1 Read this first
2 Safety Instructions
   2.1 Warning signs in text
   2.2 Environmental issues
   2.3 Requirements of personnel
3 Separator Basics
   3.1 Basic principles
   3.2 Definitions
   3.3 General description
   3.4 Liquid flow in the bowl
4 Operating Instructions
   4.1 Operating routine
   4.2 First start
   4.3 Start after service
   4.4 Start
   4.5 Stop
   4.6 Safety stop
5 Service Instructions
   5.1 Periodic maintenance
   5.2 Maintenance Logs
   5.3 Check points at Intermediate Service (IS)
   5.4 Check points at Major Service (MS)
   5.5 Lifting instructions
   5.6 Cleaning
   5.7 Cleaning program
   5.8 When changing oil
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.9 Vibration</td>
<td>87</td>
</tr>
<tr>
<td>5.10 Common maintenance directions</td>
<td>88</td>
</tr>
<tr>
<td>5.11 General tools</td>
<td>94</td>
</tr>
<tr>
<td><strong>6 Dismantling/Assembly</strong></td>
<td><strong>101</strong></td>
</tr>
<tr>
<td>6.1 Introduction</td>
<td>102</td>
</tr>
<tr>
<td>6.2 Feed and discharge device</td>
<td>104</td>
</tr>
<tr>
<td>6.3 Machine top part (with large cyclone)</td>
<td>106</td>
</tr>
<tr>
<td>6.4 Machine top part (with small cyclone)</td>
<td>108</td>
</tr>
<tr>
<td>6.5 Separator bowl</td>
<td>114</td>
</tr>
<tr>
<td>6.6 Machine bottom part</td>
<td>134</td>
</tr>
<tr>
<td>6.7 Vertical driving device</td>
<td>138</td>
</tr>
<tr>
<td>6.8 Horizontal driving device</td>
<td>156</td>
</tr>
<tr>
<td>6.9 Frame feet</td>
<td>170</td>
</tr>
<tr>
<td><strong>7 Trouble-Tracing</strong></td>
<td><strong>171</strong></td>
</tr>
<tr>
<td>7.1 Mechanical faults</td>
<td>172</td>
</tr>
<tr>
<td>7.2 Concentration fault</td>
<td>174</td>
</tr>
<tr>
<td><strong>8 Technical Reference</strong></td>
<td><strong>175</strong></td>
</tr>
<tr>
<td>8.1 Product description</td>
<td>176</td>
</tr>
<tr>
<td>8.2 Technical data</td>
<td>178</td>
</tr>
<tr>
<td>8.3 Modification of BTUX to BTAX</td>
<td>180</td>
</tr>
<tr>
<td>8.4 Basic size drawing</td>
<td>181</td>
</tr>
<tr>
<td>8.5 Basic size drawing</td>
<td>187</td>
</tr>
<tr>
<td>8.6 Interface description</td>
<td>192</td>
</tr>
<tr>
<td>8.7 Paring disc characteristics</td>
<td>198</td>
</tr>
<tr>
<td>8.8 Lubricants</td>
<td>201</td>
</tr>
<tr>
<td>8.9 Other drawings</td>
<td>209</td>
</tr>
<tr>
<td>8.10 Motor specifications</td>
<td>211</td>
</tr>
<tr>
<td>8.11 Cover interlocking kit</td>
<td>219</td>
</tr>
<tr>
<td>8.12 Monitoring kit</td>
<td>220</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>8.13  Quality specifications</td>
<td>221</td>
</tr>
<tr>
<td>8.14  Machine plates and safety labels</td>
<td>223</td>
</tr>
<tr>
<td>8.15  Storage and installation</td>
<td>225</td>
</tr>
</tbody>
</table>
Read and understand instruction manuals and observe the warnings before installation, operation, service and maintenance.

Not following the instructions can result in serious accidents.

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

This manual is designed for operators and service engineers working with the Alfa Laval separator MBUX 510-34C.

For information concerning the function of the separator, see chapter “3 Separator Basics” on page 19, and chapter “8 Technical Reference” on page 175.

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

In addition to this separator manual a Spare Parts Catalogue, SPC is supplied.

This separator manual consists of:

Safety Instructions

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

Separator Basics

Read this chapter if you are not familiar with this type of separator. This chapter contains the technical description and function description.

Operating Instructions

This chapter contains operating instructions for the separator only.
Service Instructions
This chapter gives instructions for daily checks, cleaning, oil changes, servicing and check points.

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

Trouble-tracing
Refer to this chapter if the separator functions abnormally.
If the separator has been installed as part of a processing system always refer to the trouble-tracing part of the system documentation first.

Technical Reference
This chapter contains technical data and drawings concerning the separator.
The centrifuge includes parts that rotate at high speed. This means that:

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

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

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

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

The following basic safety instructions therefore apply:

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

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

**Entrapment hazards**

- Make sure that rotating parts have come to a **complete standstill** before 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 and guards must be in place.

**Electrical hazard**

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

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

**Crush hazards**

- Use correct lifting tools and follow lifting instructions.

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

- Use ear protection in noisy environments.

Burn hazards

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

Skin irritation hazards

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

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

**Flying objects**

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

**Health hazard**

- 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**

Type of hazard

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

**WARNING**

Type of hazard

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

**CAUTION**

Type of hazard

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

**NOTE**

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

Unpacking

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

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

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

Metal straps should be sent for material recycling.

Maintenance

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

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

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

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

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

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

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

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

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

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

Contents

3.1 Basic principles 20
  3.1.1 Factors influencing the separation result 21

3.2 Definitions 22
  3.2.1 Throughput 22
  3.2.2 Reception ability 22
  3.2.3 Purification 23
  3.2.4 Clarification 23
  3.2.5 Concentration 23
  3.2.6 Sediment/Concentrate 23
  3.2.7 Centrate 23

3.3 General description 24
  3.3.1 Machine top part with large and small cyclone 24
  3.3.2 Bowl 26
  3.3.3 Sediment ejection 28
  3.3.4 Safety precautions 29
  3.3.5 Machine bottom part 31
  3.3.6 Mechanical power transmission 32
  3.3.7 Braking function 32
  3.3.8 Motor 33
  3.3.9 Revolution counter 34

3.4 Liquid flow in the bowl 35
  3.4.1 Self-regulating Vortex nozzles 36
3.1 Basic principles

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 present at the same time,
- to separate and concentrate solid particles from a liquid.

Separation by gravity

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

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

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

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

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 temperature) and in the throughput.
3.1.1 Factors influencing the separation result

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

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

Density difference
The greater the density difference between two liquids, the easier the separation. The density difference can be increased by heating.
Phase proportions
An increased quantity of heavy phase in a process liquid will influence the separating result through the optimum transporting capacity of the disc stack. An increased heavy phase content can be compensated for by reducing the throughput in order to restore the optimum separating efficiency.

Size and shape of particles
The round and smooth particle (A) is more easily separated out than the irregular one (B).

Rough treatment, for instance in pumps, may cause a splitting of the particles resulting in slower separation. Larger particles (1) are more easily separated than smaller ones (2) even if they have the same density.

The throughput
The throughput sets the time allowed for the separation. A better separation result can often be achieved by reducing the throughput, i.e. by increasing the settling time.

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

3.2 Definitions

3.2.1 Throughput
This means the quantity of liquid supplied per unit time. The throughput is given in m³/h or litres/h.

3.2.2 Reception ability
This means the largest liquid quantity that the bowl can treat per unit time, expressed in m³/h or litres/h.
3.2.3 Purification

A liquid separation in which the machine is used for separating two intermixed liquids, which are insoluble in each other and have different specific gravities, the lighter liquid constituting the major part of the mixture. Solids with specific gravities higher than those of the liquids can be separated off at the same time.

3.2.4 Clarification

A liquid – sludge separation in which the machine is used to separate particles, normally solid ones, from a liquid having a lower specific gravity than that of the particles.

3.2.5 Concentration

A liquid separation in which the machine is used for separating two intermixed liquids, which are insoluble in each other and have different specific gravities, the heavier liquid constituting the major part of the mixture. Solids with specific gravities higher than those of the liquids can be separated off at the same time.

3.2.6 Sediment/Concentrate

Separated solids are defined as sediment or concentrate.

3.2.7 Centrate

In case of clarification the liquid is defined as centrate. In the manual you will also find the terms; effluent, clear liquid, centrifugate and light phase.
3.3 General description

3.3.1 Machine top part with large and small cyclone

The MBUX 510-34C separator is a high-speed centrifugal separator intended for: Biotechnical application where sterilization is needed.

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

1. Paring disc
2. Bowl
3. Axial seal
4. Frame hood
5. Cyclone (large)

201. Inlet for product
222. Concentrate outlet
220. Outlet for clarified liquid
321. Washed out solids
405. Cooling water in
406. Cooling water out
1. Paring disc
2. Bowl
3. Axial seal
4. Frame hood
5. Cyclone (small)

201. Inlet for product
222. Concentrate outlet
220. Outlet for clarified liquid
321. Washed out solids
405. Cooling water in
406. Cooling water out
3.3 General description

3.3.2 Bowl
1. Bowl body
2. O-ring
3. Bushing
4. O-ring
5. O-ring
6. Valve operating slide
   6A. Bushing *
   6B. Nozzle
7. Compression spring *
8. Spring support *
9. Nut
10. Valve plug *
11. Valve seating *
12. Guide ring
13. Screw
14. Vortex holder
15. O-ring
16. Vortex chamber
17. Outlet washer
18. O-ring
19. O-ring
20. O-ring
21. cover
22. Distributor support
23. Rectangular ring
24. Distributor
25. Bottom disc
26. Bowl disc
27. Bowl disc
28. Seal ring
29. Bowl hood
30. Lock ring
31. Rectangular ring
32. Level disc
33. Washer
34. Rectangular ring
35. Paring disc chamber
36. Lock nut
37. Cap nut

The parts by which the sediment ejection are effected are marked with an asterisk (*) in the list above.

Replacement of certain parts necessitates rebalancing of the bowl. Such parts are specially indicated in the Spare Parts Catalogue.
3.3.3 Sediment ejection

Sediment ejection takes place through nine valves seats in the bowl body. Between ejections, these are kept closed by the operating slide and the valve plugs which are pressed up against the valve seats by coil springs.

At ejection, the slide is forced down and opens the valves with the aid of compressed air supplied through the bowl spindle. The discharged quantity is varied by admitting air for different length of time.

(Guiding values: for a discharge quantity of 3.5 litres the solenoid valve opening time 0.4 sec. and air pressure 500 kPa. The total sludge space is 3.8 litres.)
3.3.4 Safety precautions

Lock ring

Tighten the large lock ring until solid contact is obtained between bowl and bowl body (ø-marks exactly in line). Use the accompanying compression tool for the disc set. Note! Do not use the compression tool as lifting tackle.

Observe the lubrication instructions for the lock ring and the other bowl parts. Seizure damage may otherwise result.

Handle all parts with care. Always place the bowl on a clean, soft base.

Guides

When assembling ensure that the bowl parts are properly located as defined by the guides. Never force parts into position. Check instead if any part has been wrongly mounted.

Otherwise, operational safety may be jeopardized.

Disc pressure

In a tightened bowl the disc pressure may in time decrease so that the individual discs are not stable, although the guide mark on the lock ring is directly opposite the corresponding mark on the bowl hood. Bad bowl running (vibration) may be the result. If so, one or more extra discs must be added to the disc set.

Note! Insufficient compression of the disc set can effect the bowl balance, causing abnormal vibration of the machine.

See “5.3.6 Disc stack pressure” on page 64.
3.3 General description

Paring disc

The machine is equipped with a paring disc, for the light phase (effluent).

A paring disc is a stationary pump mounted in a chamber in the rotating bowl neck. The paring disc dips radially into the rotating liquid which then is pared out.

To prevent aeration of the product it is important that the paring disc is covered to a certain extent. Recommended back pressure See: “8.7 Paring disc characteristics" on page 198.
3.3.5 Machine bottom part

1. Motor
2. Frame
3. Oil drain screw
4. Oil gauge glass
5. Air chamber
6. Junction box
7. Oil filling screw
3.3.6 Mechanical power transmission

The main parts of the power transmission between the motor and the bowl are:

The coupling disc (F), worm gear (C, D) and bowl spindle (A).

The worm gear has a ratio which increases the bowl speed several times compared with the motor speed. For correct ratio see chapter “8.1 Product description” on page 176.

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

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

3.3.7 Braking function

The separator is not equipped with a mechanical brake, but DC braking can be used to reduce the stopping time. This means that, immediately after the power to the motor has been cut off, DC current is supplied to the motor. A transformer must be installed to obtain correct DC voltage.

Voltage: See “8.1 Product description” on page 176.
3.3.8 Motor

CT-motor (Control-Torque motor)

This separator has a rigid coupling and for this reason the motor must be able to endure long run-up times.

The motor supplied with the machine is of special design. Compared with a standard three phase motor with the same kW rating, it has a higher class of insulation, a higher rotor resistance and larger iron masses. These features counteract the temperature rise in the motor when starting. Furthermore, the motor is provided with thermal sensors in the form of thermistors in the stator windings. The thermistors must be connected to a special tripping device in the starter.

These special motors have been designed by Alfa Laval as "control-torque motors" - abbreviated to CT-motors.

These motors can normally make two starts (with separators) in succession without overheating. If the separator is slowed down immediately after two starts in succession, the motor must be allowed to cool down before it can start again. Cooling will take several hours.

The motor has been designed for star / delta starting, i.e. it must be connected in star throughout the acceleration period of the bowl. Switching from starting to operation position is normally performed by the equipment for speed monitoring.

The overload protection (e.g. in the form of bimodal relays) in the starter must be connected into the D circuit. The protection must be inoperative during the run-up period.

An amperemeter must be fitted near the separator or in the starter.

Notice that the sediment discharge process will produce an increase in current consumption.
3.3.9 Revolution counter

It is essential to operate the machine at the correct speed both in order to achieve the best separating results and for reasons of safety. Count the number of revolutions per minute, by putting a thumb against the revolution counter.

Refer to the name plate for speed particulars.
3.4 Liquid flow in the bowl

Feed inlet and outlet

The feed enters the bowl through the inlet pipe (A). Down under the distributor (B). The feed is accelerated by the wings under the distributor. The feed flows up through the distributing holes into the disc stack (C) where the separation takes place. The solid particles and the concentrate of the feed are forced by the centrifugal force towards the solids pockets (D) at the periphery of the bowl. The concentrate of the bowl (E), and leaves the separator through a paring disc (F) at the top of the bowl. As the paring disc acts as a stationary pump the effluent outlet takes place under pressure.
3.4 Liquid flow in the bowl

Concentrate

The concentrate in the solids pockets is forced through the concentrates tubes (G) and internal vortex nozzles (H) to a paring chamber where a paring tube (I) pumps the concentrate from the paring chamber to the concentrate outlet at the top of the frame hood. Thus the concentrate discharge is completely closed. The vortex nozzles have a self-regulating function that is further described below.

3.4.1 Self-regulating Vortex nozzles

The unique advantage of the vortex nozzles is that they are self-regulating, i.e. they automatically compensate for variations of the feed flow or the feed concentration.

Principle function

The concentrate enters the nozzle chamber tangentially at the periphery, form a whirl, and leaves through a hole in the nozzle center.

The whirl acts as a resistance for the flow through the nozzle. When the concentrate is thin the whirl runs at high speed, which creates a high counter-acting pressure gradient and a high resistance to the flow. Thus, the flow is choked when the solids content (viscosity) is low.

If solids concentration and therefore viscosity increases, the speed of the whirl will be lower and this causes a higher flow from the nozzle.
The vortex nozzle’s position in the bowl body below the concentrate paring chamber.

If the solids flow in the feed increases, this is balanced by an increased flow rate out of the vortex nozzle. In a traditional nozzle the flow rate can never increase with increased concentration (viscosity).

Solids concentration from the vortex nozzle is therefore much more efficiently balanced.

As an example a comparison between a traditional nozzle and a vortex nozzle is shown in the accompanying graph.

1. Normal operating capacity or feed concentration.
2. Increase of operating capacity or feed concentration with great risk of clogging the traditional nozzle.

The graph illustrates clearly that the vortex nozzle will balance an increase in capacity or feed concentration. The change of outgoing concentration is reduced to 1/4. Actual result may vary in each case, depending on product properties.

A nomograph will be provided to help the customer select a suitable vortex nozzle that will balance the feed flow rate and solids content to the desired concentration of discharged solids.
4 Operating Instructions

Contents

4.1 Operating routine 40
  4.1.1 Before first start 40

4.2 First start 41

4.3 Start after service 41

4.4 Start 42
  4.4.1 When the separator has reached full speed 42

4.5 Stop 43

4.6 Safety stop 44
4.1 Operating routine

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

4.1.1 Before first start

Technical demands for connections and logical limitations for the separator can be found in this chapter:

- Technical data
- Connection list
- Interface description
- Basic size drawing
- Foundation drawing.

Before first start the following steps must be checked:

Motors equipped with regreasing nipples: When starting the motor for the first time, or after long storage of the motor, apply the specified quantity of grease until new grease is forced out of the grease outlet.

1. Ensure that all pipes and drains have been flushed clean.
   If not, flush the pipe system. Open valves and flush the pipe system to remove any chips, welding beads etc. left from installation. Check that drains are not blocked.

2. Check that the safety water system has been installed.

3. Check that all pipes and electrical connections are installed correctly.

4. Install the separator and ensure that the separator is installed correctly.

5. Fill oil in the worm gear housing. The oil level should be exactly in the middle of the sight glass. For grade and quality of oil see “8.8.4 Recommended oil brands” on page 207.
4.2 First start

Cooling water must be fed to the seals during the starting and stopping periods as well as during operation.

Flow data See “8.5.3 Connection list” on page 189.

- Open the outlet valve. Start pumps, if any. Check the safety water system.
- Turn on the supply of cooling water to the cooling jacket.

Note! No restriction allowed in the cooling water outlet.

- Turn on the supply of cooling water to axial seals.

![WARNING]

Disintegration hazard

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

4.3 Start after service

Pay special attention to unusual conditions when starting the separator after a service. Different fault symptoms are listed in chapter “7 Trouble- Tracing” on page 171.
4.4 Start

- Start the separator.
- Be alert for unusual noises and conditions.
- 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.

**WARNING**

Disintegration hazards

When excessive vibration occurs, keep liquid feed or safety water on 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.

4.4.1 When the separator has reached full speed

- Turn on the process liquid.
- Check throughput.
- Set the suitable back pressure. See “8.7 Paring disc characteristics” on page 198.
4.5 Stop

- Flush out the process liquid with water before stop.

**NOTE**

Turn on the water before the process liquid valve is closed.

**NOTE**

The bowl must be filled with liquid throughout the stopping period.

- Stop the motor.

Before the bowl has reached final stop:

- Turn off any water supply to the bowl.
- Make repeated sediment discharges to empty the bowl.
- Clean the bowl. See procedure in “5.7.2 Main principles of the CIP program” on page 81.

**WARNING**

Entrapment hazards

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

**WARNING**

Disintegration hazard

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

*The separator must not be dismantled before standstill*
4.6 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 liquid feed or safety water on 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.
# 5 Service Instructions

## Contents

### 5.1 Periodic maintenance
- 5.1.1 Introduction 46
- 5.1.2 Maintenance intervals 46
- 5.1.3 Maintenance procedure 48
- 5.1.4 Service kits 49

### 5.2 Maintenance Logs
- 5.2.1 Daily checks 50
- 5.2.2 Oil change 51
- 5.2.3 Intermediate Service (IS) 52
- 5.2.4 Major Service (MS) 54
- 5.2.5 Lubrication of electric motor 56

### 5.3 Check points at Intermediate Service (IS)
- 5.3.1 Height adjustment of Inlet/Outlet device 57
- 5.3.2 Height adjustment of machine top part 58
- 5.3.3 Corrosion 59
- 5.3.4 Cracks 61
- 5.3.5 Erosion 62
- 5.3.6 Disc stack pressure 64
- 5.3.7 Thread wear of lock ring 66
- 5.3.8 Worm wheel and worm; wear of teeth 67
- 5.3.9 Lock ring joint 68
- 5.3.10 Bowl spindle taper 73

### 5.4 Check points at Major Service (MS) 74
- 5.4.1 Bowl spindle; radial wobble 74
- 5.4.2 Worm wheel shaft; radial wobble 75
- 5.4.3 Motor shaft; radial wobble 76

### 5.5 Lifting instructions 77
- 5.5.1 Separator 77

### 5.6 Cleaning
- 5.6.1 External cleaning 79
- 5.6.2 Cleaning of bowl discs 80

### 5.7 Cleaning program
- 5.7.1 Cleaning function 81
- 5.7.2 Main principles of the CIP program 81
- 5.7.3 Example of a relatively complete CIP-program 82

### 5.8 When changing oil
- 5.8.1 Worm wheel and worm; wear of teeth 83
- 5.8.2 Oil change procedure 86

### 5.9 Vibration
- 5.9.1 Vibration analysis 87

### 5.10 Common maintenance directions
- 5.10.1 Balancing of bowl 88
- 5.10.2 Ball and roller bearings 88
- 5.10.3 Before shutdowns 93

### 5.11 General tools 94
5.1 Periodic maintenance

5.1.1 Introduction

Periodic (preventive) maintenance reduces the risk of unexpected stoppages and breakdowns. Follow the maintenance logs on the following pages in order to facilitate the periodic maintenance.

![WARNING]

Disintegration hazards

Separator parts that are either 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 gives a brief description of which parts to be cleaned, checked and renewed at different maintenance intervals.

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

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

Oil change

The oil change interval is every **1000-1500 hours** or at least once every year if the total number of operating hours is less than **1000-1500 hours**.
Intermediate Service (IS)
Intermediate Service consists of an overhaul of the separator bowl and inlet/outlet device every 3 months or 2000 operating hours. Seals in bowl and gaskets in inlet/outlet device are renewed.

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

3-year Service (3S)
3-year Service consists of renewing the frame feet. The feet get harder with increased use and age.

Periodic maintenance schedule

Oil change
Intermediate Service = IS
Major Service = MS
3-year Service = 3S
5.1.3 Maintenance procedure

At each Intermediate and Major Service, take a copy of the maintenance 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 maintenance log and described in chapter “6 Dismantling/Assembly” on page 101.
   Place the separator parts on clean, soft surfaces such as pallets.

2. Inspect and clean the dismantled separator parts according to the maintenance log.

3. Fit all the parts delivered in the service kit while assembling the separator as described in chapter “6 Dismantling/Assembly” on page 101. The assembly instructions have references to check points which should be carried out before and during the assembly.

**WARNING**

Disintegration hazards

No modifications are to be made to any part of the separator by machining or any other means as this can affect material strength or alter the fine tolerances necessary for safe operation.

**WARNING**

Disintegration hazards

Worn, eroded or improperly assembled machine parts may cause severe damage. Follow maintenance instructions and check for possible damage.
5.1.4 Service kits

Special service kits are available for Intermediate Service (IS) and Major Service (MS), as well as for servicing the frame feet (3S).

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

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

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

---

**NOTE**

Always use Alfa Laval genuine parts as otherwise the warranty will become invalid.

Alfa Laval takes no responsibility for the safe operation of the equipment if non-genuine spare parts are used.

---

**WARNING**

Disintegration hazards

Use of imitation parts may cause severe damage.
5.2 Maintenance Logs

5.2.1 Daily checks

The following steps should be carried out daily.

<table>
<thead>
<tr>
<th>Main component and activity</th>
<th>Part</th>
<th>Page</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inlet and outlet</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check for leakage</td>
<td>Connecting housing.</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td><strong>Separator bowl</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check for vibration and noise</td>
<td></td>
<td>87</td>
<td></td>
</tr>
<tr>
<td><strong>Horizontal driving device</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worm wheel shaft and gear casing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical motor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check for heat, vibration and noise</td>
<td></td>
<td></td>
<td>1)</td>
</tr>
<tr>
<td></td>
<td>Oil level in gear housing</td>
<td>86</td>
<td></td>
</tr>
</tbody>
</table>

1) See manufacturer's instruction
5.2.2 Oil change

The oil change and check of worm gear should be carried out every **1000-1500 hours** of operation.

**Note!** In a new installation, or after replacement of gear, change the oil after 200 operating hours and clean the gear housing.

<table>
<thead>
<tr>
<th>Main component and activity</th>
<th>Part</th>
<th>Page</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal driving device</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worm wheel shaft and gear housing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check</td>
<td>Worm wheel and worm</td>
<td>83</td>
<td></td>
</tr>
<tr>
<td>Renew</td>
<td>Oil(^1) in gear housing</td>
<td>86</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) See chapter “8.8 Lubricants” on page 201 for further information.

When the separator is running for short periods, the lubricating oil must be changed every 12 months even if the total number of operating hours is less than 1000-1500 hours (2000 h).
## 5.2.3 Intermediate Service (IS)

Name of plant: 
Local identification: 
Separator: MBUX 510-34C 
Manufacture No./Year:  
Total running hours:  
Product No: 881159-01-02/2  
Date:  
Signature:  

<table>
<thead>
<tr>
<th>Main component and activity</th>
<th>Part</th>
<th>Page</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inlet and outlet</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean and inspect</td>
<td>Inlet pipe</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Connecting housing</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Renew</td>
<td>O-rings and sealings</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td><strong>Separator bowl</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean and check</td>
<td>Paring tube</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Guide ring</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Concentrate tube</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distributor support</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lock rings</td>
<td>66,68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bowl hood</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bowl discs</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distributor</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bowl body nave</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bowl body</td>
<td>66,68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paring disc chamber</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nozzles and holders</td>
<td>119,114</td>
<td></td>
</tr>
<tr>
<td>Check</td>
<td>Corrosion</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cracks</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Erosion</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disc stack pressure</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Height position of paring disc</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>Renew</td>
<td>O-rings and sealings</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>
### Main component and activity

<table>
<thead>
<tr>
<th>Vertical driving device</th>
<th>Horizontal driving device</th>
<th>Signs and labels on separator</th>
<th>Monitoring equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean and check</td>
<td>Worm wheel shaft and gear housing</td>
<td>Check attachment and legibility</td>
<td>Function check</td>
</tr>
<tr>
<td></td>
<td>Check</td>
<td>Safety label on hood</td>
<td>Vibration switch</td>
</tr>
<tr>
<td></td>
<td>Renew</td>
<td>Direction of rotation arrow</td>
<td>Speed sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power supply frequency</td>
<td>Cover interlocking switch</td>
</tr>
<tr>
<td>Bowl spindle taper</td>
<td>Worm wheel and worm</td>
<td></td>
<td>(option)</td>
</tr>
<tr>
<td></td>
<td>Oil in gear housing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oil drain plug packing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Note:** Renew all parts included in the Intermediate Service kit (IS).
## 5.2.4 Major Service (MS)

Name of plant: Local identification:
Separator: MBUX 510-34C Manufacture No./Year:
Total running hours: Product No: 881159-01-02/2
Date: Signature:

<table>
<thead>
<tr>
<th>Main component and activity</th>
<th>Part</th>
<th>Page</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inlet and outlet</strong></td>
<td>Inlet pipe</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Clean and inspect</td>
<td>Connecting housing</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Renew</td>
<td>O-rings and sealings</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>Separator bowl</strong></td>
<td>Paring tube</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Clean and check</td>
<td>Guide ring</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Concentrate tube</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Distributor support</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Lock rings</td>
<td>66,68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bowl hood</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Bowl discs</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distributor</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Bowl body nave</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Bowl body</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Paring disc chamber</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Nozzles and holders</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td><strong>Check</strong></td>
<td>Corrosion</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cracks</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Erosion</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disc stack pressure</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Height position of paring disc</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td><strong>Renew</strong></td>
<td>O-rings and sealings</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
### Vertical driving device

<table>
<thead>
<tr>
<th>Main component and activity</th>
<th>Part</th>
<th>Page</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean and check</td>
<td>Bowl spindle</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bowl spindle taper</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Buffer springs and ball bearing housing</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Check</td>
<td>Radial wobble of bowl spindle</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td>Renew</td>
<td>Spindle bearings, O-rings and rubber buffers</td>
<td>88, 138</td>
<td></td>
</tr>
</tbody>
</table>

### Horizontal driving device

<table>
<thead>
<tr>
<th>Main component and activity</th>
<th>Part</th>
<th>Page</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worm wheel shaft and gear housing</td>
<td>Worm wheel and worm</td>
<td>83</td>
<td></td>
</tr>
<tr>
<td>Check</td>
<td>Worm wheel coupling</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radial wobble of worm wheel shaft</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Renew</td>
<td>Bearings, O-rings, sealings</td>
<td>156</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oil in gear housing</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Rigid coupling</td>
<td>Clean and check</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Electrical motor</td>
<td>Radial wobble of motor shaft</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td>Check</td>
<td>See manufacture’s instruction</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Lubrication</td>
<td>Safety label on hood</td>
<td>224</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Direction of rotation arrow</td>
<td>224</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power supply frequency</td>
<td>224</td>
<td></td>
</tr>
</tbody>
</table>

### Signs and labels on separator

<table>
<thead>
<tr>
<th>Main component and activity</th>
<th>Part</th>
<th>Page</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check attachment and legibility</td>
<td>Safety label on hood</td>
<td>224</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Direction of rotation arrow</td>
<td>224</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power supply frequency</td>
<td>224</td>
<td></td>
</tr>
</tbody>
</table>

### Monitoring equipment

<table>
<thead>
<tr>
<th>Main component and activity</th>
<th>Part</th>
<th>Page</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function check</td>
<td>Vibration switch</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

### 3-year Service (3S)

Renew the frame feet. The 3-year service should be carried out in conjunction with a Major Service (MS). The extent of the 3-year service is the same as for a major service plus renewing the parts included in the 3-year Service kit (3S).
5.2.5 Lubrication of electric motor

Correct lubrication interval and recommended type of grease can be found on a plate fixed on the motor. The information can also be found in chapter Electric motor in the Installation Manual.

Manual lubrication

Regreasing while motor is running

- Remove grease outlet plug or open closing valve if fitted.
- Be sure that the lubrication channel is open.
- Press the specified amount of grease into the bearing.
- Let the motor run 1-2 hours to ensure that all excess grease is forced out of the bearing. Close the grease outlet plug or closing valve if fitted.

Regreasing while motor is at standstill

Regrease motors while running. If this is not possible, lubrication can be carried out while the machine is at a standstill.

- In this case, use only half the quantity of grease, then run the motor for a few minutes at full speed.
- When the motor has stopped, press the rest of the specified amount of grease into the bearing.
- After 1-2 running hours close grease outlet plug or closing valve if fitted.
5.3 Check points at Intermediate Service (IS)

5.3.1 Height adjustment of Inlet/Outlet device

The adjustment is made by altering the number of height adjusting rings (A). During the check, the large bowl lock ring must be firmly tightened and the frame hood clamped with the nuts.

The checking should be done at the time intervals prescribed in the maintenance schedule and after replacement or mounting of parts that can affect the height position.

A. Height adjusting ring
B. OFF, Left hand tread
5.3.2 Height adjustment of machine top part

Check that the height of the ventilation plate is correct. See picture.

To adjust the height, alter the number of adjustment washer.
5.3.3 Corrosion

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

**WARNING**

Disintegration hazard

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

Always contact your Alfa Laval representative if you suspect that the largest depth of the corrosion damage exceeds 1.0 mm or if cracks have been found. Do not continue to use the separator until it has been inspected and given clearance for operation by Alfa Laval.

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

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

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

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

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

A 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.

**WARNING**

**Disintegration hazard**

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

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

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

Other metal parts

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

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

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

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

**WARNING**

†

Disintegration hazard

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

Always replace a part if cracks are present.

It is particularly important to inspect for cracks in rotating parts 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 Check points at Intermediate Service (IS)  5 Service Instructions

5.3.5 Erosion

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

![Erosion Image]

**WARNING**

Disintegration hazard

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

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

Erosion is characterised by:

- Burnished traces in the material.
- Dents and pits having a granular and shiny surface.
Surfaces particularly subjected to erosion are:

1. The underside of the distributor in the area of the distribution holes and wings in the area of openings of the inlet tube.
2. The paring tube and the underside of the distributor support.
3. The areas round the holes for the nozzle bushings of the bowl body.
4. The inner wall of bowl body at the inlets of the nozzles.
5. Round the distribution holes of the bowl discs and along the caulks.
6. The treads of the lock ring joints in the bowl body and lock ring.
7. Frame parts exposed to the nozzle jets.

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

**WARNING**

Disintegration hazard

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

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

Replace the part if erosion can be suspected of affecting its strength or function.
5.3.6 Disc stack pressure

NOTE

Ensure that the disc stack pressure is sufficient to maintain bowl balance.
Insufficient pressure in the disc stack can cause vibration and reduce lifetime of ball bearings.

1. Add one or more discs to the top of the disc stack. Fit the bowl hood.

2. Fit the tool on the bowl hood.
Fit the compressing tool and compress the disc stack until the overflow valve in the compressing tool is released.

3. Lubricate the lock ring threads and screw on the ring with the lock ring spanner. tighten by hand as far as it goes. The \( \phi \)-mark of lock ring should now be positioned about 50-100mm before the drill mark of the bowl body.

4. If the three marks are right in front of each other, or the \( \phi \)-mark of the lock ring has passed the other ones, one or more discs must be added.
5. If the ø-mark is positioned more than 100 mm before the drill mark of the bowl body, one or more discs must be removed.

6. Continue with the above procedures until the right disc stack pressure has been reached.

7. Finally, tighten the lock ring with some blows using a tin hammer.

**Complementary check using the compressing tool**

With the large lock ring correctly tightened and the compressing tool mounted on the separator bowl, turn the control lever to position 1 for compression.

Compress the disc stack by pumping the horizontal handle until the oil pressure is released through the relief valve.

Measure the height (H1) of the piston rod (see illustration) with the slide calliper depth gauge. Make a note of the reading obtained.

Release the pressure in the compressing tool by turning the control lever to position 0. The piston rod will now move downwards slightly when the disc set is released inside the bowl.

Measure once again the height (H2) of the piston rod with the slide calliper and make a note of the reading obtained.
If the difference between H1 and H2 is less than 2 mm, the disc stack pressure is correct. If it exceeds 2 mm, the number of discs is insufficient. Add one or more discs and repeat the above procedure until the correct disc stack pressure is obtained.

**NOTE**

An insufficient number of discs will create an imbalance causing vibration.

### 5.3.7 Thread wear of lock ring

In a new bowl, the alignment marks $\phi$ should be right in front of each other as shown in the figure. In time, due to thread wear, it will become possible to draw the lock ring alignment mark past the other marks on bowl hood and bowl body.

**Thread check:**

1. Unscrew the large lock ring, lift off the bowl hood and remove the seal ring in the bowl body.

**CAUTION**

Cut hazard

The lock ring threads may have sharp edges which can cause cuts.

2. Remove three to five bowl discs.
3. Lift on the bowl hood.
4. Screw on the lock ring and tighten until the bowl hood lies tightly against the bowl body.
5. If the lock ring $\phi$–mark can be drawn past the bowl body $\phi$–mark, punch the lock ring at the new position. This punch mark henceforth replaces the old $\phi$–mark.

6. When the original $\phi$–mark of the lock ring can be drawn past the other $\phi$–mark by more than $25^\circ$ (75 mm) our representative should be consulted.

**WARNING**

Disintegration hazard

Wear on large lock ring thread must not exceed safety limit. $\phi$–mark on lock ring must not pass opposite $\phi$–mark by more than the specified distance.

5.3.8 Worm wheel and worm; wear of teeth

Same as described in “5.8.1 Worm wheel and worm; wear of teeth” on page 83 in this chapter.
5.3 Check points at Intermediate Service (IS)  

5.3.9 Lock ring joint

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

Check threads as well as contact and guiding surfaces (see arrow).

Check parts for seizure damages by letting your fingers lightly slide over the area to be inspected. Note, however, that these damages are very sharp and easily cut your fingers.

Therefore, always use a piece of cloth or gloves when making this inspection.

CAUTION

Cut hazard

The lock ring threads may have sharp edges which can cause cuts.

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

NOTE

Never force any parts together. It can be very time consuming and expensive to repair these defects. Careful handling is therefore of utmost importance.
1. Clean threads, contact and guiding surfaces with a defatting agent, HNO3 (1/2% solution) or NaOH (1 - 2%) to absolute clean material. This is important as the following programme otherwise is of minor value.

1. Emery cloth (grain size: 240)
2. Hand drilling machine
3. Defatting agent
4. Fibre brush (diam. 25 mm)
5. Brush wax (grain size: 600)
6. Very fine-cut file (single-cut)
7. Fibre brush (diam. 50 mm)
2. If the seizure damage is large, first use a fine and single-cut file, but moderately. Otherwise the damage may get worse. Remove the seizure damage material on top of the surface. Don’t use rotating files etc. Just take away the damaged, not the undamaged material.

3. A fine-grain emery cloth, i.e. 240, should be used to smoothen off the edges and to remove the burnt in impurities.
4. Accomplish the remedying by polishing the damaged spot with the fibre brushes and brush wax. It is recommended to polish the whole area where seizure damage may occur. The polishing will smoothen out the complete damage, even in the deepest parts.

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

6. Spray the clean and dry surface with Molykote 321R and let it dry for 10 minutes.
7. Use a fibre brush to polish the Molykote into the surface. The black spray will look like black shoe cream well polished when right performed. **Note!** Never use the same brush as in previous operation.

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

9. Polish the Molykote to a black shining surface which now can last about one year. Smaller damages can be repaired locally.
5.3.10 Bowl spindle taper

Impact marks and similar on the spindle taper may cause bad bowl run.

Clean spindle taper with a suitable defatting solvent. Remove any impact marks on taper with an oil stone.
5.4  Check points at Major Service (MS)

5.4.1  Bowl spindle; radial wobble

Excessive wobble is indicated by rough bowl running.

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

Maximum permissible radial wobble: **0,05 mm.**

First check the wobble before dismounting the spindle. If wobble is too large: replace the top and bottom bearings.

Measure again the wobble after assembly. If it is still excessive, the spindle is probably damaged and must be replaced.

Check wobbling as a preventive measure each time the spindle and top bearing have been assembled.

During reading, the spindle must be revolved by hand using the coupling drum.
5.4.2 Worm wheel shaft; radial wobble

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

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

Permissible radial wobble is maximum 0,10 mm.

If the wobble is larger, the worm wheel shaft must be removed from the frame for closer examination. Get in touch with your Alfa Laval representative as the worm wheel shaft may need to be replaced.
5.4.3 Motor shaft; radial wobble

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

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

Maximum permissible radial wobble 0,10 mm.

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

Check the wobble as a preventive measure in connection with major service.
5.5  Lifting instructions

5.5.1 Separator

Before lifting the separator remove following parts.

- Inlet and outlet device
- Frame hood
- Motor
- Bowl

Attach three endless slings or cables to the lifting eyes (the screws must be tightened with spanner).

Length of each sling must be **min. 2 metres**.

**NOTE**

Machine weight without frame hood and bowl is approx. **1000 kg**.

Do not lift the separator unless the frame hood and bowl have been removed.

**WARNING**

**Crush hazards**

Use only the three **special lifting eyes** (M10) for lifting the machine. They are to be screwed into the special threaded holes normally covered by the frame hood.

Other holes are **not** dimensioned for lifting the machine.

A falling separator can cause accidents resulting in serious injury to persons and damage to equipment.
5.5.2 Bowl

This instruction describes how to lift a complete bowl, which normally is done only during a transport of the separator.

When lifting the bowl, use the special lifting tool fastened on the bowl hood.

NOTE
Check that the lock ring is properly tightened. The height of the lock ring above the bowl body must not exceed 4 mm, see illustration.

Weight to lift is approx. 350 kg.

When lifting the bowl out of the separator frame, the cap nut fixing the bowl to the bowl spindle and the screws fixing the bowl body to the heavy phase cover must first be removed.

5.5.3 Other parts

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 endless lifting straps and a lifting hook with safety catch.

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

NOTE
When lifting parts without weight specifications, always use lifting straps with the capacity of at least 500 kg.
5.6 Cleaning

5.6.1 External cleaning

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

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.
5.6.2  Cleaning of bowl discs

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

NOTE

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

A gentle chemical cleaning is therefore preferable to mechanical cleaning.

CAUTION

Cut hazard

Sharp edges on separator discs may cause cuts.

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

2. Let the discs remain in the cleaning agent until the deposits have been dissolved. This will normally take between two and four hours.

3. Finally clean the discs with a soft brush.
5.7 Cleaning program

5.7.1 Cleaning function

The built-up of solids that are not discharged with the concentrate is greatly minimized thanks to the solids pockets machined out of the bowl wall. From there, however, the solids can easily be discharged by means of cleaning-in-place (CIP) at full speed. A wash liquid is supplied to the bowl, and the pneumatically controlled valve slide under the bowl bottom opens momentarily the CIP valves through which the solids and some CIP liquid are ejected.

5.7.2 Main principles of the CIP program

CIP (Cleaning in place) is used to keep the separator clean by preventing clogging of nozzles and disc set, and to avoid bacteriological infection. The use of CIP, together with repeated sediment discharge, prolongs the intervals between manual cleaning of the separator.

No general rules can be given for frequency and type of CIP to be used, as this depends on the properties of the product feed, which in its turn decides where in the separator any sediment deposits will be precipitated. The CIP interval also depends on the requirements placed on the cleaning result as regards bacteria. Normally, CIP should be performed at least once a day.

The CIP liquids to be used are also dependent on product properties and cleaning requirements.
### 5.7.3 Example of a relatively complete CIP-program

<table>
<thead>
<tr>
<th>Media</th>
<th>Temp.</th>
<th>Reason</th>
<th>Time period minutes</th>
<th>No. of disch./period</th>
<th>Disch. volume (litres)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Water Cold</td>
<td></td>
<td>For primary flushing</td>
<td>5</td>
<td>5</td>
<td>Max. 5</td>
<td>Used water usually passes to drain</td>
</tr>
<tr>
<td>2. Water Hot/70°C</td>
<td></td>
<td>For thermolysis of yeast</td>
<td>5</td>
<td>5</td>
<td>Max. 5</td>
<td>Used water normally either passes to drain (before or after heat recovery) or is circulated</td>
</tr>
<tr>
<td>3. Lye NaOH 1-2% 70°C</td>
<td></td>
<td>For dissolving protein deposits</td>
<td>20</td>
<td>5</td>
<td>Max. 5</td>
<td>The lye is normally circulated</td>
</tr>
<tr>
<td>4. Water Hot/70°C</td>
<td></td>
<td>Flushing</td>
<td>5</td>
<td>5</td>
<td>Max. 5</td>
<td>Return as for 2</td>
</tr>
<tr>
<td>5. Nitric acid abt. 1% 70°C</td>
<td></td>
<td>For dissolving inorganic deposits (primarily calcium salts)</td>
<td></td>
<td></td>
<td>Max. 5</td>
<td>If soft water is used, acid washing is only required a few times a year. In this case the return can pass to drain. If hard water is used, acid washing will be required at very CIP. In this case a circulating system should be used</td>
</tr>
<tr>
<td>6. Water Hot/90-95°C</td>
<td></td>
<td>For flushing and sterilizing</td>
<td>5</td>
<td>5</td>
<td>Max. 5</td>
<td>Return as for 2</td>
</tr>
</tbody>
</table>
5.8 When changing oil

5.8.1 Worm wheel and worm; wear of teeth

To check at each oil change

Check the teeth of both the worm wheel and worm for wear. Examine the contact surfaces and compare the tooth profiles with the "Tooth appearance examples" on page 85. The gear may operate satisfactorily even when worn to some degree.

- Replace both worm wheel and worm at the same time, even if only one of them is worn.
- To avoid damaging the teeth when lifting the bowl spindle: push the worm wheel to one side first.
  Position the spindle in correct place before fitting the worm wheel.

When replacing the gear, always make sure that the new worm wheel and worm have the same number of teeth as the old ones. See chapter "8.1 Product description" on page 176 for correct number of teeth.

WARNING

Disintegration hazards

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

NOTE

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

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

In all these cases it is imperative to change to a high-temperature oil.

For further information, see chapter “8.8 Lubricants” on page 201.
Tooth appearance examples

**Satisfactory teeth:**
Uniform wear of contact surfaces. Surfaces are smooth.

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

**Worn teeth:**
Permissible wear is as a rule 1/3 of the thickness of the upper part of a tooth, provided that
- the wear is uniform over the whole of the flank of a tooth
- and all teeth are worn in the same way.

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

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

**NOTE**
Before adding or renewing lubricating oil in the worm gear housing, the information concerning different oil groups, handling of oils, oil change intervals etc. given in chapter “8.8 Lubricants” on page 201 must be well known.

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

**CAUTION**
Burn hazards

Lubricating oil in the worm gear housing and various machine surfaces can be sufficiently hot to cause burns.

2. Fit the drain plug with the gasket and fill new oil in the worm gear housing. The oil level should be exactly in the middle of the sight glass.

Oil volume: Approx. 8 litres.

For recommended oil brands, see “8.8.4 Recommended oil brands” on page 207.

**NOTE**
During operation the oil level must be slightly below the middle of the sight glass.

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

The oil level must not be above the middle of the sight glass.
5.9 Vibration

5.9.1 Vibration analysis

Excessive vibration or noise indicates that something is incorrect. Stop the separator and identify the cause.

Use vibration analysis instrument to periodically check and record the level of vibration. See the illustration where to take measurements.

**NOTE**

The level of vibration should not exceed **11.2 mm/s** at full speed.

**WARNING**

Disintegration hazards

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

The cause of the vibration must be identified and corrected before the separator is restarted. Excessive vibration can be due to incorrect assembly or poor cleaning of the bowl.
5.10 Common maintenance directions

5.10.1 Balancing of bowl

The separator bowl is statically and dynamically factory-balanced only as a complete unit.

Major bowl parts cannot be replaced with new parts without rebalancing the entire bowl.

Bowl parts must never be interchanged from one machine to an other.

5.10.2 Ball and roller bearings

Special-design 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 damage to equipment as a result.

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

For bearings where no driving-off sleeve is included in the tool kit, 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.

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(s), if the faults cannot be remedied by polishing.

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 oil the bearing seating on shaft (spindle) or alternatively in housing, with a thin oil.

NOTE

It is important to lubricate the ball bearing before assembly. The anti-rust agent is no lubricant and without oil the ball bearings will be damaged.
• When assembling ball bearings, the bearings must be heated in oil to max. 125 °C.

**NOTE**

Heat the bearing in a clean container.

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.

**WARNING**

Burn hazards

Use protective gloves when handling the heated bearings.

• 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.

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).
5.10.3 Before shutdowns

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 101.

**NOTE**

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

Vibration in foundations can be transmitted to the bowl and produce one-sided loading of the bearings. The resultant indentations in the ball bearing races can cause premature bearing failure.

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

- If the separator has been shut-down for more than 3 months but less than 12 months, an Intermediate Service (IS) has to be made. If the shut-down period has been longer than 12 months, a Major Service (MS) should be carried out.
# 5.11 General tools

<table>
<thead>
<tr>
<th>Pos. / Description</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Puller</td>
<td>Ball bearing worm- wheel shaft</td>
</tr>
<tr>
<td>2. Puller</td>
<td>Worm wheel, worm</td>
</tr>
<tr>
<td>3. Driving off-tool</td>
<td>Top bearing</td>
</tr>
<tr>
<td>4. Dismounting tool</td>
<td>Coupling drum</td>
</tr>
<tr>
<td>5. Torque pin</td>
<td>Spanner cup nut</td>
</tr>
<tr>
<td>6. Extension rod 255 mm</td>
<td></td>
</tr>
<tr>
<td>7. Hook spanner</td>
<td></td>
</tr>
<tr>
<td>8. Open ended spanner</td>
<td>36 mm</td>
</tr>
<tr>
<td>9. Socket 13 mm (1/2&quot;)</td>
<td>Bowl body bushing</td>
</tr>
<tr>
<td>10. Socket 9/16 mm (1/2&quot;)</td>
<td></td>
</tr>
<tr>
<td>11. Socket 17 mm (1/2&quot;)</td>
<td></td>
</tr>
<tr>
<td>12. Socket 34 mm (1/2&quot;)</td>
<td></td>
</tr>
<tr>
<td>13. Socket 30mm (1/2&quot;)</td>
<td></td>
</tr>
<tr>
<td>14. Sleeve</td>
<td>Dismounting top bearing</td>
</tr>
<tr>
<td>15. Lifting tool WLL 1,2 t</td>
<td>Distributor</td>
</tr>
<tr>
<td>16. Lifting tool WLL 1,2 t</td>
<td>Bowl body</td>
</tr>
<tr>
<td>17. Lifting tool WLL 0,7 t</td>
<td>Bowl hood</td>
</tr>
<tr>
<td>18. Lifting tool WLL 1,2 t</td>
<td>Spindle (top)</td>
</tr>
<tr>
<td>19. Lifting eye bolt</td>
<td>Lock ring large</td>
</tr>
<tr>
<td>20. Torque wrench</td>
<td></td>
</tr>
<tr>
<td>21. Snap ring pliers (Shaft)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1</td>
<td><img src="image1.png" alt="Image of Tool 1" /></td>
</tr>
<tr>
<td>2</td>
<td><img src="image2.png" alt="Image of Tool 2" /></td>
</tr>
<tr>
<td>3</td>
<td><img src="image3.png" alt="Image of Tool 3" /></td>
</tr>
<tr>
<td>4</td>
<td><img src="image4.png" alt="Image of Tool 4" /></td>
</tr>
<tr>
<td>5</td>
<td><img src="image5.png" alt="Image of Tool 5" /></td>
</tr>
<tr>
<td>6</td>
<td><img src="image6.png" alt="Image of Tool 6" /></td>
</tr>
<tr>
<td>7</td>
<td><img src="image7.png" alt="Image of Tool 7" /></td>
</tr>
<tr>
<td>8</td>
<td><img src="image8.png" alt="Image of Tool 8" /></td>
</tr>
<tr>
<td>9</td>
<td><img src="image9.png" alt="Image of Tool 9" /></td>
</tr>
<tr>
<td>10</td>
<td><img src="image10.png" alt="Image of Tool 10" /></td>
</tr>
<tr>
<td>11</td>
<td><img src="image11.png" alt="Image of Tool 11" /></td>
</tr>
<tr>
<td>12</td>
<td><img src="image12.png" alt="Image of Tool 12" /></td>
</tr>
<tr>
<td>13</td>
<td><img src="image13.png" alt="Image of Tool 13" /></td>
</tr>
<tr>
<td>14</td>
<td><img src="image14.png" alt="Image of Tool 14" /></td>
</tr>
<tr>
<td>15</td>
<td><img src="image15.png" alt="Image of Tool 15" /></td>
</tr>
<tr>
<td>16</td>
<td><img src="image16.png" alt="Image of Tool 16" /></td>
</tr>
<tr>
<td>17</td>
<td><img src="image17.png" alt="Image of Tool 17" /></td>
</tr>
<tr>
<td>18</td>
<td><img src="image18.png" alt="Image of Tool 18" /></td>
</tr>
<tr>
<td>19</td>
<td><img src="image19.png" alt="Image of Tool 19" /></td>
</tr>
<tr>
<td>20</td>
<td><img src="image20.png" alt="Image of Tool 20" /></td>
</tr>
<tr>
<td>21</td>
<td><img src="image21.png" alt="Image of Tool 21" /></td>
</tr>
<tr>
<td>Pos. / Description</td>
<td>Application</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>22. Snap ring tong (Hole)</td>
<td>36 mm</td>
</tr>
<tr>
<td>24. Hexagon Tubul. Box spanner</td>
<td>Cap nut</td>
</tr>
<tr>
<td>25. Spanner</td>
<td>Lock ring small</td>
</tr>
<tr>
<td>26. Spanner</td>
<td>Lock ring large</td>
</tr>
<tr>
<td>27. Ring</td>
<td>Mounting worm wheel shaft</td>
</tr>
<tr>
<td>28. Ring</td>
<td>Mounting ball bearing worm wheel shaft</td>
</tr>
<tr>
<td>29. Ring</td>
<td>Dismounting ball bearing worm wheel shaft</td>
</tr>
<tr>
<td>30. Ring spanner 1 mm, 22mm</td>
<td></td>
</tr>
<tr>
<td>31. Tube</td>
<td>Rack for vertical device</td>
</tr>
<tr>
<td>32. Hex. socket 8 mm (1/2&quot;)</td>
<td></td>
</tr>
<tr>
<td>33. Hex. socket 10 mm (1/2&quot;)</td>
<td>Driving-off worm. worm wheel</td>
</tr>
<tr>
<td>35. Screw</td>
<td>Lock ring large</td>
</tr>
<tr>
<td>36. Screw driver</td>
<td></td>
</tr>
<tr>
<td>37. Ratchet handle</td>
<td></td>
</tr>
<tr>
<td>38. Pin spanner</td>
<td>Oil fan vertical driving device</td>
</tr>
<tr>
<td>39. Tin hammer 4,4 kg</td>
<td></td>
</tr>
<tr>
<td>41. Mounting tool</td>
<td>Worm</td>
</tr>
<tr>
<td>42. Mounting tool</td>
<td>Ball bearing worm wheel shaft</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td><img src="pliers" alt="Image" /></td>
<td><img src="tool" alt="Image" /></td>
</tr>
<tr>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td><img src="ring" alt="Image" /></td>
<td><img src="tool" alt="Image" /></td>
</tr>
<tr>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td><img src="ring" alt="Image" /></td>
<td><img src="ring" alt="Image" /></td>
</tr>
<tr>
<td>31</td>
<td>32</td>
</tr>
<tr>
<td><img src="tool" alt="Image" /></td>
<td><img src="tool" alt="Image" /></td>
</tr>
<tr>
<td>34</td>
<td>35</td>
</tr>
<tr>
<td><img src="tool" alt="Image" /></td>
<td><img src="tool" alt="Image" /></td>
</tr>
<tr>
<td>37</td>
<td>38</td>
</tr>
<tr>
<td><img src="ratchet" alt="Image" /></td>
<td><img src="tool" alt="Image" /></td>
</tr>
<tr>
<td>40</td>
<td>41</td>
</tr>
<tr>
<td><img src="tool" alt="Image" /></td>
<td><img src="tool" alt="Image" /></td>
</tr>
<tr>
<td>Pos. / Description</td>
<td>Application</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>43. Turning tool</td>
<td>Bowl body</td>
</tr>
<tr>
<td>45. Washer</td>
<td>Brake pulley</td>
</tr>
<tr>
<td>47. Compression tool</td>
<td>Disc stack and discharge device</td>
</tr>
<tr>
<td>49. Lifting tool WLL 0,8t</td>
<td>Distributor support</td>
</tr>
<tr>
<td>51. Lifting eye bolt</td>
<td>Valve operating slide</td>
</tr>
<tr>
<td>52. Spanner</td>
<td>3 mm</td>
</tr>
<tr>
<td>53. Hex socket head key</td>
<td>4 mm</td>
</tr>
<tr>
<td>55. Pin spanner</td>
<td>Inlet-, outlet pipe</td>
</tr>
<tr>
<td>57. Open-ended spanner</td>
<td>46 mm</td>
</tr>
<tr>
<td>58. Mount and dismount tool</td>
<td>Axial seal upper</td>
</tr>
<tr>
<td>60. Screw</td>
<td>Bearing shield</td>
</tr>
<tr>
<td>61. Pin spanner</td>
<td>Lock ring horizontal device</td>
</tr>
<tr>
<td>63. Sleeve</td>
<td>Spring support</td>
</tr>
<tr>
<td>64. Spindle</td>
<td>Compression tool</td>
</tr>
<tr>
<td>66. Angled box wrench</td>
<td>Frame hood 19 mm</td>
</tr>
<tr>
<td>67, 69. Pin spanner</td>
<td>Dismounting the sleeve spindle bottom</td>
</tr>
<tr>
<td>71. Lifting shoulder</td>
<td>Hood (vortex)</td>
</tr>
<tr>
<td>72. Washer</td>
<td>Dismounting bottom bearing</td>
</tr>
<tr>
<td>73. Lifting eye</td>
<td>Separator</td>
</tr>
<tr>
<td>74. Screw</td>
<td>Separator</td>
</tr>
<tr>
<td>75. Lifting eye</td>
<td>Frame hood</td>
</tr>
<tr>
<td>76. Screw</td>
<td></td>
</tr>
</tbody>
</table>
## 5.11 General tools

<table>
<thead>
<tr>
<th>43</th>
<th>45</th>
<th>47</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="87x87.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>49</th>
<th>51</th>
<th>57</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>52</th>
<th>55</th>
<th>57</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>53</th>
<th>61</th>
<th>63</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>60</th>
<th>64</th>
<th>64A</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>66</th>
<th>71</th>
<th>71A</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>72</th>
<th>73</th>
<th>74</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
<td><img src="528x746.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>75</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="528x746.png" alt="Image" /></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# 6 Dismantling/Assembly

## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6.1 Introduction</strong></td>
<td>102</td>
</tr>
<tr>
<td>6.1.1 General directions</td>
<td>102</td>
</tr>
<tr>
<td>6.1.2 References to check points</td>
<td>103</td>
</tr>
<tr>
<td>6.1.3 Tools</td>
<td>103</td>
</tr>
<tr>
<td>6.1.4 Tightening of screws</td>
<td>103</td>
</tr>
<tr>
<td><strong>6.2 Feed and discharge device</strong></td>
<td>104</td>
</tr>
<tr>
<td>6.2.1 Exploded views</td>
<td>104</td>
</tr>
<tr>
<td>6.2.2 Dismantling / Assembly</td>
<td>105</td>
</tr>
<tr>
<td><strong>6.3 Machine top part</strong></td>
<td>106</td>
</tr>
<tr>
<td>(with large cyclone)</td>
<td></td>
</tr>
<tr>
<td>6.3.1 Exploded views</td>
<td>106</td>
</tr>
<tr>
<td><strong>6.4 Machine top part</strong></td>
<td>108</td>
</tr>
<tr>
<td>(with small cyclone)</td>
<td></td>
</tr>
<tr>
<td>6.4.1 Exploded views</td>
<td>108</td>
</tr>
<tr>
<td>6.4.2 Dismantling</td>
<td>110</td>
</tr>
<tr>
<td>6.4.3 Assembly</td>
<td>113</td>
</tr>
<tr>
<td><strong>6.5 Separator bowl</strong></td>
<td>114</td>
</tr>
<tr>
<td>6.5.1 Exploded view</td>
<td>114</td>
</tr>
<tr>
<td>6.5.2 Tools to be used</td>
<td>116</td>
</tr>
<tr>
<td>6.5.3 Dismantling</td>
<td>119</td>
</tr>
<tr>
<td>6.5.4 Dismantling / Spring support, valve operating slide</td>
<td>124</td>
</tr>
<tr>
<td>6.5.5 Exchange of valve plugs</td>
<td>126</td>
</tr>
<tr>
<td>6.5.6 Assembly / Spring support, valve operating slide</td>
<td>127</td>
</tr>
<tr>
<td>6.5.7 Assembly</td>
<td>130</td>
</tr>
<tr>
<td><strong>6.6 Machine bottom part</strong></td>
<td>134</td>
</tr>
<tr>
<td>6.6.1 Exploded views</td>
<td>134</td>
</tr>
<tr>
<td><strong>6.7 Vertical driving device</strong></td>
<td>138</td>
</tr>
<tr>
<td>6.7.1 Exploded view</td>
<td>138</td>
</tr>
<tr>
<td>6.7.2 Bowl Spindle</td>
<td>140</td>
</tr>
<tr>
<td>6.7.3 Dismantling</td>
<td>142</td>
</tr>
<tr>
<td>6.7.4 Assembly</td>
<td>148</td>
</tr>
<tr>
<td><strong>6.8 Horizontal driving device</strong></td>
<td>156</td>
</tr>
<tr>
<td>6.8.1 Exploded view</td>
<td>156</td>
</tr>
<tr>
<td>6.8.2 Tools</td>
<td>158</td>
</tr>
<tr>
<td>6.8.3 Dismantling</td>
<td>159</td>
</tr>
<tr>
<td>6.8.4 Dismantling / Bearing housing</td>
<td>163</td>
</tr>
<tr>
<td>6.8.5 Assembly / Horizontal driving device</td>
<td>164</td>
</tr>
<tr>
<td><strong>6.9 Frame feet</strong></td>
<td>170</td>
</tr>
<tr>
<td><strong>6.7 Vertical driving device</strong></td>
<td>138</td>
</tr>
<tr>
<td>6.7.1 Exploded view</td>
<td>138</td>
</tr>
<tr>
<td>6.7.2 Bowl Spindle</td>
<td>140</td>
</tr>
<tr>
<td>6.7.3 Dismantling</td>
<td>142</td>
</tr>
<tr>
<td>6.7.4 Assembly</td>
<td>148</td>
</tr>
<tr>
<td><strong>6.8 Horizontal driving device</strong></td>
<td>156</td>
</tr>
<tr>
<td>6.8.1 Exploded view</td>
<td>156</td>
</tr>
<tr>
<td>6.8.2 Tools</td>
<td>158</td>
</tr>
<tr>
<td>6.8.3 Dismantling</td>
<td>159</td>
</tr>
<tr>
<td>6.8.4 Dismantling / Bearing housing</td>
<td>163</td>
</tr>
<tr>
<td>6.8.5 Assembly / Horizontal driving device</td>
<td>164</td>
</tr>
<tr>
<td><strong>6.9 Frame feet</strong></td>
<td>170</td>
</tr>
</tbody>
</table>

101
6.1 Introduction

6.1.1 General directions

The separator must be dismantled regularly for cleaning and inspection.

The recommended intervals are stated in chapter “5.1.2 Maintenance intervals” on page 46.

**WARNING**

**Entrapment hazard**

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

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

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

These parts must be handled carefully.

Do not place parts directly on the floor, but on a clean rubber mat, fibreboard or a suitable pallet.

**NOTE**

**Never interchange bowl parts**

To prevent mixing of parts, e.g. in an installation comprising several machines of the same type, the major bowl parts are marked with the machine manufacturing number or its last three digits.
6.1.2 References to check points

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

✔ Check point
   “5.3.6 Disc stack pressure” on page 64.

In this example, look up check point Disc stack pressure in chapter 5 for further instructions.

6.1.3 Tools

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

**NOTE**

When lifting parts without weight specifications, always use lifting straps with the capacity of at least **500 kg**.

6.1.4 Tightening of screws

When tightening screws, use the torques stated in the table below unless otherwise stated. The figures apply to oiled screws tightened with a torque wrench.

<table>
<thead>
<tr>
<th>METRIC THREAD</th>
<th>Quality Class A4-70 Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread</td>
<td>kpm</td>
</tr>
<tr>
<td>M6</td>
<td>0,75</td>
</tr>
<tr>
<td>M8</td>
<td>1,8</td>
</tr>
<tr>
<td>M10</td>
<td>3,6</td>
</tr>
<tr>
<td>M12</td>
<td>6,5</td>
</tr>
<tr>
<td>M16</td>
<td>16,0</td>
</tr>
<tr>
<td>M20</td>
<td>31,0</td>
</tr>
<tr>
<td>M24</td>
<td>51,0</td>
</tr>
</tbody>
</table>
6.2 Feed and discharge device

6.2.1 Exploded views

1. Paring tube holder
2. Collar
3. Inlet and discharge pipe
4. O-ring
5. Paring disc
6. O-ring
7. O-ring
8. Discharge cover
9. Rectangular ring
10. O-ring
11. Outlet housing
12. O-ring
13. Inlet housing
14. Nut
15. Gasket
16. Outlet piece
17. Seal ring
18. Sleeve
19. Coupling nut
20. Rectangular ring
21. Sleeve
22. Coupling nut
23. Rectangular ring
24. Sleeve
25. Coupling nut
6.2.2 Dismantling / Assembly

A. Off
B. These part are located in the bowl
6.3 Machine top part (with large cyclone)

6.3.1 Exploded views

Machine top part (illustration on next page)


2. Frame top part

3. Screw

3.1. Usit-ring

4. Protecting cap

5. O-ring

6. Usit-ring

7. Screw

8. Gasket

9. Ventilation plate

10. Screw

11. O-ring

12. Stud bolt

13. Frame hood

14. Cap nut

15. Stud bolt

16. Height adjusting ring

18. Cap nut

20. Stud bolt

21. Cyclone

22. Gasket

23. Washer

24. Cap nut

25. Gasket

26. Ventilation pipe

26A. T-piece

26B. Pipe

26C. Gasket

26D. Pipe bend

26E. Gasket

26F. Hose valve

26G. Pipe bend

26H. Coupling straight

27. Gasket

28. Rectangular ring

29. Washer

30. Coupling nut

31. Gasket

32. Washer

33. Coupling nut

34. Rectangular ring

35. Nipple

44. Flushing nozzle

46. Pipe union

47. Cooling water hose

48. Plug

48.1. Usit-ring

49. O-ring

50. Sight glass fitting

51. Pipe reducer

52. Gasket

53. Coupling nut

54. Non-return valve

54A. Non-return valve

54B. Coupling nut

54C. Sleeve

54D. Rectangular ring
### 6.4 Machine top part (with small cyclone)

#### 6.4.1 Exploded views

Machine top part (illustration on next page)

| 1. | Height adjusting ring | 20. | Stud bolt |
| 2. | Frame top part | 21. | Cyclone |
| 3. | Screw | 22. | Gasket |
| 3.1. | Usit-ring | 23. | Washer |
| 4. | Protecting cap | 24. | Cap nut |
| 5. | O-ring | 25. | Gasket |
| 7. | Screw | 26A. | T-piece |
| 8. | Gasket | 26B. | Pipe |
| 9. | Ventilation plate | 26C. | Gasket |
| 10. | Screw | 26D. | Pipe bend |
| 11. | O-ring | 26E. | Rectangular ring |
| 12. | Stud bolt | 26F. | Hose valve |
| 13. | Frame hood | 26G. | Pipe bend |
| 14. | Cap nut | 26H. | Coupling straight |
| 15. | Stud bolt | 27. | Gasket |
| 16. | Height adjusting ring | 30. | Gasket |
| 18. | Cap nut | 31. | Sleeve |
| 17. | Usit-ring | 26J. | Hose valve |
| 19. | Stud bolt | 26K. | Pipe bend |
| 21. | Cyclone | 26L. | Ventilation pipe |
| 23. | Washer | 26M. | T-piece |
| 24. | Cap nut | 26N. | Pipe |
| 25. | Gasket | 26O. | Gasket |
| 26. | Ventilation pipe | 26P. | Usit-ring |
| 27. | Gasket | 26Q. | Plug |
| 28. | Gasket | 26R. | Pipe reducer |
| 29. | Gasket | 26S. | Cooling water hose |
| 30. | Gasket | 26T. | Non-return valve |
| 31. | Sleeve | 26U. | Coupling nut |
| 32. | Coupling nut | 26V. | Cooling water hose |
| 41. | Flushing nozzle | 26W. | Non-return valve |
| 42. | Pipe union | 26X. | Coupling nut |
| 43. | Cooling water hose | 26Y. | Sleeve |
| 44. | Plug | 26Z. | Rectangular ring |
| 44A. | Non-return valve | 27A. | Rectangular ring |
| 44B. | Coupling nut | 27B. | Sleeve |
| 44C. | Sleeve | 27C. | Gasket |
| 44D. | Rectangular ring | 27D. | Gasket |
| 44E. | Sleeve | 27E. | Gasket |
| 44F. | Rectangular ring | 27F. | Gasket |
| 44G. | Sleeve | 27G. | Gasket |
| 44H. | Rectangular ring | 27H. | Gasket |
| 44I. | Sleeve | 27I. | Gasket |
| 44J. | Rectangular ring | 27J. | Gasket |
| 44K. | Sleeve | 27K. | Gasket |
| 44L. | Rectangular ring | 27L. | Gasket |
| 44M. | Sleeve | 27M. | Gasket |
| 44N. | Rectangular ring | 27N. | Gasket |
| 44O. | Sleeve | 27O. | Gasket |
| 44P. | Rectangular ring | 27P. | Gasket |
| 44Q. | Sleeve | 27Q. | Gasket |
| 44R. | Rectangular ring | 27R. | Gasket |
| 44S. | Sleeve | 27S. | Gasket |
| 44T. | Rectangular ring | 27T. | Gasket |
| 44U. | Sleeve | 27U. | Gasket |
| 44V. | Rectangular ring | 27V. | Gasket |
| 44W. | Sleeve | 27W. | Gasket |
| 44X. | Rectangular ring | 27X. | Gasket |
| 44Y. | Sleeve | 27Y. | Gasket |
| 44Z. | Rectangular ring | 27Z. | Gasket |

108
6 Dismantling/Assembly

6.4 Machine top part (with small cyclone)
6.4.2 Dismantling

WARNING

Entrapment hazards

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

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

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

---

1. Unscrew the coupling nuts (A-C) using a hook spanner (T7), and remove hoses.

2. Unscrew the nut (A) holding the in- and outlet housing together and remove it. Use the open-ended spanner, 46 mm (T57).

   **Left-hand thread!**
3. Remove inlet and outlet house by hand.

4. Remove two nuts opposite each other. Fit the lifting eyes in the threaded holes.

5. Unscrew and remove the nuts holding the frame hood and lift it off.
6.4.3 Assembly

1. Fit the frame hood and tighten the frame hood nuts.

**NOTE**

Ensure the height of feed and discharge device is correctly adjusted.

Incorrect height will cause the paring disc to scrape against the rotating bowl.

✓ Check point

“5.3.1 Height adjustment of Inlet/Outlet device” on page 57.

2. Fit the outlet housing on to the inlet pipe (do not forget the packing).

3. Fit the inlet pipe nut. Tighten the nut firmly.

   **Left-hand thread!**

**NOTE**

It is essential to tighten the inlet pipe firmly as this tightening torque will keep the paring disc in place during the running of the machine.

4. Fit the inlet pipe bend and tighten the coupling nut.

5. Fit the inlet and outlet hoses and tighten the coupling nuts (A-C).
6.5 Separator bowl

6.5.1 Exploded view
1. Bowl body
2. O-ring
3. Bushing
4. O-ring
5. O-ring
6. Valve operating slide
6A. Bushing
6B. Nozzle
7. Compression spring
8. Spring support
9. Nut
10. Valve plug
11. Valve seating
12. Guide ring
13. Screw
14. Vortex holder
15. O-ring
16. Vortex chamber
17. Outlet washer
18. O-ring
19. O-ring
20. O-ring
21. Cover
22. Distributor support
23. Rectangular ring
24. Distributor
25. Bottom disc
26. Bowl disc
27. Bowl disc
28. Seal ring
29. Bowl hood
30. Lock ring
31. Rectangular ring
32. Level disc
33. Washer
34. Rectangular ring
35. Paring disc chamber
36. Lock nut
37. Cap nut
6.5.2 Tools to be used

A. **OFF. B. Instruction book**
B. Instruction Book for Compression Tool

1. Lock ring, small
2. Paring chamber cover
3. Washer
4. Level disc
5. Lock ring, large *
6. Bowl hood *
7. Bowl discs
8. Bowl disc
9. Distributor *

Tools - B. Instruction Book for Compression Tool

* Exchange necessities rebalancing
A. OFF
1. Distributor support
2. Vortex holder, cover
3. Vortex holder
4. Cap nut
5. Bowl body *

6. Bushing
7. Valve plug
8. Valve slide *
9. Valve seating
T   Tools
*   Exchange necessities rebalancing
6.5 Separator bowl

6 Dismantling/Assembly
6.5.3 Dismantling

1. Fit the tool (Tool 25) and unscrew the small lock ring, with some light blows, using a tin hammer.
   **Left-hand thread!**

2. Remove the small lock ring, the paring chamber and the level disc.

3. Unscrew and remove the inlet pipe using a hook spanner on the wings.

4. Fit the lifting tool (T17) on the bowl hood.
5. Fit the compressing tool through the lifting tool and thread it into the distributor. Turn the control lever to position for compression.

6. Compress the disc stack, by pumping the handle until the oil pressure is released through the relief valve, i.e. when no resistance can be felt any more.

7. Fit the tool for the large lock ring (Tool 26) and secure it with the screw.
8. Loosen the large lock ring by hitting the spanner with a tin hammer.
   **Left-hand thread!**

9. Release the pressure in the compression tool, by setting the switch to position 0, the upright position.
   - Unscrew and remove the compressing tool.

10. Remove the bowl hood.

**NOTE**

The large lock ring must be placed resting on a flat and horizontal surface to avoid distortion.

Only slight distortion can make it impossible to refit.
11. Fit the special lifting tool to distributor and lift it of together with the disc stack.

**CAUTION**

Cut hazard

Sharp edges on separator discs may cause cuts.

12. Lift out the collar (1).

13. Fit the special tool (T 49) to distributor support (2). Lift it out.

14. Lift out the paring tube holder (3).

15. Fit the 3 special tools (T71) evenly spaced in the grooves in the cover. Loosen and remove the cover.

16. Remove the 9 complete vortex holders (5).

17. Loosen and remove the three screws (6) holding the guide ring (7) and remove it.
18. Loosen and remove the cap nut using special tool (T5 and T24).

19. Fit the combined driving-off and lifting tool (Tool 16). Use the handle of the tin hammer to drive the bowl of the spindle. Make sure that the cap nut is removed.

**NOTE**
Do not forget to loosen the bowl body from the tapered end of the bowl spindle by means of the central screw.

20. Lift the bowl body out of the frame and place it on a wooden surface. Remove the lifting tool.

**WARNING**

- **Crush hazard**

  Support the bowl body when turning to prevent it from rolling.

**WARNING**

- **Crush hazard**

  Use correct lifting tools and follow lifting instructions.

  Do **not** work under hanging load.
6.5.4 **Dismantling / Spring support, valve operating slide**

1. Fit the “bowl body turning tool” (T 43). Turn the bowl 90° and lower it on a wooden surface.

   ![](image)
   **WARNING**
   Risk for squeezing

2. Fit the spindle (64) in the tapered hole in the bowl body and secure it with the washer and nut (64A).

3. Lift the bowl body and turn it upside down and place on a wooden surface.

4. Fit sleeve (63) over the spindle.
5. Fit the compression tool through the sleeve and thread it into the spindle.

6. Compress the spring support. Pump with the handle until the oil pressure is released through the relief valve, i.e. when no resistance can be felt any more.

7. Loosen the nuts for the spring support, successively a little at a time. Remove the nuts.

8. Release the pressure on the compression tool, by setting the switch to position 0. Remove the compression tool and the sleeve.

9. Remove the spring support and the springs.
10. Fit two lifting eyes in the valve operating slide and lift it off from the bowl body.

11. Place the valve operating slide with the valve plugs facing upwards.

---

6.5.5 Exchange of valve plugs

Disassemble the valve plug holder and the valve plug. Use tools (T 37, T 33).

Always replace the old valve plugs with new ones.

It is of utmost importance that all the valve plugs are at the same height, when they are mounted, therefore the valve plug holder seats and valve plug holders must be thoroughly cleaned and tightened with the right tightening torque (40 Nm).

The holder must be cleaned and lubricated with Molykote Paste 1000 before reassembly.

After replacement of the valve plugs or disassembly of the valve slide, run the machine without process liquid enabling the plugs to enter their seats properly. This is to avoid leakage and too long acceleration periods.
6.5.6 Assembly / Spring support, valve operating slide

1. Fit the valve operating slide. The valve operating slide can only be fitted one way because of the uneven spaced guide pins.

2. Fit the springs and spring support.

3. Fit the sleeve and thread the compression tool into the spindle.
4. Compress the spring support.
   Pump with the handle until the oil pressure is released through the relief valve, i.e. when no resistance can be felt any more.
   Fit and tighten the three nuts.
   Tightening torque 70-80 Nm (A).

5. Release the pressure on the compression tool, by setting the switch to position 0.
   Remove the compression tool (47) and the sleeve (63).

6. Fit the “bowl body turning tool” (T 43). Turn the bowl 90° and lower it on a wooden surface.

7. Unscrew the nut (64A) and washer holding the spindle (64) and remove it.
8. Lift and turn the bowl body and lower it on a wooden surface.
   Remove the "bowl body turning tool" (T 43).
6.5.7 Assembly

✔ Check points

- “5.3.3 Corrosion" on page 59.
- “5.3.4 Cracks” on page 61.
- “5.3.5 Erosion” on page 62.
- “5.3.7 Thread wear of lock ring” on page 66.
- “5.3.9 Lock ring joint” on page 68.

NOTE

Ensure that the disc stack pressure is sufficient to maintain bowl balance.

Insufficient pressure in the disc stack can cause vibration and reduce life of ball bearings.

1. Clean the conical hole in the bowl body thoroughly before mounting.

2. Fit the bowl body to the spindle.
   Lower it down carefully to ensure that the threads on the spindle don’t get damaged.

3. Check the height adjustment.
   See, “5.3.2 Height adjustment of machine top part” on page 58.

4. Fit and tighten the cap nut using special tool (T5 and T24).
5. Fit the guide ring (6) and tighten the screws (5).

6. Fit the 9 complete vortex holders (4).

7. Fit the cover (3).

8. Fit the paring tube holder (2).

9. Fit the distributor support with the rectangular ring, use special tool (T49).

10. Fit the collar (1).

11. Fit the bowl discs to the distributor. Then fit the special lifting tool and lift the assembly to the bowl body.
   Check that the marks on the distributor and bowl body are in line with each other and that the distributor guide lugs fit in the slots in bowl body.

12. Fit the bowl hood.
   Check that the marks on the bowl hood and bowl body are in line with each other. This is very important though there is no polar guiding between bowl hood and bowl body.
13. Fit the compressing tool through the lifting tool and thread it into the distributor. Turn the control lever to position 1 for compression.

14. Compress the disc stack.
   Pump with the handle until the oil pressure is released through the relief valve, i.e. when no resistance can be felt any more.
   Remove the handle.

15. Fit large lock ring and tighten by hitting the spanner with a tin hammer.
   **Left-hand thread!**

**✔ Check point**

“5.3.6 Disc stack pressure” on page 64.

16. Release the pressure in the compression tool by setting the switch in position 0, the upright position.
17. Unscrew and remove the compressing tool.

18. Unscrew and remove the lifting tool (T17).

19. Fit washer (level ring), inlet pipe with paring disc and paring disc chamber.  
   Note! The Ø 142 mm washer should be used as standard.

20. Fit the small lockring. Use special tool (Tool 25) and fasten the small lock ring, with some light blows, using a tin hammer.  
   **Left-hand thread!**
6.6 Machine bottom part

6.6.1 Exploded views
1. Frame bottom part
2. Gasket
3. Drain screw
4. Gasket
5. Screen
6. Gasket
7. Glass disc
8. Rectangular ring
9. Fixing plate
10. Screw
11. Driving device horizontal
12. Gasket
13. Bearing shield
13A Tolerance ring
14. Washer
15. Screw
16. Cylindrical pin
17. Gasket
18. Worm wheel guard
19. Washer
20. Screw
21. Guard
22. Washer
23. Screw
24. Driving device vertical
25. Screw
26. Bracket
27. Bracket
28. Screw
29. Washer
30. Proteckting sheet
31. Screw
32. Cooling water tube
35. Grating
36. Screw
38. Screw
39. Hose
40. Holder
41. Screw
42. Pipe
Revolution counter

1. Screw
2. Washer
3. Worm wheel guard
4. Gasket

1. Seal ring
2. Revolution counter shaft
3. Stop ring
4. Slotted pin
5. Bushing
6. Plug
7. Gasket
8. Worm wheel guard
9. Stop screw
10. Gear wheel
11. Taper pin
6.7 Vertical driving device

6.7.1 Exploded view
1. Bottom bearing housing
   1A. Bottom bearing
   1B. Insert sleeve
   1C. Screw
   1D. O-ring
2. O-ring
3. Screw
4. Bowl spindle
5. Ball bearing
6. Ball bearing holder
7. Rubber buffer
8. Compression spring
9. Top bearing support
10. Oil fan
11. Ball bearing holder upper
12. Rubber buffer
13. Top bearing cover
14. O-ring
15. Screw
16. Worm
17. Support washer
18. Roller bearing
22. Gasket
23. Screw
24. Protecting collar
25. Protecting cap
26. O-ring
27. Screw
28. O-ring
29. Protecting plate
30. Screw
31. Protecting collar
33. Wear nut
34. Bushing
35. O-ring
36. Plunger
37. Compression spring
38. Coupling body
40. O-ring
43. Screw
45. Washer
46. Insert nipple
6.7 Vertical driving device

6.7.2 Bowl Spindle

7. Bowl spindle
14. Ball bearing holder upper
15. Rubber buffer
17. Top bearing cover
18. O-ring
20. Screw
46. O-ring
47. Screw
48. Washer

A = Loctite 242
1. Bottom bearing housing
2. O-ring
3. Screw
4. –
5. Screw
6. Screw
7. Ball bearing
8. Ball bearing holder
9. Rubber buffer
10. Compression spring
11. Top bearing support
12. Oil fan
13. Gasket
14. Screw
15. Worm
16. Support washer
17. Roller bearing
18. Protecting collar
19. Wear nut
20. O-ring
21. Bushing
6.7.3 Dismantling

**WARNING**

† Entrapment hazards

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

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

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

---

1. Drain off the oil from the gear housing.

**CAUTION**

† Burn hazards

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

---

2. Remove the cover before starting any dismantling. Check the teeth of the worm wheel and worm for wear.
3. On the horizontal driving device, loosen the screws in the clamping element uniformly and in the order shown in the figure. In the first round, do not loosen them more than 1/4 turn to avoid wryness in the clamping rings. Do not unscrew the screws entirely.

**CAUTION**

**Crush hazard**

The worm wheel is quite heavy. Hold it firmly when dismantling. Risk for jamming injury.

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

5. Remove the bushing (34) inlet for compressed air at the bottom of the spindle.

6. Unscrew six screws and remove the ventilation plate and height adjusting ring.
7. Remove the three screws and remove the protecting cap.

8. Remove the O-ring and pull off the protecting collar.
   **Note!** No threads.

9. Unscrew the six screws and lift out the guard.

10. Remove the rubber ring.
11. Unscrew and remove the six screws holding the vertical driving device.

12. Lift out the vertical driving device with the lifting tool (T18).
   Place the device horizontally on a wooden support.

13. Loosen the wear nut with a screw spanner.

14. Remove the protecting collar. Use the hook spanner T7.
15. Pull off the worm together with the roller bearing and the support washer. Use tool (T2), washer (T72) and a bar to stop the spindle from turning. Hit a few light blows with a hammer on the end of the screw if the worm won’t loosen.

16. Fit the vertical driving device upside down in the special mounting tube tool (T31).

17. Unscrew and remove the oil fan, using special tool (T38).

Top bearing
18. Unscrew and remove the three screws.
19. Remove the top bearing support and the lower rubber buffer. The lower rubber buffer is provided with springs.
   Lift out the spindle.
   Remove the bearing cover and the upper rubber buffer.

20. Ease off and remove the lower ball bearing holder by using the three screws removed in point 18 (above).
    Unscrew the three screws and repeat the procedure for the upper ball bearing holder.

21. Drive off the ball bearing from the top end, using special tool (T3) and a tin hammer.

22. Clean the parts thoroughly.
6.7.4 Assembly

✔ Check points

“5.8.1 Worm wheel and worm; wear of teeth” on page 83.
“5.3.10 Bowl spindle taper” on page 73.

NOTE

The bearings used for the bowl spindle are specifically designed to withstand the speed, vibration, temperature and load characteristics of high-speed separators. Do not use other bearings than those stated in Spare Parts Catalogue.

Do not refit a used bearing. Always replace it with a new one.

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

2. Heat the upper and lower ball bearing supports to 125 °C and mount them on the top bearing.

NOTE

If any doubt how to mount roller bearings in a correct way, see the detailed description in chapter “5.10.2 Ball and roller bearings” on page 88.
3. Heat the top bearing assembly to max. **125 °C** and mount it on the spindle. Use the oil fan as a tool to secure the correct position of the top bearing assembly. See also "5.10.2 Ball and roller bearings" on page 88. Remove the oil fan after about **5 minutes**.

4. Fit the top bearing cover and the upper rubber buffer, the one without springs, in the mounting tube tool.
Lower the spindle through the top bearing cover, with the short spindle side down.
Adjust the parts into their positions.
5. Place the lower rubber buffer with its springs on the ball bearing holder. Maximum admitted indentations in the bearing holder and bearing support are 0.5 mm.

6. Fit a new O-ring in the top bearing cover. Pull the top bearing support together with the top bearing cover by tightening the three screws.

$A_{\text{max.}} = 0.5 \text{ mm}$
7. Mount the oil fan.

8. Force the worm by hand onto the lower cleaned tapered part of the bowl spindle. **Note!** The worm should not be heated before assembly.

9. Fit the support washer. Wipe off and oil the bearing seat before fitting the roller bearing.

10. Heat the bottom bearing to max. 125 °C and mount it on the spindle.

**NOTE**
If any doubt how to mount roller bearings in a correct way, see the detailed description in chapter "5.10.2 Ball and roller bearings" on page 88.
11. Fit the protecting collar. Use the hook spanner (T7).

12. Fasten the wear nut with a screw spanner.

13. Fit a new gasket in the frame top part. **Note!** The old one must be completely removed. Lift the bowl drive cartridge into the frame with the lifting tool (T18).

14. Fasten the bowl drive cartridge in the frame with the six screws. **Note!** The screws must be locked with Loctite 242.
15. Fit a new rubber ring in the frame top part.

16. Fit three guard and tighten the six screws.

17. Fit the protecting collar and the O-ring
   **Note!** The collar must rest against the thrust collar on the bowl spindle.

18. Fit the protecting plate and tighten the three screws.
   **Note!** Too hard tightening may damage the protecting collar
19. Mount the hood above the top bearing. 
   Tighten the screws.

   Check the height adjustment between bowl and ventilation plate see “5.3.2 Height adjustment of machine top part” on page 58.

   Rotate the spindle and check for smooth run. 
   No scrapings or other jarring sounds must be heard.

20. When fitting a new gearing, always ensure that the new parts have the correct number of teeth. See “8.1 Product description” on page 176.

---

**WARNING**

Disintegration hazard

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

21. Push the worm wheel on the horizontal shaft into position for driving the bowl spindle. Fix the worm wheel:

   a. First tighten the three clamping elements screws, A, B and C (see illustration), but only so little that the clamping elements sticks onto the worm wheel.

   b. Then tighten all the screws uniformly and in the order indicated in the illustration (screw 1 to 12). Do not tighten crosswise. Tightening torque: **29 Nm**. This must be done several turns around the clamping element until it is impossible to turn the screws.
c. The catch of the dynamometric wrench is immediately released. Check continuously that the ring of the clamping element remains plane-parallel.

✔ **Check points**

“5.4.1 Bowl spindle; radial wobble” on page 74.
“5.4.2 Worm wheel shaft; radial wobble” on page 75.

**NOTE**

Spindle wobble may cause vibration and reduce life of ball bearing.
6.8 Horizontal driving device

6.8.1 Exploded view

1. Foundation beam 7. Stud bolt
1.1 Foundation girder 8. Washer
3. Nut 10. Anchoring foot
4. Brake pulley 11. Adjusting washer
4A. Screw 12. Nut
1. Bearing housing
2. Round nut
3. Worm wheel shaft
4. Ball bearing
5. Round nut
6. Lock ring
7. Worm wheel
7A. Nave
7B. Buffer
7C. Sleeve
7D. Ring
7E. Screw
7F. Gear rim
8. Clamp element
9. Ball bearing
10. Flat key
11. Washer
12. Spring washer
13. Screw
6.8.2 Tools

A. Socket 30mm
B. Loctite 242
C. OFF
D. Loctite 270
E. Socket 13 mm
6.8.3 Dismantling

**WARNING**

**Entrapment hazards**

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

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

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

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.

If the bowl spindle has been removed according to earlier description, points 1-2 below are already done. Proceed then with point 3.

1. Drain the oil from the worm gear housing.

**CAUTION**

**Burn hazards**

Lubricating oil in the worm gear housing and various machine surfaces can be hot and cause burns.

2. Remove the two covers and their gaskets.
3. Remove the bearing shield. Ease it off by means of two of the fastening bolts.

**CAUTION**

Crush hazards

The shield is quite heavy. Hold the shield firmly or use two longer screws as guide pins so as not to drop it during dismantling.

4. Push the worm wheel to one side before removing the spindle. If worm wheel is stuck use a piece of wood to loosen it.

5. Fit the puller tool and pull off the ball bearing from the worm wheel shaft.
6. Loosen the clamp screws uniformly and successively around the clamping rings in the order stated. At the first round, do not loosen them more than 1/4 turn to avoid wryness in clamping rings. Do not screw out the clamp screws entirely.

7. Remove the clamping element and the worm wheel.

**CAUTION**

*Crush hazards*

The worm wheel is quite heavy. Hold it firmly when dismantling. Risk for jamming injury.

8. Disconnect the motor cables. Note the position of the cables in the terminal box to reconnect correctly (for correct direction of the rotation).

9. Attach the lifting device to the motor.

10. Loosen the nuts on the motor flange.

11. Remove the motor.

12. Remove the three elastic plates.

13. Remove the screw, washer and spring washer.

   Fit the screw again and use it as protection for the shaft.
14. Fit the puller tool and pull off the coupling disc.

15. Remove the lock ring on the worm wheel side using a pin spanner (T 61).
   **Left-hand thread!**

16. Knock loose the worm wheel shaft by means of a piece of wood and a tin hammer. Use light blows from the motor side.

17. Unscrew the round nut fixing the ball bearing. The nut is locked with Loctite 242. Use a hook spanner (T 7).
18. Remove the ball bearing. Put some cotton twist into the tool to avoid damage to the shaft. The pressure should be applied to the inner race of the ball bearing.

### 6.8.4 Dismantling / Bearing housing

The bearing housing should only be removed if it is necessary to renew it or when the separator is being reconditioned.

1. Remove the lock ring using special tool (T26).

2. Knock the bearing housing out from the motor side.
6.8.5 Assembly / Horizontal driving device

✔ Check points

“5.4.3 Motor shaft; radial wobble” on page 76.

6.8.6 Assembly / Bearing housing

1. Apply Loctite 242 to the guide surface of the bearing housing and fit it to the frame if it has been removed.

2. Lock the bearing housing with the lock ring, using special tool (T26).

3. Clean and oil the seat of the large ball bearing on the worm wheel shaft.

4. Heat the large ball bearing to 125 °C in oil. See also “5.10.2 Ball and roller bearings” on page 88.
   Mount the ball bearing on the shaft. Use protective gloves.
5. Apply some Loctite 242 on the threads of the round nut. Lock the ball bearing in its position by tightening the nut.

6. Clean the ball bearing housing in the frame and oil the outer race of the ball bearing. Force the worm wheel shaft into its position in the frame so that the ball bearing enters correctly into its seat. Use the mounting sleeve, tin hammer and the ring forcing the outer race of the ball bearing.

7. Fit the lock ring. Tighten it with the pin spanner.

   **Left-hand thread!**

8. When mounting the coupling disc. Check that the key in the worm wheel shaft enters into the recess in the nave of the disc.

9. Lock the coupling disc in its position by means of the plain washer, spring washer and centre screw.
10. If the brake pulley has been removed, first lubricate the motor shaft with Molykote Paste 1000. Then knock the disc onto the motor shaft as far as possible using a piece of wood and a hammer.

   Screw the tool illustrated into the motor shaft as far it goes and apply some grease to its washer. Then turn the tool until the coupling disc is in position. Lock with the lock screw.

11. Check the three elastic plates. Clean or renew, if needed.

12. Before mounting the motor, check the axial play of the elastic plates. Measure the distances “a” and “b”. The difference should be $35 \pm 0.5 \text{ mm}$.

   $b = a - 35 \pm 0.5 \text{ mm}$

13. Fit the electric motor, using a hoist.

   Fit the adjusting washer between motor and motor plate, if any.
14. When fitting a new gearing, always ensure that the new parts have the correct number of teeth. See “8.1 Product description” on page 176.

**WARNING**

Disintegration hazard

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

15. Worm wheel assembly:
   If the rubber bumpers have been replaced, apply some Loctite 270 on the six screws. Tightening torque = 25 Nm.

16. Clean the worm wheel shaft and the inner surface of the worm wheel nave thoroughly. Carefully push the worm wheel into its position on the shaft.

17. Clean the inner surface of the nave of the clamping element and oil it. The oil must be of the same quality as is used in the gear housing. Mount the clamping element on to the worm wheel.
18. Mount the ball bearing (not heated) on the free end of the shaft. Apply the mounting tool and hit a few blows on the latter to ascertain that the bearing is in the correct position.

19. Clean the bearing seat in the bearing shield. Check that the tolerance ring is in position (renewed at Major Service).

20. Renew the gasket and fit the bearing shield.
   Note that the shield can be fitted in one position only.
   If necessary, pull it into position using the screws or tap its centre with a tin hammer.

The remaining description in this section implies that the bowl spindle is mounted in the frame. If not, proceed with the assembly instruction for the vertical driving device, See "6.7.4 Assembly" on page 148.

21. Push the worm wheel on the horizontal shaft into position for driving the bowl spindle.
22. Fix the worm wheel by first tightening the three clamping element A, B and C (see figure), but only so little that the clamping element sticks on to the worm wheel. Then tighten all the screws uniformly and in the order indicated in the order indicated in the figure (1-12). Do not tighten crosswise. Tightening torque: **29 Nm**.

This must be done several turns around the clamping element until it is impossible to turn the screws further with the prescribed torque. The catch of the dynamometric wrench is immediately released. Check continuously that the ring of the clamping element remains plane parallel.

23. Fit the two covers and their gaskets.

24. Fill new oil into the worm gear housing. The oil level should reach the middle of the sight glass. For correct oil quality, see “8.8 Lubricants” on page 201.

Oil volume: **8 litres**.
6.9 Frame feet

See also “8.15.4 Foundations” on page 230.
7 Trouble-Tracing

Contents

7.1 Mechanical faults 172
7.2 Concentration fault 174
# 7.1 Mechanical faults

<table>
<thead>
<tr>
<th>Indication</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Machine vibrates</strong></td>
<td>Moderate vibrations normally occur at the critical number of revolutions during the running up and retardation periods.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Bowl out of balance due to: Bad cleaning of clogged nozzles – Incorrect assembling – badly tightened lock ring – bowl assembled with parts from different machines</td>
<td>Stop immediately and establish cause. Badly tightened lock ring involves fatal danger Replace</td>
</tr>
<tr>
<td></td>
<td>Vibration damping rubber washers have lost elasticity</td>
<td>Renew rubber washers</td>
</tr>
<tr>
<td></td>
<td>Top bearing spring broken</td>
<td>Exchange all springs</td>
</tr>
<tr>
<td></td>
<td>Disc set pressure to low</td>
<td>Add disc(s)</td>
</tr>
<tr>
<td></td>
<td>Bearings damaged or worn</td>
<td>Fit new bearings</td>
</tr>
<tr>
<td></td>
<td>Foundation too weak</td>
<td>Reinforce foundation</td>
</tr>
<tr>
<td><strong>Speed too high</strong></td>
<td>Incorrect transmission</td>
<td>Stop immediately. Check that proper transmission is used in view of motor speed</td>
</tr>
<tr>
<td></td>
<td>Motor fault/switching from Y-D</td>
<td>Rectify</td>
</tr>
<tr>
<td><strong>Speed is too low.</strong></td>
<td>Voltage drop in mains</td>
<td>Check mains voltage (D.C.)</td>
</tr>
<tr>
<td></td>
<td>Ball bearing damage</td>
<td>Locate and exchange defective bearing</td>
</tr>
<tr>
<td></td>
<td>Other machine defects</td>
<td>Stop immediately. Check that bowl can be rotated by hand</td>
</tr>
<tr>
<td></td>
<td>Motor defect</td>
<td>Exchange or repair motor</td>
</tr>
<tr>
<td></td>
<td>Motor fault/switching from Y-D</td>
<td>Rectify</td>
</tr>
<tr>
<td><strong>Run-up time prolonged</strong></td>
<td>Ball bearing damage</td>
<td>Locate and exchange</td>
</tr>
<tr>
<td></td>
<td>Motor fault/switching from Y-D</td>
<td>Rectify</td>
</tr>
</tbody>
</table>
## 7 Trouble-Tracing
### 7.1 Mechanical faults

<table>
<thead>
<tr>
<th>Indication</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting power too high</td>
<td>Ammeter reading incorrect</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td>Motor defect</td>
<td>Exchange or repair motor</td>
</tr>
<tr>
<td></td>
<td>Motor fault/switching from Y-D</td>
<td>Rectify</td>
</tr>
<tr>
<td></td>
<td>Ball bearing damaged</td>
<td>Locate and exchange defective bearing</td>
</tr>
<tr>
<td></td>
<td>Other machine defects</td>
<td>See – Speed is too low</td>
</tr>
<tr>
<td>Water in worm gear housing</td>
<td>Condensation</td>
<td>Drain water and change oil</td>
</tr>
<tr>
<td></td>
<td>Water flushing by external cleaning</td>
<td>Drain water and change oil</td>
</tr>
<tr>
<td></td>
<td>Leakage via top bearing</td>
<td>Exchange seal rings and packings. Change the oil</td>
</tr>
<tr>
<td>Noise from worm gear housing</td>
<td>Oil quantity Incorrect</td>
<td>Check quantity and quality</td>
</tr>
<tr>
<td></td>
<td>Worm wheel or worm worn</td>
<td>Exchange worn parts. Exchange of complete gear is generally advisable</td>
</tr>
<tr>
<td></td>
<td>Ball bearing worn or damaged</td>
<td>Exchange bearing</td>
</tr>
<tr>
<td>Smell</td>
<td>Bearing running hot</td>
<td>Feel over machine and locate spot. Exchange bearing</td>
</tr>
<tr>
<td></td>
<td>Motor fault/switching from Y-D</td>
<td>Rectify</td>
</tr>
<tr>
<td>“Scraping” sounds</td>
<td>Incorrect height position of paring disc and/or ventilation plate</td>
<td>Stop and adjust</td>
</tr>
</tbody>
</table>
### 7.2 Concentration fault

<table>
<thead>
<tr>
<th>Indication</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outgoing heavy phase contains light phase</strong></td>
<td>Vortex nozzles to large</td>
<td>Fit new vortex nozzles with smaller hole diameter</td>
</tr>
<tr>
<td></td>
<td>Closed valve or to high back pressure in light phase outlet</td>
<td>Open valve</td>
</tr>
<tr>
<td></td>
<td>Throughput too high</td>
<td>Reduce feed rate</td>
</tr>
<tr>
<td><strong>Outgoing light phase contains too much heavy phase</strong></td>
<td>Throughput too high</td>
<td>Reduce rate of feed</td>
</tr>
<tr>
<td></td>
<td>Vortex nozzles to small</td>
<td>Fit new vortex nozzles with larger hole diameter</td>
</tr>
<tr>
<td><strong>Heavy phase contains too much solids</strong></td>
<td>Nozzle too small</td>
<td>Fit nozzles with larger hole diameter</td>
</tr>
<tr>
<td></td>
<td>Nozzle clogged</td>
<td>Clean all nozzles</td>
</tr>
<tr>
<td><strong>Air in light phase</strong></td>
<td>Back pressure in outlet pipe too low</td>
<td>Increase back pressure</td>
</tr>
<tr>
<td></td>
<td>(light phase)</td>
<td></td>
</tr>
<tr>
<td><strong>Liquid sediment flows out through the bowl casing during operation</strong></td>
<td>Leaky valve plugs.</td>
<td>Replace</td>
</tr>
</tbody>
</table>
8 Technical Reference

Contents

8.1 Product description 176
  8.1.1 Directives & Standards 177

8.2 Technical data 178

8.3 Modification of BTUX to BTAX 180

8.4 Basic size drawing 181
  8.4.1 Separator, large cyclone 181
  8.4.2 Dimensions of connections 182
  8.4.3 Connection list 183

8.5 Basic size drawing 187
  8.5.1 Separator, small cyclone 187
  8.5.2 Dimensions of connections 188
  8.5.3 Connection list 189

8.6 Interface description 192
  8.6.1 General 192
  8.6.2 Definitions 192
  8.6.3 Component description and Signal processing. Hydraulic connections 193
  8.6.4 Electric connections 193
  8.6.5 Function graph and running limitations 197

8.7 Paring disc characteristics 198

8.8 Lubricants 201
  8.8.1 Introduction 201
  8.8.2 Lubrication chart 202
  8.8.3 Recommended lubricants 203
  8.8.4 Recommended oil brands 207
  8.8.5 Recommended oil brands 208

8.9 Other drawings 209
  8.9.1 Foundation drawing 209
  8.9.2 Interconnection diagram 210

8.10 Motor specifications 211
  8.10.1 Motor data, BROOKS 211
  8.10.2 Electric motor 213
  8.10.3 Motor data, ABB 215
  8.10.4 Electric motor, ABB 217

8.11 Cover interlocking kit 219

8.12 Monitoring kit 220

8.13 Quality specifications 221
  8.13.1 Operating liquid 221
  8.13.2 Compressed air 222

8.14 Machine plates and safety labels 223

8.15 Storage and installation 225
  8.15.1 Introduction 225
  8.15.2 Storage and transport of goods 225
  8.15.3 Planning of installation 227
  8.15.4 Foundations 229

8.16 Other drawings 209

8.17 Foundation drawing 209

8.18 Interconnection diagram 210

8.19 Motor data, BROOKS 211

8.20 Electric motor 213

8.21 Motor data, ABB 215

8.22 Electric motor, ABB 217

8.23 Cover interlocking kit 219

8.24 Monitoring kit 220

8.25 Quality specifications 221

8.26 Operating liquid 221

8.27 Compressed air 222

8.28 Machine plates and safety labels 223

8.29 Storage and installation 225

8.30 Introduction 225

8.31 Storage and transport of goods 225

8.32 Planning of installation 227

8.33 Foundations 229

175
8.1  Product description

Alfa Laval ref. 557059, rev. 5

NOTE

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

Product number: 881159-01-02/3
Separator type: MBUX 510T-34C
Application: Micro biology
Technical design: Clarifier with internal nozzle sediment outlet
Bowl in stainless steel
Machine top part in stainless steel, Water cooled frame top part, and frame hood
EPDM or Nitrile sealings
Restrictions: Hydraulic capacity: Max 10m³/h
Feed temperature: 0° C to +100° C.
Ambient temperature: +5° C to +55° C.
Maximum discharge volume: 5 litres
Feed/sediment density max 1200/1700 kg/m³
Only land based installations are permitted.
Bowl must be kept filled during stopping sequence.
Risks for corrosion and erosion have to be investigated in each case by the application centre.
### 8.1.1 Directives & Standards

*Alfa Laval ref. 591985, rev. 4*

<table>
<thead>
<tr>
<th>Declaration of Incorporation of partly completed Machinery</th>
</tr>
</thead>
<tbody>
<tr>
<td>The machinery complies with the relevant, essential health and safety requirements of:</td>
</tr>
<tr>
<td>2006/42/EC</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>To meet these requirements the following standards have been used:</td>
</tr>
<tr>
<td>EN 60204-1</td>
</tr>
<tr>
<td>EN ISO 12100</td>
</tr>
<tr>
<td>ISO 3744</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Declaration of Conformity</th>
</tr>
</thead>
<tbody>
<tr>
<td>The machinery complies with the following Directives:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>To meet the requirements the following standards have been applied:</td>
</tr>
<tr>
<td>EN 60204-1</td>
</tr>
<tr>
<td>EN 61000-6-2</td>
</tr>
<tr>
<td>EN 61000-6-4</td>
</tr>
<tr>
<td>EN ISO 12100</td>
</tr>
</tbody>
</table>
8.2 Technical data

Alfa Laval ref. 557166, rev. 4

**WARNING**

**Disintegration hazards**

Use the separator only for the purpose and parameters (type of liquid, rotational speed, temperature, density etc.) specified in this chapter and in the Purchase order documents. Consult your Alfa Laval representative before any changes outside these parameters are made.

**Product number**

881159-01-02/3

**Separator type**

MBUX 510T-34C

**Bowl speed max**

7432/7488 rev/min 50 Hz / 60 Hz

**Speed motor shaft max**

1500/1800 rev/min 50 Hz / 60 Hz

**Gear ratio**

109:22/104:25 50 Hz / 60 Hz

**Revolution counter**

118-125/142-150 rev/min. 50Hz/60Hz

**Hydraulic capacity**

10 m³/h

**Max. nozzle flow (Paring tube ø4)**

1.5 m³/h

**Max. nozzle flow (Paring tube ø12)**

5 m³/h

**Max. discharge interval**

1 minute

**Min./Max. discharge volume**

1.5/5 litres variable discharge

**Sediment volume**

3.8 litres

**Max density of sediment/feed**

1700/1200 kg/m³

**Feed temperature**

0/100 min/max °C

**Ambient temperature**

+5 to +55 °C

**Weight of separator**

965 kg (without motor)

**Motor power**

37 kW

**Jp reduced to motor shaft**

248 kg/m² 50Hz

**Jp reduced to motor shaft**

175 kg/m² 60Hz

**Power consumption**

10,5/23 kW (idling/at max. capacity)

**Starting time**

5/6 minutes (min/max)

**Stopping time with brake**

7,5/8,5 minutes (min/max)

**Stopping time without brake**

32 minutes (average)
Lubricating oil volume  8  litres
Max running time without flow:
- with empty bowl/ with filled bowl  180/180  minutes
Sound press level  82  dB(A)
Vibration level max. according to PF  7,1/11,2  mm/sec (new sep/sep in use)
Alarm level for vibration monitor,
Connection 750  4/6  mm/sec (1st/2nd)
Bowl max inner diameter  476  mm
Bowl volume  17  litres
Bowl weight  317  kg
Bowl body material:  AL 1112397-81

There are no other material than stainless steel in contact with process liquid.
8.3 Modification of BTUX to BTAX

1. Remove collar (1), paring tube holder (2) and the 9 complete wortex holders (3,4 and 5).

2. Fit concentrate tube plug (6).
8.4 Basic size drawing

Alfa Laval ref. 557083/1, rev. 0

8.4.1 Separator, large cyclone

A. Maximum horizontal displacement at the in/outlet connections during operations ±20 mm
B. Maximum vertical displacement at the cyclone connections during operations ±10 mm
C. Tightening torque 200 Nm

Connection 222 turnable 360°
Connections 201 and 220 turnable 360°
Min. angle between 201 and 220 = 40°

All connections to be installed non-loaded and flexible.

Data for connections see “8.4.3 Connection list” on page 183.
8.4.2 Dimensions of connections

Data for connections see "8.4.3 Connection list" on page 183.

All connections to be installed non-loaded and flexible.
### 8.4.3 Connection list

**Large cyclone**

*Alfa Laval ref. 557176, rev. 3*

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Requirements / limits</th>
</tr>
</thead>
</table>
| **201** | Inlet for product  
- Required inlet pressure  
(for water at max back pressure) |  |
|  | Flow m$^3$/h | Inlet pressure kPa |
| 201 | 10 | - 10 |
|  | 5 | - 60 |
|  | 1 | - 60 |
| **220** | Outlet for clarified liquid  
- Required min back pressure to get liquid free of gas,  
and max back pressure to avoid overflow. |  |
|  | Flow m$^3$/h | Back pressure kPa  
min - max |
| 220 | 10 | 300 - 500 |
|  | 5 | 300 - 600 |
|  | 1 | 300 - 600 |
| **222** | Outlet for concentrate  
- Max allowed back pressure | 600 kPa |
|  | - Flow (paring tube $d^1 = 4$mm) | max 1.5 m$^3$/h |
|  | - Flow (paring tube $d^1 = 12$ mm standard) | max ca 5 m$^3$/h |
| **302** | Inlet for flushing above the bowl (equipped with a 2 mm exchangeable nozzle).  
Normally used only in the discharge sequence and/or for cleaning. |  |
|  | - Pressure range | 100 - 600 kPa |
|  | - Pressure (recommended) | 300 kPa |
|  | - Flow (momentary at rec. pressure) | 250 l/h |
|  | - Consumption | 0 - 6 l /discharge |
### Inlet for flushing with CIP liquid in air compensation pipe (equipped with a 2 mm exchangeable nozzle.)

- Pressure range: 100 - 600 kPa
- Pressure (recommended): 300 kPa
- Flow (momentary at rec. pressure): 250 l/h
- Consumption: 0 - 6 l/discharge

### Outlet for solid phase

- Discharge frequency: Max 60 discharge/h

The outlet from the cyclone must always be arranged to prevent the cyclone from being filled up with sludge. Solids are discharge by gravity.

### Inlet for compressed air for discharge system

- Pressure range: 500 - 600 kPa
- Consumption: 30 Nl/discharge
- Quality requirements: See demand spec. air

### Outlet for returned air from discharge system

### Inlet for cooling/heating frame parts

- Pressure range: max 100 kPa
- Flow: max 1400 l/h
- Flow at 30 kPa: 700 l/h

### Inlet for cooling/heating cyclone

- Pressure: max 100 kPa
- Flow: max 2400 l/h
- Flow at 30 kPa: 800 l/h

### Outlet for cooling/heating cyclone

### Drain, general plugged

### Outlet from drain of frame top part

Should be possible to drain liquids by gravity.
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Requirements / limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>502</td>
<td>Inlet for compressed air to valve on gas recirculation pipe</td>
<td>max 100 kPa</td>
</tr>
<tr>
<td></td>
<td>- Pressure</td>
<td></td>
</tr>
<tr>
<td>511</td>
<td>Inlet for inert gas (if any) to frame top part</td>
<td></td>
</tr>
<tr>
<td>512</td>
<td>Outlet for inert gas (if any) from frame top part</td>
<td></td>
</tr>
<tr>
<td>701</td>
<td>Motor for separator</td>
<td>± 5%</td>
</tr>
<tr>
<td></td>
<td>Allowed frequency variation</td>
<td>± 10%</td>
</tr>
<tr>
<td></td>
<td>(momentarily during maximum 5 seconds)</td>
<td></td>
</tr>
<tr>
<td>712</td>
<td>Pneumatic discharge valve</td>
<td>See interface description</td>
</tr>
<tr>
<td></td>
<td>- Type</td>
<td>3-way(3/2)direct activated</td>
</tr>
<tr>
<td></td>
<td>- Protection class</td>
<td>EEx ed 11 CT74</td>
</tr>
<tr>
<td></td>
<td>- Degree of protection</td>
<td>IP 65</td>
</tr>
<tr>
<td></td>
<td>- Power supply AC 50/60 Hz</td>
<td>24 V 48 V 110 V 220V</td>
</tr>
<tr>
<td></td>
<td>- Power supply DC</td>
<td>24 V</td>
</tr>
<tr>
<td></td>
<td>- Effect, nominal</td>
<td>--W  --W  --W  --W</td>
</tr>
<tr>
<td></td>
<td>- Effect, inrush</td>
<td>40 W 40 VA 40 VA 40 V</td>
</tr>
<tr>
<td></td>
<td>- Effect, holding</td>
<td>3 VA 3 VA 3 VA 3 VA</td>
</tr>
<tr>
<td>730</td>
<td>Temperature sensors, motor winding</td>
<td>PTC-thermistors 190 °C</td>
</tr>
<tr>
<td></td>
<td>- Type</td>
<td></td>
</tr>
<tr>
<td>741</td>
<td>Speed sensor for motor shaft</td>
<td>See interface description</td>
</tr>
<tr>
<td></td>
<td>- Type</td>
<td>Inductive proximity switch</td>
</tr>
<tr>
<td></td>
<td>- Supply voltage, nominal</td>
<td>8 V</td>
</tr>
<tr>
<td></td>
<td>- With sensor activated (near metal)</td>
<td>≤1 mA</td>
</tr>
<tr>
<td></td>
<td>- With sensor not activated (far from metal)</td>
<td>≥3 mA</td>
</tr>
<tr>
<td></td>
<td>- Number of pulses per revolution</td>
<td>4</td>
</tr>
<tr>
<td>750</td>
<td>Unbalance sensors, vibration</td>
<td>See interface description</td>
</tr>
<tr>
<td></td>
<td>Vibration accelerometer sensor</td>
<td>10-32 VDC</td>
</tr>
<tr>
<td></td>
<td>- Supply voltage</td>
<td>4-20 mA</td>
</tr>
<tr>
<td></td>
<td>- Current consumption max.</td>
<td>2 Hz-1kHz</td>
</tr>
<tr>
<td></td>
<td>- Frequency response</td>
<td></td>
</tr>
</tbody>
</table>
### 8.4 Basic size drawing

#### 8 Technical Reference

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Requirements / limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>760</td>
<td>Cover interlocking switch</td>
<td>See interface description</td>
</tr>
<tr>
<td></td>
<td>- Type</td>
<td>Velocity transducer</td>
</tr>
<tr>
<td></td>
<td>- Switch rating, resistive load max.</td>
<td>AC 75 VA 7 W</td>
</tr>
<tr>
<td></td>
<td>- Switch rating, resistive load max.</td>
<td>24 V 200 VA 7 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>48 V 280 VA 9 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>127 V 500 VA 13 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>230 V 550 VA -</td>
</tr>
<tr>
<td>813</td>
<td>Opening for valve plug service</td>
<td></td>
</tr>
<tr>
<td>814a</td>
<td>Inspection opening with sight glass</td>
<td></td>
</tr>
<tr>
<td>814b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>821</td>
<td>Plugged connection (can e.g. be used for flushing the cyclone with sprayball or turbine.)</td>
<td></td>
</tr>
<tr>
<td>838</td>
<td>Plugged connection (can e.g. be used for level sensor.)</td>
<td></td>
</tr>
</tbody>
</table>
8.5 Basic size drawing

Alfa Laval ref. 557116/1, rev. 0

8.5.1 Separator, small cyclone

A. Maximum horizontal displacement at the in/outlet connections during operations ±20 mm
B. Maximum vertical displacement at the cyclone connections during operations ±10 mm
C. Tightening torque 200 Nm

Connection 222 turnable 360°
Connections 201 and 220 turnable 360°
Min. angle between 201 and 220 = 40°

All connections to be installed non-loaded and flexible.

Data for connections see “8.5.3 Connection list” on page 189.
8.5.2 Dimensions of connections

Alfa Laval ref. 5557116/2, rev. 0

Data for connections see “8.5.3 Connection list” on page 189.

All connections to be installed non-loaded and flexible.

A. Nut, DN 38
B. Nut, DN 51
### 8.5.3 Connection list

**Small cyclone**

*Alfa Laval ref. 557177, rev. 3*

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Requirements / limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>Inlet for product</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Required inlet pressure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(for water at max back pressure)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flow m³/h Inlet pressure kPa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10  - 10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5  - 60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1  - 60</td>
<td></td>
</tr>
<tr>
<td>220</td>
<td>Outlet for clarified liquid</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Required min back pressure to get liquid free of gas, and max back pressure to avoid overflow.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flow m³/h Back pressure kPa min - max</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10  300 - 500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5  300 - 600</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1  300 - 600</td>
<td></td>
</tr>
<tr>
<td>222</td>
<td>Outlet for concentrate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Max allowed back pressure 600 kPa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Flow (paring tube d² = 4mm) max 1.5 m³/h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Flow (paring tube d² = 12 mm standard) max ca 5 m³/h</td>
<td></td>
</tr>
<tr>
<td>302</td>
<td>Inlet for flushing above the bowl (equipped with a 2 mm exchangeable nozzle).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normally used only in the discharge sequence and/or for cleaning.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Pressure range 100 - 600 kPa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Pressure (recommended) 300 kPa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Flow (momentary at rec. pressure) 250 l/h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Consumption 0 - 6 l /discharge</td>
<td></td>
</tr>
</tbody>
</table>
### 8.5 Basic size drawing

#### Technical Reference

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Requirements / limits</th>
</tr>
</thead>
</table>
| 321 | Outlet for solid phase | Max 60 discharge/h  
- Discharge frequency  
The outlet from the cyclone must always be arranged to prevent the cyclone from being filled up with sludge. Solids are discharged by gravity. |
| 380 | Inlet for compressed air for discharge system | 500 - 600 kPa  
- Pressure range  
- Consumption  
- Quality requirements  
30 Nl/discharge  
See demand spec. air |
| 381 | Outlet for returned air from discharge system | |
| 405 | Inlet for cooling/heating frame parts | max 100 kPa  
- Pressure range  
- Flow  
- Flow at 30 kPa  
max 1400 l/h  
700 l/h |
| 406 | Outlet for cooling/heating frame parts | 4 kW  
- Heat to be removed (at idling without process flow) |
| 460a | Drain, general plugged | |
| 460b | | |
| 463 | Outlet from drain of frame top part | Should be possible to drain liquids by gravity |
| 511 | Inlet for inert gas (if any) to frame top part | |
| 512 | Outlet for inert gas (if any) from frame top part | |
| 701 | Motor for separator  
Allowed frequency variation  
(momentarily during maximum 5 seconds) | ± 5%  
± 10% |
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Requirements / limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>712</td>
<td>Pneumatic discharge valve</td>
<td>See interface description</td>
</tr>
<tr>
<td></td>
<td>- Type</td>
<td>3-way(3/2)direct activated</td>
</tr>
<tr>
<td></td>
<td>- Protecting class</td>
<td>EEx ed 11 CT 74</td>
</tr>
<tr>
<td></td>
<td>- Degree of protection</td>
<td>IP 65</td>
</tr>
<tr>
<td></td>
<td>- Power supply AC 50/60 Hz</td>
<td>24 V 48 V 110 V 220V</td>
</tr>
<tr>
<td></td>
<td>- Power supply DC</td>
<td>24 V</td>
</tr>
<tr>
<td></td>
<td>- Effect, nominal</td>
<td>--W --W --W --W</td>
</tr>
<tr>
<td></td>
<td>- Effect, inrush</td>
<td>40 W 40 VA 40 VA 40 V</td>
</tr>
<tr>
<td></td>
<td>- Effect, holding</td>
<td>3 VA 3 VA 3 VA 3 VA</td>
</tr>
<tr>
<td>730</td>
<td>Temperature sensors, motor winding</td>
<td>PTC-thermistors 190 °C</td>
</tr>
<tr>
<td></td>
<td>- Type</td>
<td></td>
</tr>
<tr>
<td>741</td>
<td>Speed sensor for motor shaft</td>
<td>See interface description</td>
</tr>
<tr>
<td></td>
<td>- Type</td>
<td>Inductive proximity switch</td>
</tr>
<tr>
<td></td>
<td>- Supply voltage, nominal</td>
<td>8 V</td>
</tr>
<tr>
<td></td>
<td>- With sensor activated (near metal)</td>
<td>≤1 mA</td>
</tr>
<tr>
<td></td>
<td>- With sensor not activated (far from metal)</td>
<td>≥3 mA</td>
</tr>
<tr>
<td></td>
<td>- Number of pulses per revolution</td>
<td>4</td>
</tr>
<tr>
<td>750</td>
<td>Unbalance sensors, vibration</td>
<td>See interface description</td>
</tr>
<tr>
<td></td>
<td>Vibration accelerometer sensor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Supply voltage</td>
<td>10-32 VDC</td>
</tr>
<tr>
<td></td>
<td>- Current consumption max.</td>
<td>4-20 mA</td>
</tr>
<tr>
<td></td>
<td>- Frequency response</td>
<td>2 Hz-1kHz</td>
</tr>
<tr>
<td>760</td>
<td>Cover interlocking switch</td>
<td>See interface description</td>
</tr>
<tr>
<td></td>
<td>- Type</td>
<td>Velocity transducer</td>
</tr>
<tr>
<td></td>
<td>- Switch rating, resistive load max.</td>
<td>AC DC</td>
</tr>
<tr>
<td></td>
<td>- Switch rating, resistive load max.</td>
<td>12 V 75 VA 7 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 V 200 VA 7 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>48 V 280 VA 9 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>127 V 500 VA 13 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>230 V 550 VA -</td>
</tr>
<tr>
<td>813</td>
<td>Opening for valve plug service</td>
<td></td>
</tr>
</tbody>
</table>
8.6 Interface description

Alfa Laval ref. 557257, rev. 3

8.6.1 General

In addition to the Connection List this document describes limitations and conditions for safe control, monitoring and reliable operation. At the end of the document a function graph and running limitations are found.

8.6.2 Definitions

Stand still (Ready for start) means:

- The machine is assembled correctly.
- All connections are installed according to Connection list, Interconnection diagram, Motor drive data and Interface description.

Start means

- The power to the separator motor is on.
- The acceleration is supervised to ensure that a certain speed has been reached within a certain time. See document Motor drive data.

The start procedure continues until the Y-D switch-over has been made and a stabilization period has passed (about 1 minute).

Normal stop means

- Stopping of the machine at any time with the brake applied.
- The bowl must be kept filled.
- Sludge ejection must not be made.
Safety stop means
The machine must be stopped in the quickest and safest way because the vibration level is too high.

Comply to following conditions:
- The bowl must be kept filled.
- Sludge ejection must not be made.
- The machine must not be restarted before the reason for the Safety stop has been investigated and action has been taken.

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

8.6.3 Component description and Signal processing.
Hydraulic connections

Inlet for product 201
The product flow to the machine can start when the stabilization period after Y-D switch over has run out.

8.6.4 Electric connections
Separator motor 701
The separator is equipped with a 3-phase Y-D started motor. The motor is of control torque type and built for a long starting time.

The starting equipment must be dimensioned for twice the rated current of the motor, and the overload relay must only be connected in the D-line.

Valve for pneumatic discharge 712
Max. number of discharges per hour: See connection list, Outlet for solid phase 321.,
Discharge time: 0,3-1,0 sec.
Motor Temperature Sensor 730

The separator motor is equipped with three thermistor sensors, one in each winding.

The sensors are connected in series and should be connected to a thermistor relay that trips the starting equipment when the temperature exceeds the tripping level, stated in “8.5.3 Connection list” on page 189.

Speed Sensor 741

Proximity sensor of inductive type according to DIN 19234 (NAMUR) standard giving the number of pulses per revolution of the bowl as stated in the connection list. The bowl speed is calculated from the gear ratio and the r/min of the motor shaft.

When supplied with rated voltage the sensor gives a current signal with a size depending if the position of the sensor head is near the metal surface or in front of a groove (non-metal).

Speed signal during start:

- The turnover to D should occur at 93-96% of the synchronous speed.
- The machine must be stopped and an alarm must be given when the speed for D-turnover has not been reached within 1.3 x the starting time, specified in chapter “8.1 Product description” on page 176.
**Speed signal during normal operation:**

Normal operation condition is considered to have been achieved 1 minute after D-turnover. During normal operation the speed is allowed to vary within speed limits specified below:

- When the synchronous speed exceeds more than 5%, the machine must be stopped and a high speed alarm must be given.

- When the speed falls to 7% below the synchronous speed for a period longer than 1 minute, a low speed alarm signal must be given.

- In case of sudden lack of pulses from the speed sensor an alarm, speed sensor failure, must be given. When this alarm is valid, the stop phase must be controlled by a timer.

**Vibration Sensor 750**

For indication of any abnormal unbalance and to be able to perform appropriate countermeasures, the separator has been equipped with an accelerometer on the separator frame. The signal from the accelerometer shall be monitored and two alarm levels according to the vibration alarm levels in Technical Data should be set. The vibration level shall be high for 3 seconds to generate an alarm. The first level is only used to generate an alarm while the second level shall stop the machine.

The vibration monitor shall include self check function to be performed at least at initiation during start.

- Vibration signal during start (bowl speed range of 0 - 95% of synchronous speed):
  
  In case of a vibration signal exceeding set point for immediate safety stop during 3 seconds the machine must be stopped and an alarm should be given. The setpoint value is given in chapter “8.1 Product description” on page 176.
Vibration signal during normal operation: Two levels of vibration are considered for this machine:

a. In case of a signal exceeding set point for warning during 3 seconds:
   
   A warning alarm shall be given. The machine shall be stopped manually with a normal stop sequence and the reason of the vibration investigated.

b. In case of a signal exceeding set point for immediate safety stop during 3 seconds following actions must be taken:
   
   Immediate Safety automatic stop of the machine including alarm for too high vibrations.

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

Cover Interlocking Switch 760

The cover of the separator is equipped with an interlocking switch.

When the cover is closed the interlocking circuit in the starter control is closed and the separator could be started.

Signal processing:

The circuit is closed when the frame hood of the separator is closed.

The interlocking switch should be connected so that starting of the motor is prevented when the separator hood is not closed.
Signal processing:
The circuit is closed when the frame hood of the separator is closed.
The interlocking switch should be connected so that starting of the motor is prevented when the separator hood is not closed.

8.6.5 Function graph and running limitations

A. Stand still
B. Starting mode
C. Running mode
D. Stop mode
E. Safety stop mode
8.7 Paring disc characteristics

Paring disc diameter 124 mm, 2 channels, wing height 5 mm, no level disc, only the washer.

A. Back pressure (bar)
B. Q (m$^3$/h)
  - Maximum pressure before overflow
  - Airfree effluent outlet
  - Inlet pressure
Paring disc diameter 124 mm, 2 channels, wing height 5 mm, level disc ø 100 mm.

A. Back pressure (bar)
B. Q (m³/h)
- Maximum pressure before overflow
- Airfree effluent outlet
- Inlet pressure
8.7 Paring disc characteristics

Paring disc diameter 124 mm, 2 channels, wing height 5 mm, level disc ø 110 mm.

A. Back pressure (bar)
B. $Q \text{ (m}^3/\text{h)}$
   - Maximum pressure before overflow
   - Inlet pressure
8.8  Lubricants

8.8.1  Introduction

The machine is delivered without oil in the worm gear housing. It must not be started unless oil in the quantity and of the quality prescribed has been supplied. A change of the separating temperature can make it necessary to replace the oil by oil of a different type. Lubricants, oil as well as grease, must be kept in clean, closed cans to prevent penetration of dust and moisture and to reduce the oxidizing effect to the air as far as possible. The storing room should be dry and cool.
### 8.8.2 Lubrication chart

**Alfa Laval ref. 55 32 16 - 01,rev. 8**

<table>
<thead>
<tr>
<th>Lubricating points</th>
<th>Type of lubricant</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The oil bath:</strong></td>
<td>See Recommended lubricants. Volume: see “Technical data”.</td>
<td><strong>Oil Change:</strong></td>
</tr>
<tr>
<td>Bowl spindle bearings are lubricated by oil splash from the oil bath.</td>
<td></td>
<td>1. Continuous operation: 2000h</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Seasonal operation: Before every operating period</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Short period's operation: 12 months even if total number of operating hours is less than stated above.</td>
</tr>
<tr>
<td><strong>Bowl spindle taper:</strong></td>
<td>Lubricating oil, only a few drops for rust protection.</td>
<td>At assembly.</td>
</tr>
<tr>
<td><strong>Bowl:</strong> Sliding contact surfaces, thread of lock nut and cap nut.</td>
<td>Pastes as specified in Recommended oil brands.</td>
<td>At assembly.</td>
</tr>
<tr>
<td><strong>Rubber seal rings:</strong></td>
<td>Grease as specified in Recommended lubricants</td>
<td>At assembly.</td>
</tr>
<tr>
<td><strong>Friction coupling ball bearings. Not valid for rigid coupling:</strong></td>
<td>The bearings are packed with grease and sealed and need no extra lubrication.</td>
<td>-</td>
</tr>
<tr>
<td><strong>Electric motor</strong></td>
<td>Follow manufacturer's instructions.</td>
<td>Follow manufacturer's instructions.</td>
</tr>
<tr>
<td><strong>Threads:</strong></td>
<td>Lubricating oil, if not otherwise stated.</td>
<td>At assembly.</td>
</tr>
</tbody>
</table>

**NOTE!**

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

**CAUTION**

Check the oil level before start. Top up when necessary. Do not overfill.
8.8.3 Recommended lubricants

Alfa Laval ref. 55 32 17 - 01, rev. 12

Lubricant recommendation for hygienic and non-hygienic applications

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

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

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

Paste for assembly of metallic parts, non-hygienic applications

<table>
<thead>
<tr>
<th>Part No</th>
<th>Quantity</th>
<th>Designation</th>
<th>Manufacturer</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>537086-02</td>
<td>1000 g</td>
<td>Molykote 1000 Paste</td>
<td>Dow Corning</td>
<td>-</td>
</tr>
<tr>
<td>537086-03</td>
<td>100 g</td>
<td>Molykote 1 G-n plus Paste</td>
<td>Dow Corning</td>
<td>-</td>
</tr>
<tr>
<td>537086-06</td>
<td>50 g</td>
<td>Molykote G-rapid plus Paste</td>
<td>Dow Corning</td>
<td>-</td>
</tr>
<tr>
<td>537086-04</td>
<td>-</td>
<td>Gleitmo 705</td>
<td>Fuchs Lubritech</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Wolfracoat C Paste</td>
<td>Klüber</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Dry Moly Paste</td>
<td>Rocol</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>MT-LM</td>
<td>Rocol</td>
<td>-</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Part No</th>
<th>Quantity</th>
<th>Designation</th>
<th>Manufacturer</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>535586-01</td>
<td>375 g</td>
<td>Molykote D321R Spray</td>
<td>Dow Corning</td>
<td>Varnish or spray</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gleitmo 900</td>
<td>Fuchs Lubritech</td>
<td></td>
</tr>
</tbody>
</table>
Paste for assembly of metallic parts, hygienic applications (NSF registered H1 is preferred)

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

<table>
<thead>
<tr>
<th>Part No</th>
<th>Quantity</th>
<th>Designation</th>
<th>Manufacturer</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No-Tox Food Grade Silicone grease</td>
<td>Bel-Ray</td>
<td>NSF Registered H1 (16 December 2011)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dow Corning 360 Medical Fluid</td>
<td>Dow Corning</td>
<td>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.</td>
</tr>
<tr>
<td>539474-02</td>
<td>100 g</td>
<td>Molykote 111 Compound</td>
<td>Dow Corning</td>
<td>Molykote® 111 Compound meets several global standards for water contact, including NSF 51, NSF 61, FDA 21 CFR 175.300, Water Regulations Advisory Scheme Approval BS9260 (England), IPL Certificate of Conformity (France) and DIN-DVGW Examination certificate (Germany).</td>
</tr>
<tr>
<td>539474-03</td>
<td>25 g</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>569415-01</td>
<td>50 g</td>
<td>Molykote G 5032</td>
<td>Dow Corning</td>
<td>NSF Registered H1 (3 June 2005)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Geralyn SG MD 2</td>
<td>Fuchs Lubritech</td>
<td>NSF Registered H1 (30 March 2007)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chemplex 750</td>
<td>Fuchs Lubritech</td>
<td>DVGW approved according to the German KTW-recommendations for drinking water.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paraliq GTE 703</td>
<td>Klüber</td>
<td>NSF Registered H1 (25 Feb 2004). Approved according to WRAS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unisilikon L 250 L</td>
<td>Klüber</td>
<td>Complies with German Environmental Agency on hygiene requirements for tap water. Certified by DVGW-KTW, WRAS, AS4020, ACS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ALCO 220</td>
<td>MMCC</td>
<td>NSF Registered H1 (25 March 2002)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foodlube Hi-Temp</td>
<td>Rocol</td>
<td>NSF Registered H1 (18 April 2001)</td>
</tr>
</tbody>
</table>
Always follow the lubrication recommendations of the bearing manufacturer.
Grease for ball and roller bearings in electric motors

<table>
<thead>
<tr>
<th>Part No</th>
<th>Quantity</th>
<th>Designation</th>
<th>Manufacturer</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>Energrease LS2</td>
<td>BP</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Energrease LS-EP2</td>
<td>BP</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Energrease MP-MG2</td>
<td>BP</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>APS 2</td>
<td>Castrol</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Spheerol EPL 2</td>
<td>Castrol</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Multifak EP2</td>
<td>Chevron</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Multifak AFB 2</td>
<td>Chevron</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Molykote G-0101</td>
<td>Dow Corning</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Molykote Multilub</td>
<td>Dow Corning</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Unirex N2</td>
<td>ExxonMobil</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Mobilith SHC 460</td>
<td>ExxonMobil</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Mobilux EP2</td>
<td>ExxonMobil</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Lagermeister EP2</td>
<td>Fuchs Lubritech</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Rembrandt EP2</td>
<td>Q8/Kuwait Petroleum</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Alvania EP2</td>
<td>Shell</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>LGEP 2</td>
<td>SKF</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>LGMT 2</td>
<td>SKF</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>LGFP 2</td>
<td>SKF</td>
<td>NSF Registered H1 (17 Aug 2007)</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Multis EP2</td>
<td>Total</td>
<td>-</td>
</tr>
</tbody>
</table>
8.8.4  Recommended oil brands

Alfa Laval ref. 55 32 18 - 07, rev. 3
Paraffinic mineral lubricating oil, category
(ISO-L-) CKE 320.

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

<table>
<thead>
<tr>
<th>Alfa Laval lubrication oil group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity grade VG (ISO 3448/3104)</td>
</tr>
<tr>
<td>Viscosity index VI (ISO 2909)</td>
</tr>
<tr>
<td>Manufacturer</td>
</tr>
<tr>
<td>ChevronTexaco</td>
</tr>
<tr>
<td>Shell</td>
</tr>
</tbody>
</table>

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

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

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

<table>
<thead>
<tr>
<th>Standard</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 12925-1, (ISO 6743/6)</td>
<td>ISO-L-CKC/CKD/CKE/CKT 320</td>
</tr>
<tr>
<td>DIN 51517 part 3</td>
<td>DIN 51517 - CLP 320</td>
</tr>
</tbody>
</table>
8.8.5 Recommended oil brands

Alfa Laval ref. 55 32 19 -08, rev. 0

One group of lubricating oils is approved for this separator. It is designated as lubricating oil group B. The numerical value after the letter states the viscosity grade.

The corresponding commercial oil brands, see chapter “8.8.5 Recommended oil brands” on page 208.

<table>
<thead>
<tr>
<th>Ambient temperature °C</th>
<th>Alfa Laval lubricating oil group</th>
<th>Time in operation Oil change interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between +5 and +45</td>
<td>B/320</td>
<td>1500 h</td>
</tr>
</tbody>
</table>

Note!

- In a new installation or after change of gear transmission, change oil after 200 operating hours.

- When the separator is operated for short periods, lubricating oil must be changed every 12 months even if the total number of operating hours is less than stated in the recommendations above.

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

- In seasonal operation: change oil before every operating period.
8.9 Other drawings

8.9.1 Foundation drawing

Alfa Laval ref. 9008980, rev. 0

---

A. Min. lifting capacity required when doing service, 1000 kg
B. Max. height of largest component incl. lifting tool
   Recommended speed for lifting:
   - Low speed 0,5-1,5 m/min
   - High speed 2-6 m/min
C. Center of lifting device
D. Center of motor
E. 16 holes Ø 14,5 for anchorage.
F. Installation according to stated foundation forces
G. Floor level
H. Structural concrete
I. Anchor bolt
J. Service side

---

Recommended free floor space for unloading when doing service
No fixed installation within this area
Vertical dynamic forces ±20 kN/foot (static forces are excluded)
Horizontal dynamic forces ±20 kN/foot (static forces are excluded)
Total vertical dynamic instantaneous foundation forces (sum of all feet) ±20 kN (static forces are excluded)
Total horizontal dynamic instantaneous foundation forces (sum of all feet) ±20 kN (static forces are excluded)
8.9.2 Interconnection diagram

Alfa Laval ref. 576899 rev. 1

Wire colour codes

<table>
<thead>
<tr>
<th>Colour Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BK</td>
<td>Black</td>
</tr>
<tr>
<td>WT</td>
<td>White</td>
</tr>
<tr>
<td>BN</td>
<td>Brown</td>
</tr>
<tr>
<td>RD</td>
<td>Red</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>SHI</td>
<td>Shield</td>
</tr>
<tr>
<td>GN-YW</td>
<td>Green-Yellow</td>
</tr>
<tr>
<td>SIG</td>
<td>Signal</td>
</tr>
<tr>
<td>BK-YW</td>
<td>Black-Yellow</td>
</tr>
<tr>
<td>TRANS</td>
<td>Transparent</td>
</tr>
<tr>
<td>YW</td>
<td>Yellow</td>
</tr>
<tr>
<td>Scr</td>
<td>SCREEN</td>
</tr>
</tbody>
</table>

9. Junctions box
712. Solenoid valve (pneumatic discharge)
741. Speed sensor (motor shaft speed)
750. Vibration sensor
760. Interlocking switch (frame top part).
    Normally open when cover not fitted

Attention:
All wires to be cut to appropriate length to match respective earth connection terminal.
Wires 5, 6 and loose wire ends at cable 7 to be insulated with appropriate shrinking tubing.
Wire ends to be marked with “PARTEX” PA01 (1,2) and PA02 (5, 6, 40, 41) (yellow with black marking) after insulation and fitted with ferrules with insulated collar.
8.10 Motor specifications

8.10.1 Motor data, BROOKS

Alfa Laval ref. 551392, rev. 2

<table>
<thead>
<tr>
<th>A. Motor speed (r/min)</th>
<th>B. Current (A)</th>
<th>C. Time (min)</th>
<th>D. Motor speed (r/min)</th>
<th>E. η and Cos φ</th>
<th>F. Power input (A and kW)</th>
<th>G. Power output (kW)</th>
<th>H. Slip (%)</th>
<th>I. η</th>
<th>J. Cos φ</th>
<th>K. Power input (A)</th>
<th>L. Power input (kW)</th>
<th>M. Slip (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured (440 V, 60 Hz)</td>
<td>Calculated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Diagram showing motor specifications with labels A through M.]
Motor data from BROOK test certificate X911280, 83.05.16

η and cos ϕ are valid for 50 Hz. Values for 60 Hz are about 0.5% higher.

Moment of inertia: 10,10 kgm² (bowl spindle)
Bowl speed, max: 7490 r/min (motor 1500 r/min)

### Cables and fuses

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Rated current (A)</th>
<th>Fuse (A)</th>
<th>Cable area (mm² Cu)</th>
<th>Cable area (mm² Al)</th>
</tr>
</thead>
<tbody>
<tr>
<td>220</td>
<td>143</td>
<td>200</td>
<td>120</td>
<td>150</td>
</tr>
<tr>
<td>380</td>
<td>83</td>
<td>125</td>
<td>70</td>
<td>95</td>
</tr>
<tr>
<td>415</td>
<td>76</td>
<td>100</td>
<td>35</td>
<td>70</td>
</tr>
<tr>
<td>440</td>
<td>72</td>
<td>100</td>
<td>35</td>
<td>70</td>
</tr>
<tr>
<td>500</td>
<td>63</td>
<td>80</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>575</td>
<td>55</td>
<td>80</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>660</td>
<td>48</td>
<td>63</td>
<td>16</td>
<td>25</td>
</tr>
</tbody>
</table>

**Note!** Recommended cable area is valid for a max. ambient temperature of 25 °C and with the cables freely installed.
8.10.2 Electric motor

Alfa Laval ref. 545151, rev. 4

A. Plate with relubrication information
B. M10 earth terminal
C. 8 holes Ø 19
D. Cable entries tapped 2xPG42 + 1xPG13,5
E. Shaft dimensions

<table>
<thead>
<tr>
<th>Type of mounting (IEC 34-7)</th>
<th>Degree of protection (IEC 34-5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM 3001</td>
<td>IP 54</td>
</tr>
</tbody>
</table>
8.10 Motor specifications

Manufacturer: BROOK HANSEN

Method of cooling: IC 41 (IEC 34-6)

Manufacturers drawing: M21787

Bearing: D-end: N3136-CN

Noise level: Mean sound pressure level is 70 dB(A) at 50 Hz and ≈ 74 dB(A) at 60 Hz Tolerance +3db(A).

Standards: IEC 34-1 and 72-series

N-end: 6316-C3

Size: IEC 225 M

Type: WU-DF225MNF-D

Bearing: D-end: N3136-CN

Weight: 375 kg

N-end: 6316-C3

Specification: Totally enclosed 3-phase CT-motor for star-delta starting.

Poles: 4

Motor wound for 37 kW as motor rated 45 kW.

Insulation class: F

Lubrication: Motor equipped with grease Thermistors trip. level 190 °C

nipples

Relubrication instructions

<table>
<thead>
<tr>
<th>IM 3001</th>
<th>Motor speed synchronous r/min</th>
<th>Intervals in hours at amb. temp. max. 40 °C</th>
<th>Grease quantity, grams per bearing</th>
<th>Type of grease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>D-end</td>
<td>N-end</td>
<td>D-end</td>
</tr>
<tr>
<td>IM 3001</td>
<td>1500</td>
<td>19800</td>
<td>26300</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>1800</td>
<td>15000</td>
<td>2200</td>
<td></td>
</tr>
</tbody>
</table>

* Any compatible grease would be suitable

NOTE

For complete information about motor variants, please contact your Alfa Laval representative.
8.10.3 Motor data, ABB

Alfa Laval ref. 550695, rev. 1

---

Measured (440 V, 60 Hz)

- - - - - - Calculated

A. Current (A)  
B. Motor speed (r/min)  
C. Time (min)  
D. Motor speed (r/min)  
E. $\eta$ and Cos $\phi$  
F. Power input (A and kW)  
G. $\eta$  
H. Cos $\phi$  
I. Power input (A)  
J. Power input (kW)  
K. Power output (kW)
### Motor specifications

<table>
<thead>
<tr>
<th>Article No.</th>
<th>Output (kW)</th>
<th>Manufacturer</th>
<th>Type</th>
<th>Number of poles</th>
<th>Speed 50 Hz (r/min)</th>
<th>Speed 60 Hz (r/min)</th>
<th>η (%)</th>
<th>Power factor (cos ϕ)</th>
<th>Starting torque Mₛ (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>544726</td>
<td>45</td>
<td>Strömberg</td>
<td>HXUR/E 455G2 B5</td>
<td>4</td>
<td>1470</td>
<td>1764</td>
<td>94</td>
<td>0,84</td>
<td>175</td>
</tr>
</tbody>
</table>

Motor data from Strömbergs type test.

η and cos ϕ are valid for 50 Hz. Values for 60 Hz are about 0,5% higher.

Idling power, input: 8,2 kW  
output: 6,9 kW  
Moment of inertia: 7,98 kgm² (bowl spindle)  
Bowl speed, max: 6625 r/min (motor 1500 or 1800 r/min)

#### Cables and fuses

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Rated current (A)</th>
<th>Fuse (A)</th>
<th>Cable area (mm² Cu)</th>
<th>Cable area (mm² Al)</th>
</tr>
</thead>
<tbody>
<tr>
<td>220</td>
<td>152</td>
<td>200</td>
<td>150</td>
<td>120</td>
</tr>
<tr>
<td>380</td>
<td>88</td>
<td>125</td>
<td>95</td>
<td>70</td>
</tr>
<tr>
<td>415</td>
<td>80</td>
<td>100</td>
<td>70</td>
<td>35</td>
</tr>
<tr>
<td>440</td>
<td>75</td>
<td>100</td>
<td>70</td>
<td>35</td>
</tr>
<tr>
<td>500</td>
<td>66</td>
<td>80</td>
<td>50</td>
<td>35</td>
</tr>
<tr>
<td>575</td>
<td>58</td>
<td>80</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>660</td>
<td>49</td>
<td>63</td>
<td>25</td>
<td>16</td>
</tr>
</tbody>
</table>

Note! Recommended cable area is valid for a max. ambient temperature of 25 °C and with the cables freely installed.
8.10.4 Electric motor, ABB

Alfa Laval ref. 544726, rev. 5

A. Extra large terminal box with flange FL21 with 2xM63 + 1xM16
B. Shaft dimensions
C. Drain holes with closable plastic plugs (IP55 with open plugs). For horizontal mounting IM 3001, the motor has to be mounted with drain holes facing downwards.
D. Plate with relubrication instructions
E. 8 holes Ø 19

<table>
<thead>
<tr>
<th>Type of mounting (IEC 34-7)</th>
<th>Degree of protection (IEC 34-5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM 3001</td>
<td>IP 55</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of mounting (IEC 34-7)</th>
<th>Degree of protection (IEC 34-5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM 3001</td>
<td>IP 55</td>
</tr>
</tbody>
</table>
Relubrication instructions

<table>
<thead>
<tr>
<th>Quantity per bearing</th>
<th>Service</th>
<th>Lubr. interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>50g</td>
<td>24 h</td>
<td>12 month</td>
</tr>
</tbody>
</table>

* Any compatible grease would be suitable

NOTE

For complete information about motor variants, please contact your Alfa Laval representative.
8.11 Cover interlocking kit

Switch actuator 6. Protective tube
2. Screw 7. Screw
3. Limit switch 8. Tube clip
4. Screw 9. Shrinking tubing
5. Shrinking tubing 10. Cable gland
8.12 Monitoring kit

Alfa Laval ref. 557228, rev. 1

1. Vibration sensor
2. Speed sensor
8.13 Quality specifications

8.13.1 Operating liquid

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. Max. particle size 50 μm
3. TA total hardness less than 180 mg CaCO₃ per litre, which corresponds to 10°dH or 12.5°E. Hard water may with time form deposits in the operating mechanism. The precipitation rate is accelerated with increased operating temperature and low discharge frequency. These effects become more severe the hardness of the water increase.
4. A chloride content max 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. pH>6
   Increased acidity (lower pH) increases the risk for corrosion; this is accelerated by increased temperature and high chloride ion content.
8.13.2 Compressed air

The supply of compressed air to separator discharge system, valve actuators, positioners, instruments etc. must be of such a quality that satisfactory function is ensured for a reasonable time.

NOTE

Alfa Laval accepts no liability for consequences arising from unsatisfactorily purified compressed air supplied by the customer.

The following conditions must be fulfilled:

1. Dirt in the form of solid particles down to a size below 10 micron (0,01 mm) must be removed from the air. This is preferably done by means of special filters or reducing valves provided with filters. Air filters should be easily surveyable and accessible in order to facilitate daily condition checks, and exchange of the filter cartridge.

2. Oil must be removed from the air. Oil is always transferred to the compressed air from oil-lubricated compressors and must be removed to the highest possible degree. It constitutes a serious contamination, which it is difficult to remove from the instruments. Special filters or oil separators must, therefore, be provided before the instruments. In small plants, oil-free compressors can be used as an alternative.

3. At the inlet to an instrument, the dew point of the compressed air should lie at least 10 °C below the lowest ambient temperature. A correct dew point is usually obtained by using an absorption drier of suitable capacity. If the air humidity is high a primary separator should be used before the filter. In the compressed-air system a condensation takes place at various rates, depending on the moisture content at the air inlet, the temperature before and after the compressor and partially lower temperature in any cold zone passed by the pipe. The air must be dried with regard to the lowest temperature existing after the drying device, so that condensate in the instruments is avoided. Note that the air will also be cooled through expansion after passing constrictions and nozzles in the instruments, with condensation as a result.
1. **Machine plate**

Separator
Manufacturing No / Year
Product No
Machine top part
Separator Bowl
Machine bottom part
In and outlet device
Max. speed (bowl)
Direction of rotation (bowl)
Speed motor shaft
El. current frequency
Recommended motor power
Max density of feed
Max density of sediment
Process temperature min/max
A. Representative label

Space for label indicating representative.

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.

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

4. Name plate

5. Arrow

Indicating direction of rotation of horizontal driving device.

7. Power supply frequency

8. Lifting instructions

text on label: read instruction book before lifting.
8.15 Storage and installation

8.15.1 Introduction

Most of the installation instructions are Specifications, which are compulsory requirements. These specifications are sometimes completed with non-compulsory Recommendations, which could improve the installation quality.

Additional installation information, such as drawings, connection lists and interface description, can be found previous in this chapter.

8.15.2 Storage and transport of goods

Storage

Specification

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

1. Well stored and protected from mechanical damage.
2. Dry and protected from rain and humidity.
3. Organized in the store in such a way that the goods will be easily accessible when installation is about to take place.
A separator can be delivered with different types of protection:

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

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

- **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.
Transport

Specification

- During transport of the separator, the **bowl must always be removed from the machine.**
- When lifting a separator it must always be **hung securely.** See chapter “5.5 Lifting instructions” on page 77.

```
WARNING

Crush hazards

Use correct lifting tools and follow lifting instructions.
```

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

**8.15.3 Planning of installation**

Introduction

The space required for one or more separators can be calculated by consulting the drawings in the chapters “8.4 Basic size drawing” on page 181, “8.9.1 Foundation drawing” on page 209 and instructions for ancillary equipment, electrical and electronic equipment and cables.

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.

- Check the drawings when planning the installation
- Suitable space must be obtained for the maintenance work
Space for separator

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

**Specification**
- See chapter “8.9.1 Foundation drawing” on page 209 for the service space required with the separator installed.

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

Lifting height for transport of bowl

**Specification**
- A minimum height is required to lift the bowl, bowl parts and the bowl spindle, see chapter “8.9.1 Foundation drawing” on page 209.

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

Space for oil changing

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

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

**WARNING**

**Crush hazard**

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

**Specification**

- The separator should be installed at floor level, see chapter "8.9.1 Foundation drawing" on page 209.

- The separator must be installed on a strong and rigid foundation to reduce the influence of vibrations from adjacent machinery.

- Fit the separator frame on the foundation as follows:
  - Place the anchoring feet on foundation beams and tighten the nuts (1).
  - Place the separator on the foundation.
  Check that the separator frame is horizontal and that all anchoring feet rests on the foundation.
  - Mark the position of the holes for anchoring bolts on the foundation.
  - Lift the separator.
  - Fit height adjusting washers (2) required.
  - Fit the anchoring bolts to the foundation.
  - Fit the separator.

![](image)

**1. Nut**
**2. Adjusting washer**
**3. Anchoring foot**