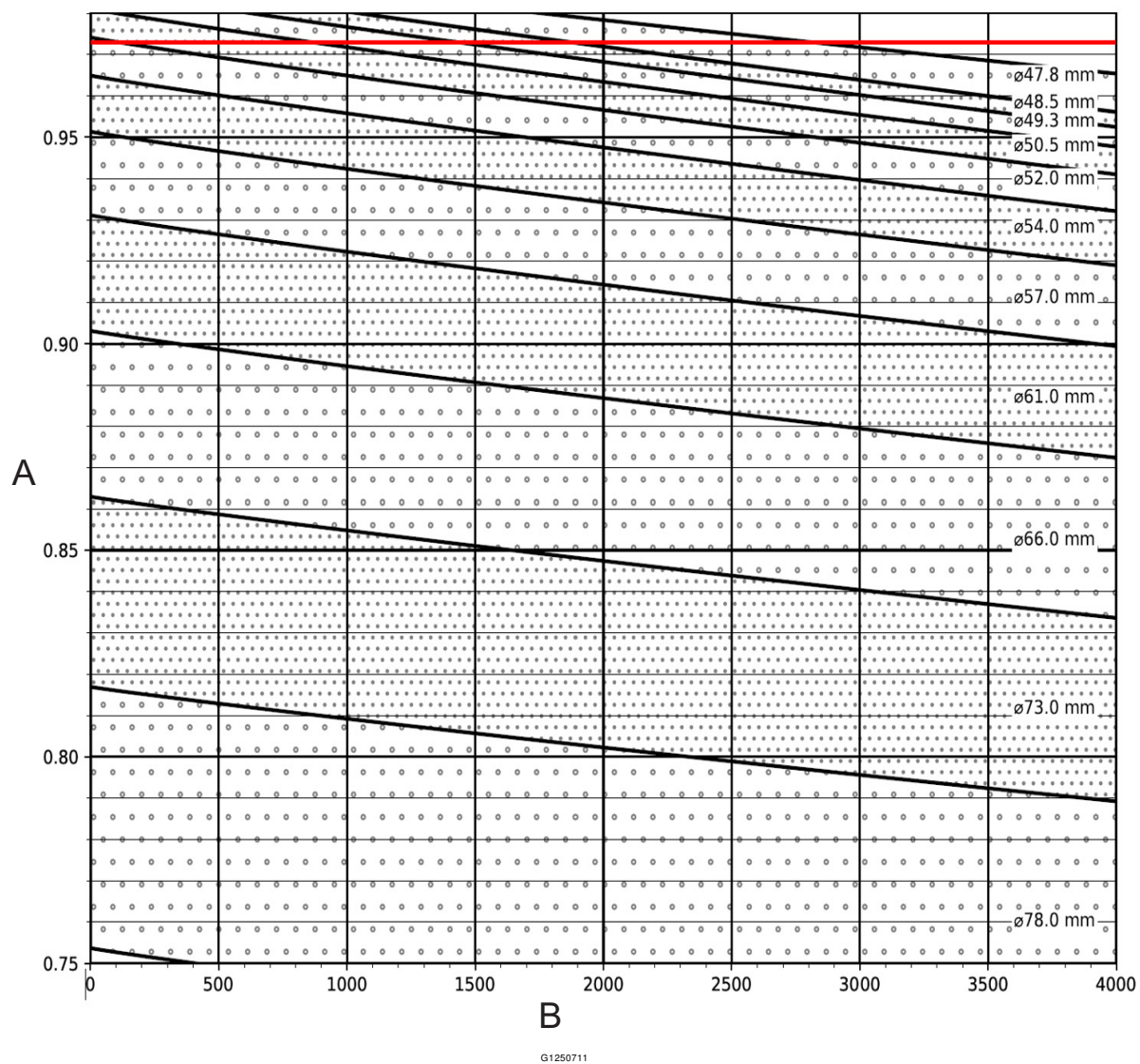
The presence of salt water in the oil may demand the use of a gravity disc with bigger hole than indicated in the nomogram. The nomogram is based on the properties of fresh water in the oil.

For operating the separator as an ALCAP separator the diameter of the disc should be 35 mm.

### 8.3.3 Gravity disc nomogram

Alfa Laval ref. 9056650 Rev. 0

Nomogram for gravity disc selection. Valid for Separator bowls 9054261 01/02.



A. Density ratio (LP/HP)

B. feed flow rate litres/h

## 8.4 Before first start

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

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



### Breakdown hazard

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



### Electrical hazard

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

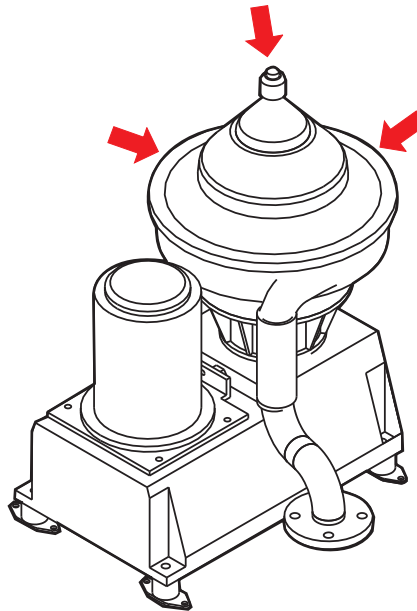


### Breakdown hazard

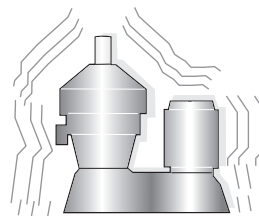
Check that the power frequency is in agreement with the machine plate. If incorrect, resulting overspeed may cause breakdown.



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



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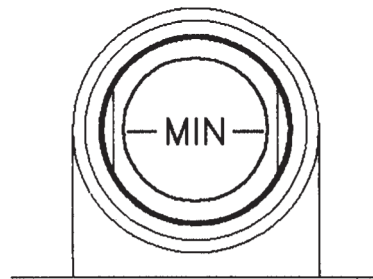
50 Hz? 60 Hz?

2. Check the oil sump level. Top up if necessary.

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



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



G0868543

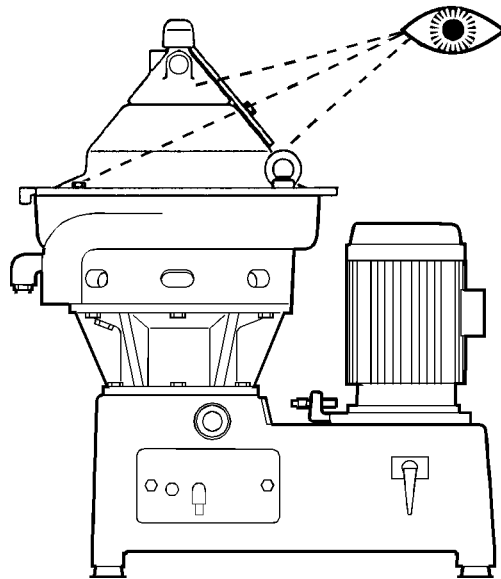
## 8.5 Start after a service

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

### 8.5.1 Before normal start

Check these points before every start.

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



G0465431

*Check assembly and tightenings*

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

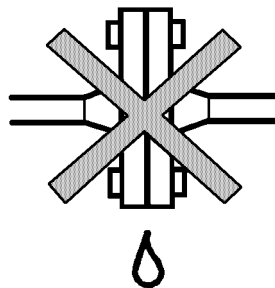


#### **Slip hazard**

**Check all connections for leakage.**

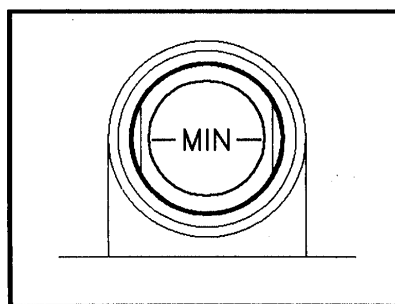
**Oil leakage may make the floor slippery.**

4. Make sure that the inlet pipe is tightened.



*Check for leakages (not admitted)*

5. Read the oil level. The line in the middle of the sight glass shows the minimum level. Refill if necessary. For grade and quality of oil see [5.9 Lubricants on page 64](#).



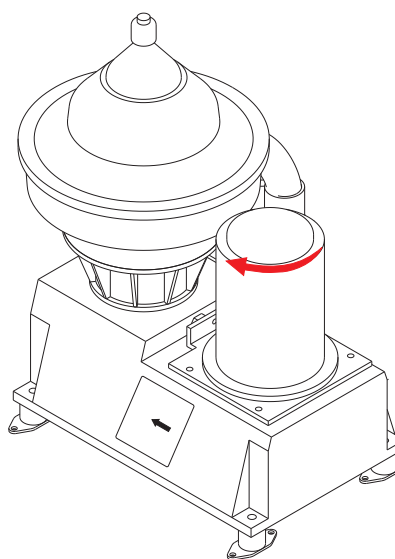
*Check the oil level*

### Rotation Direction

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



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



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### Disintegration hazards

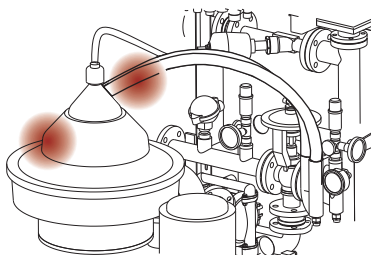
After change of feed the sludge discharge interval must be adjusted.

Too long intervals between discharges can result in breakdown.



### Burn hazard

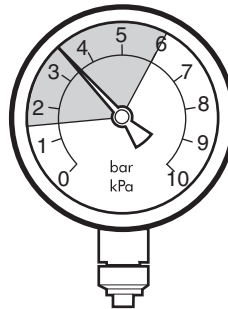
Avoid contact with hot surfaces. Process pipes, various machine surfaces, and processed liquid can be hot and cause burns.



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### 8.5.2 Starting and running-up procedure

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



*Water supply*

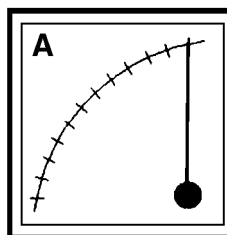
2. Start the separator.
3. Be alert for unusual noises and conditions.
4. Note the normal occurrence of critical speed periods. Some vibrations occur for short periods during the starting cycle, when the separator passes through its critical speeds. This is normal and passes over without danger. Try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



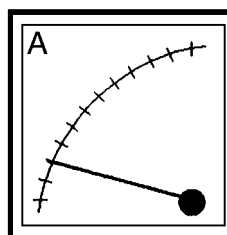
#### **Disintegration hazards**

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

5. Check the current to the separator motor to ensure that the separator has reached full speed: During start, the current reaches a peak and then slowly drops to a low and stable value. For normal length of the start-up period see [7.3 Technical data on page 142](#).



*Current increases during start...*



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

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

### 8.5.3 Separation

Do regular checks on:

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

### 8.5.4 Stopping procedure

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

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

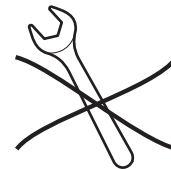
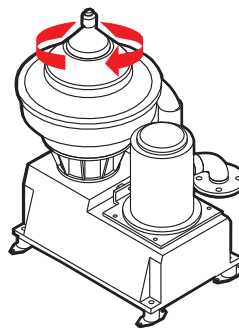
#### Separator standstill

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



#### Entrapment hazard

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



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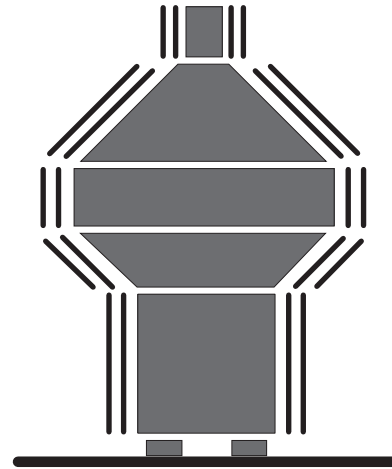
### 8.5.5 Safety stop

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

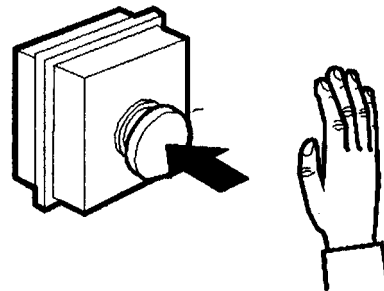
- Keep the bowl filled during the run-down to minimize the excessive vibration.
- **Evacuate the room.** The separator may be hazardous when passing its critical speeds during the run-down.



**Disintegration hazards**  
Never discharge a vibrating separator.



*Hazard!*



*Push the safety stop!*

## 8.6 After safety stop

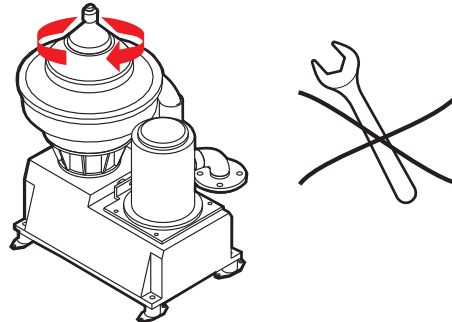
### Separator standstill

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



### Entrapment hazard

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



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### Avoid accidental start



### Entrapment hazard

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

### Remedy the cause

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



### Disintegration hazard

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

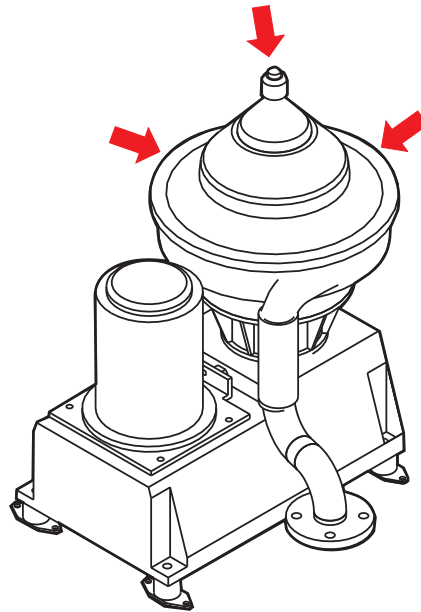
### Separator reassembled

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



### Breakdown hazard

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



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