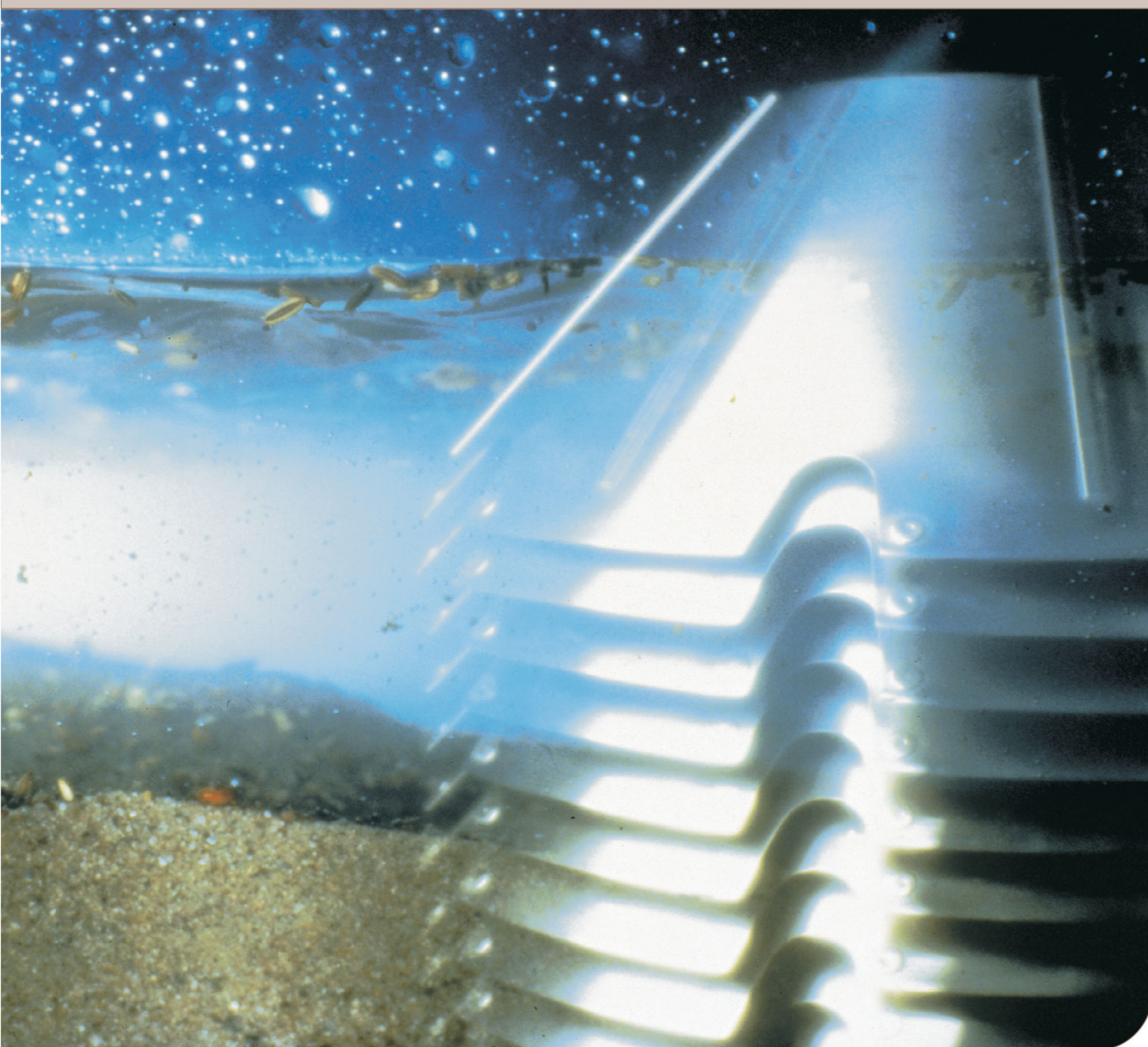




Separator Manual
High Speed Separator

S 811 & S 816



Published By:

Alfa Laval Tumba AB
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1 Read This First

This manual is designed for operators, maintenance personnel and service engineers working with the Alfa Laval S 811 & S 816 separator.

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

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

The Separator Manual consists of:

Safety Instructions

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

Basic Principles of Separation

This chapter describes the purpose of separation and separation principles.

Design and function

This chapter contains a description of the separator.

Operating Instructions

This chapter contains operating instructions for the separator only.

Service, Dismantling, Assembly

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

Fault Finding

Refer to this chapter if the separator functions abnormally.

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

Technical Reference

This chapter contains technical data concerning the separator and drawings.

Installation

This chapter contains specifications and recommendations concerning separator installation.

NOTE

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

2 Safety Instructions



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

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



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

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

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

The following basic safety instructions therefore apply:

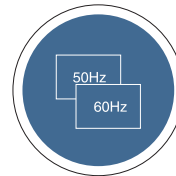
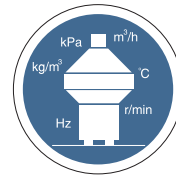
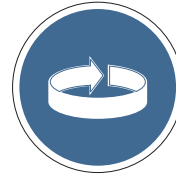
- **Use the separator only for the purpose and parameter range specified by Alfa Laval.**
- **Strictly follow the instructions for installation, operation and maintenance.**
- **Ensure that personnel are competent and have sufficient knowledge of maintenance and operation, especially concerning emergency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





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



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Entrapment hazards

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

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



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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.



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Crush hazards

- Use correct lifting tools and follow lifting instructions.

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



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Noise hazards

- Use ear protection in noisy environments.



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Burn hazards

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



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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.



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Cut hazards

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



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Flying objects

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

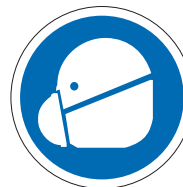


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Health hazard

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



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2.1 Warning signs in text

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



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



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



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



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



2.2 Environmental issues

Unpacking

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

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

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

Metal straps should be sent for material recycling.

Maintenance

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

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

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

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

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

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



2.3 Requirements of personnel

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

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

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

3 Basic Principles Of Separation

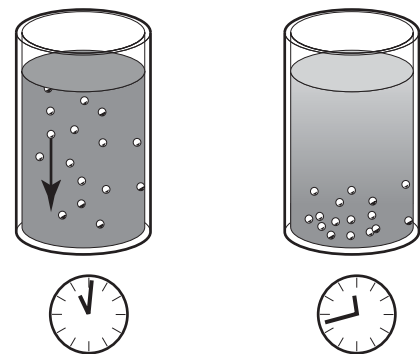
The purpose of separation can be to

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

3.1 Separation By Gravity

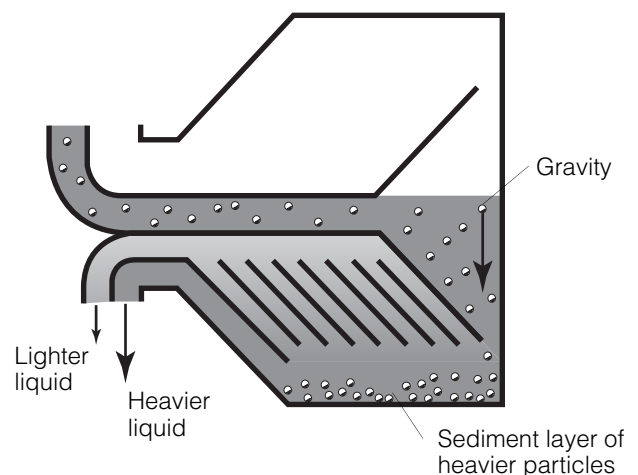
A liquid mixture in a stationary bowl will clear slowly as the heavy particles in the liquid mixture sink to the bottom under the influence of gravity.

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.



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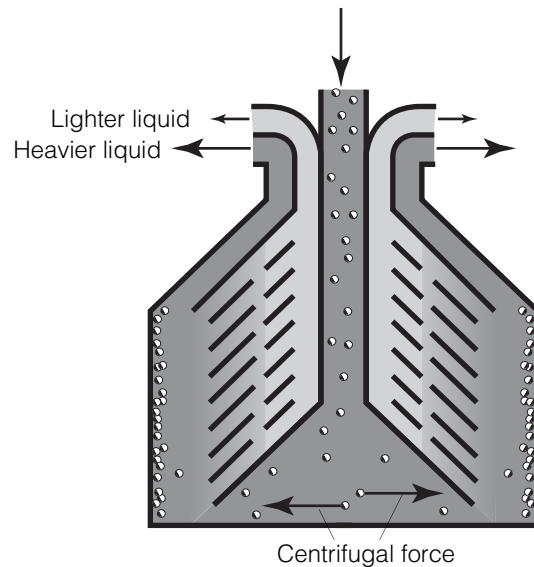
3.2 Centrifugal Separation

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

Separation and sedimentation is continuous and takes place very quickly.

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

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



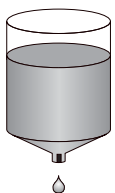
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3.3 Temperatures

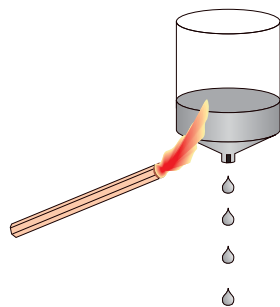
For some types of process liquids (e.g. mineral oils) a high separating temperature will normally increase the separation capacity. The temperature influences oil viscosity and density and should be kept constant throughout the separation.

Viscosity

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



High viscosity

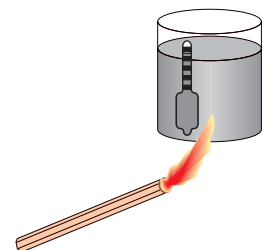
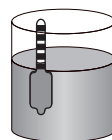


Low viscosity

Density difference

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

Low density difference

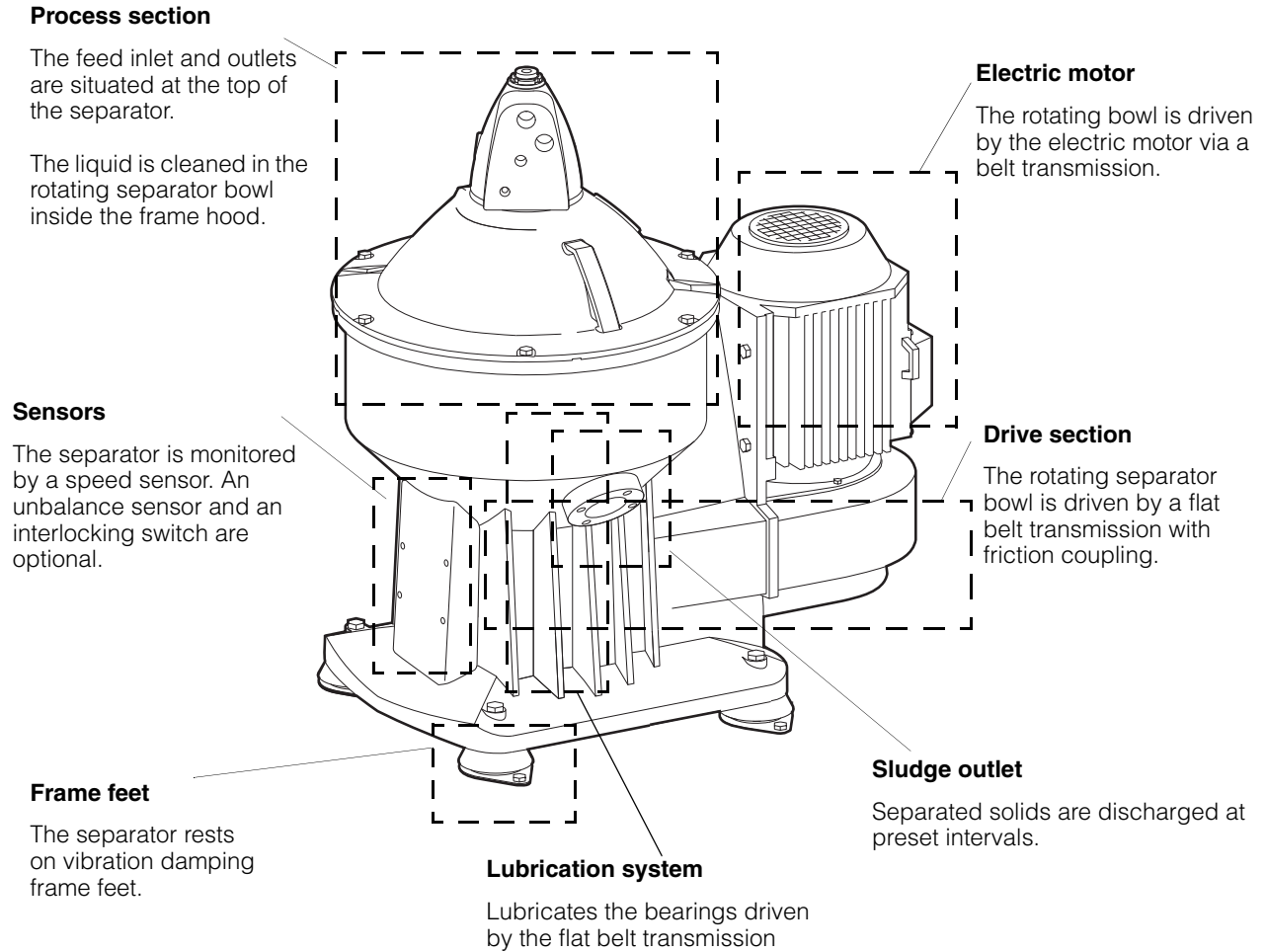


High density difference.

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4 Design



4.1 Overview

The separator comprises a process section and a drive section powered by an electric motor.

The separator frame comprises a lower body and a frame hood. The motor is attached to the frame. The frame feet dampen vibration.

The bottom part of the separator contains a flat belt transmission, a centrifugal clutch and a vertical spindle. The lower body also contains an oil sump for lubrication of spindle bearings.

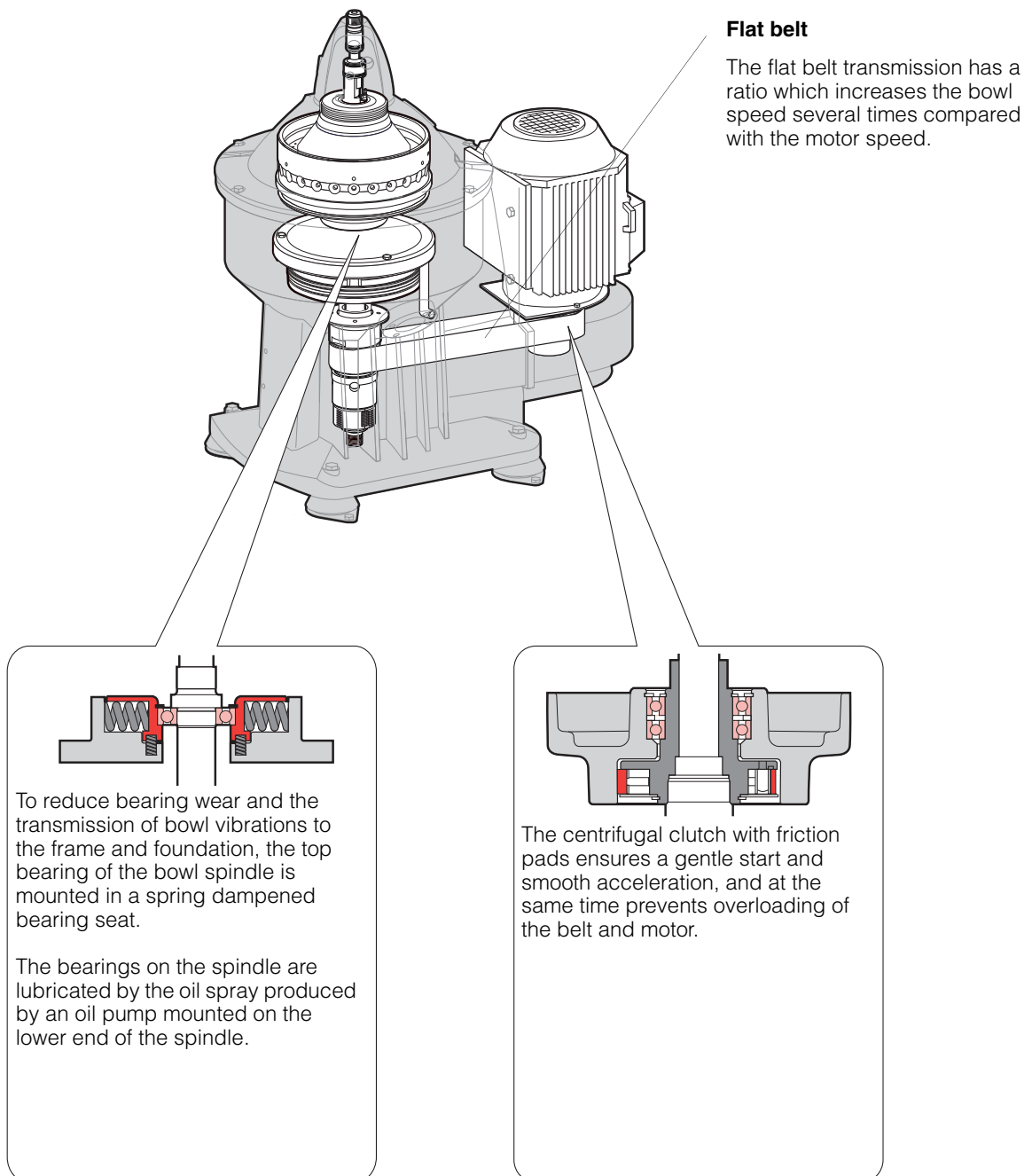
The frame hood contains the processing parts of the separator; the inlets, outlets and piping.

The process liquid is cleaned in the separator bowl. The bowl is fitted on the upper part of a vertical spindle and rotates at high speed inside the frame hood. The bowl also contains the discharge mechanism which empties the sludge during operation.

A speed sensor, and the optional unbalance sensor and lock switch, are parts of the equipment for monitoring the separator functions.

4.2 The Drive Section

The separator bowl is driven by an electric motor via a belt transmission. The belt pulley on the motor shaft includes a centrifugal clutch.



4.3 The Process Section

The separation process takes place inside the rotating separator bowl. The feed and outlet of process liquid takes place in the inlet and outlet unit on top of the separator frame hood.

Inlet and outlet

The inlet and outlet unit consists of the following parts:

A connection house for pipe connections.

A pipe with a paring disc and a paring tube is located inside the connection house. The pipe has channels for incoming and outgoing process liquid.

The paring disc and paring tube pump the cleaned oil and water respectively out of the bowl.

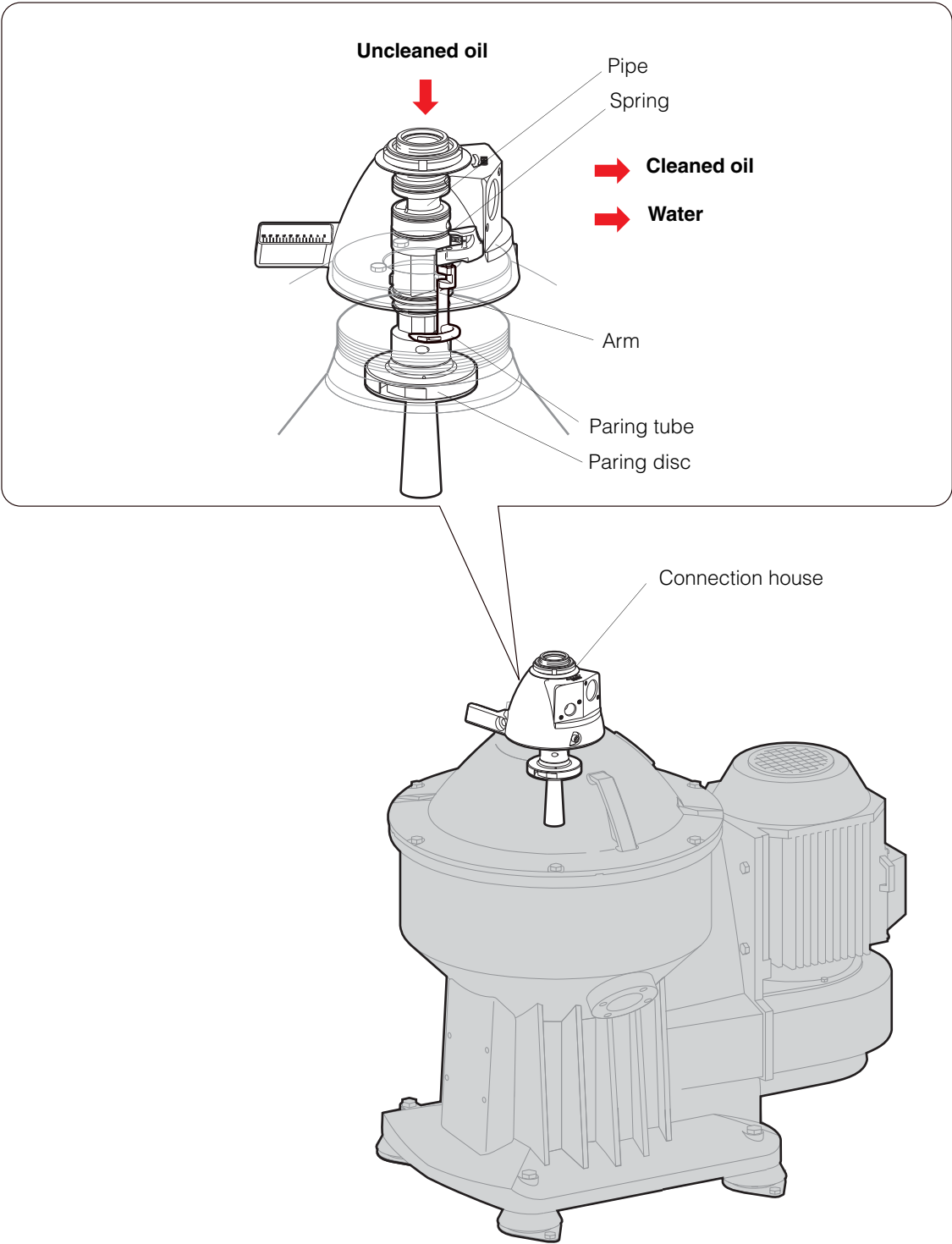
The paring tube can move radially. During separation it surfs on the liquid surface. It is balanced by a spring.

Under certain operating conditions, the paring tube radial position can be locked in place by two adjustable screws on the connection house.

The paring disc and tube are located inside and at the top of the separator bowl.

The inlet and outlet device is held together against the frame hood by a nut on the end of the inlet pipe.

Height adjusting rings determine the height position of the paring disc and paring tube relative to the bowl.



Separator bowl

The separator bowl, with its sludge discharge mechanism, is built-up as follows:

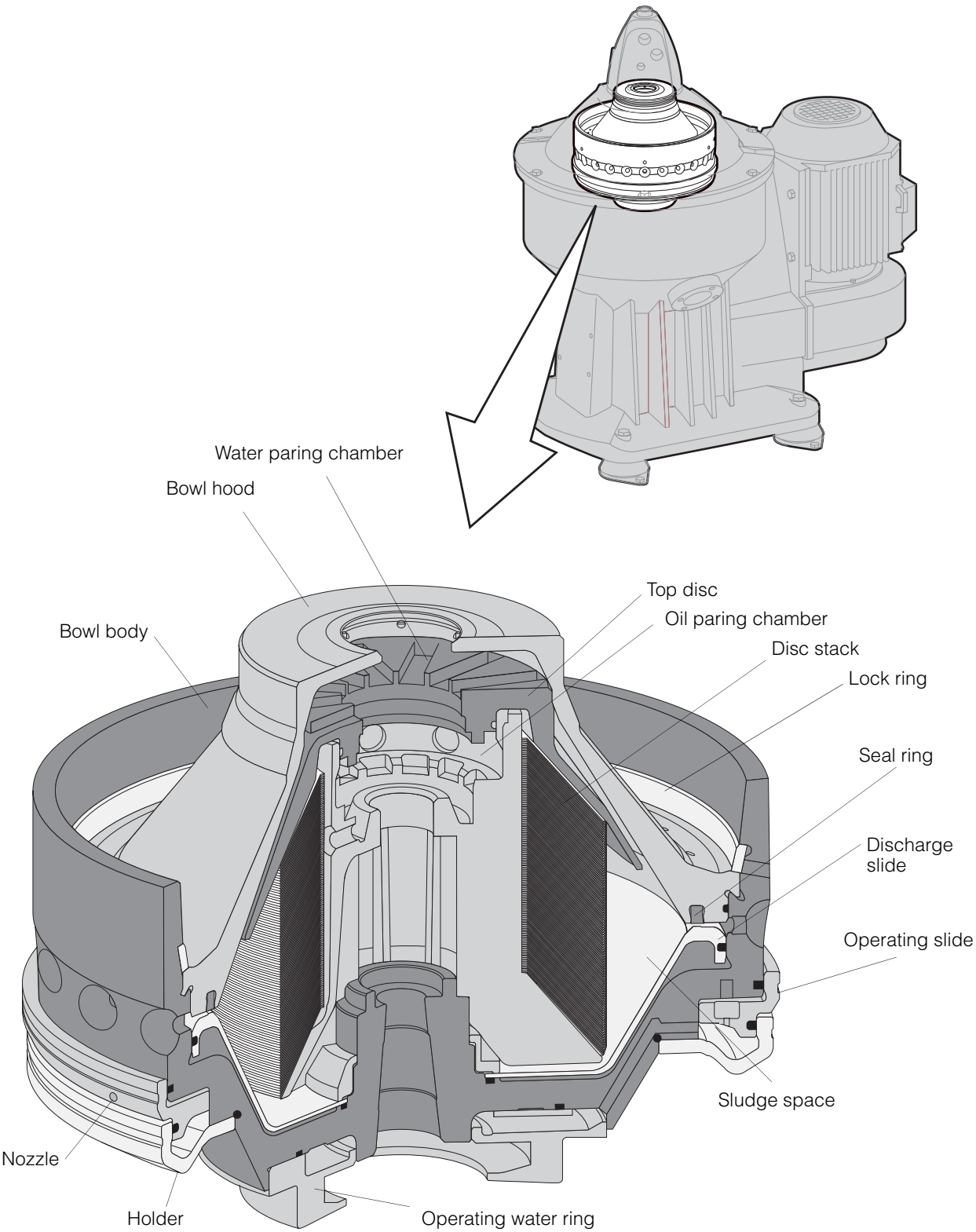
The bowl body and bowl hood are held together by a lock ring (Centrilock). Inside the bowl are the distributor and the disc stack. The disc stack is kept compressed by the bowl hood. The discharge slide forms a separate bottom in the bowl body.

The upper space between the bowl hood and the top disc forms the water paring chamber and contains the paring tube, which pumps the separated water out of the bowl. The oil paring chamber, with its paring disc, is located inside the top of the distributor. From here the cleaned oil is pumped out of the bowl.

The sludge space is in the bowl periphery. The bowl is kept closed by the discharge slide, which seals against a seal ring in the bowl hood.

At fixed intervals, decided by the operator, the discharge slide drops down to empty the bowl of sludge.

The sludge discharge mechanism, which controls the movement of the discharge slide, is comprised of an operating slide and an operating water device. Passive parts are: nozzle and valve plugs. The operating water cover, beneath the bowl, supplies operating water to the discharge mechanism via the operating water ring.



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4.4 Sensors

The separator is equipped with a speed sensor. As options an unbalance sensor and an interlocking kit can be fitted.

Speed sensor

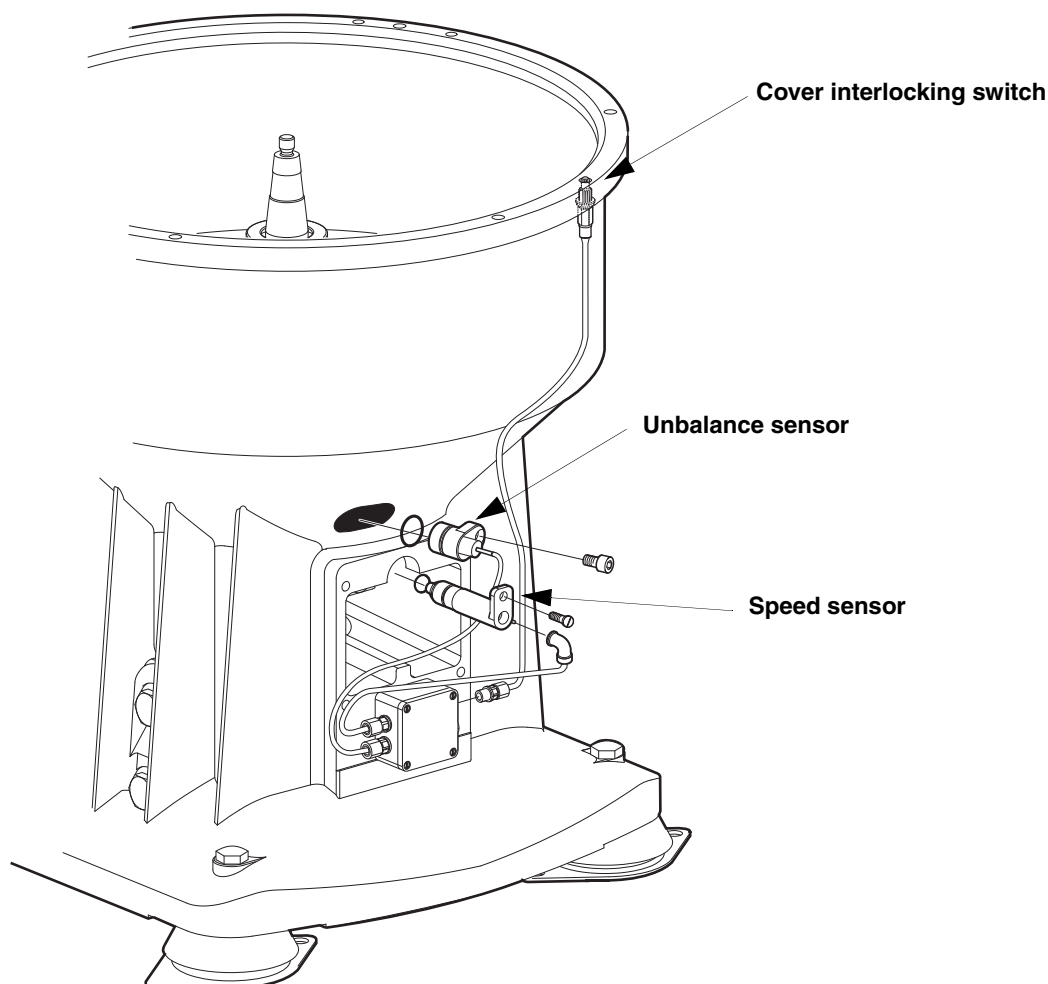
A speed sensor indicates the speed of the separator. The correct speed is needed to achieve the best separating results and for reasons of safety. Refer to type plate for speed particulars.

Unbalance sensor (optional)

For indication of any abnormal unbalance, the separator can be equipped with a sensor monitoring the radial position of the bowl spindle.

Cover interlocking switch (optional)

When the cover is closed the interlocking circuit in the control system is closed which makes it possible to start the separator.

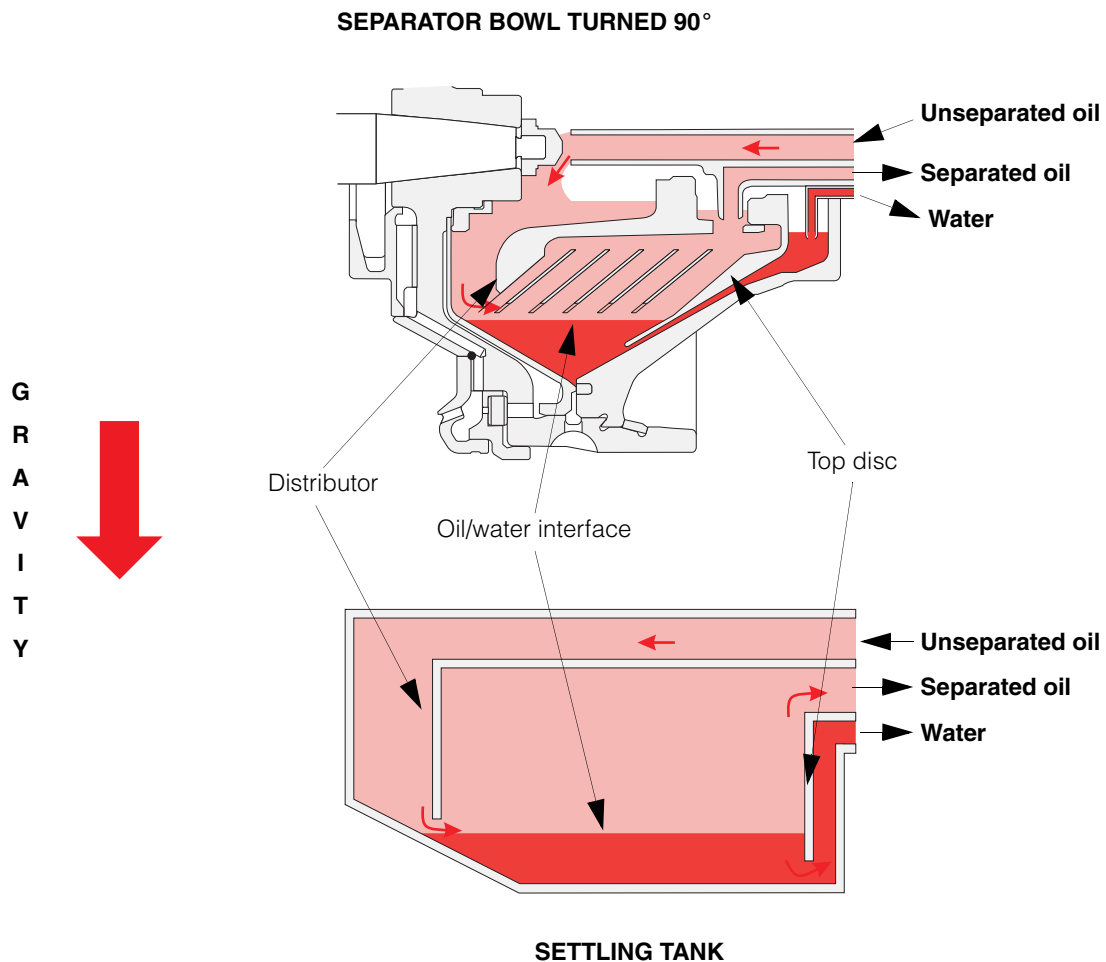


4.5 Separating Function

The separator separates water and solids from the uncleaned oil. Water normally leaves the separator through the water outlet. During sludge discharge, solids (sludge) and water are removed through the discharge ports.

4.5.1 The liquid balance in the bowl

The liquid levels in the bowl depend on many factors (bowl geometry, liquid densities, flow rates etc.). To get a picture of how the liquids are distributed in the bowl, imagine that the bowl is at standstill and turned 90° (only influenced by gravity). The bowl can now be compared with a settling tank:



4.5.2 Liquid flow

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

When the oil reaches slots in the distributor, it rises through the channels formed by the disc stack, where it is evenly distributed.

The oil is continuously cleaned as it travels towards the centre of the bowl. When the cleaned oil leaves the disc stack, it flows through a number of holes in the distributor and enters the oil paring chamber. From here it is pumped by the oil paring disc, and leaves the bowl through the oil outlet. Separated water, sludge and solid particles, which are heavier than the oil, are forced towards the periphery of the bowl and collect in the sludge space.

The space between the bowl hood and top disc, as well as the water paring chamber, is filled with oil, which is distributed over the entire circumference via the grooves in the top disc.

During normal operation, the water drain valve in the water outlet is closed.

4.5.3 Discharge of sludge and water

As the sludge space fills up and water enters the disc stack, traces of water will escape with the cleaned oil. The increase of water content in the cleaned oil is the sign of reduced separation efficiency.

This condition is monitored by the process control system, and water is removed from the bowl when minimal levels are recorded.

The water is removed by either of two ways:

- The water drain valve opens and the water leaves the bowl through the water outlet.
- Through the sludge ports at sludge discharge.

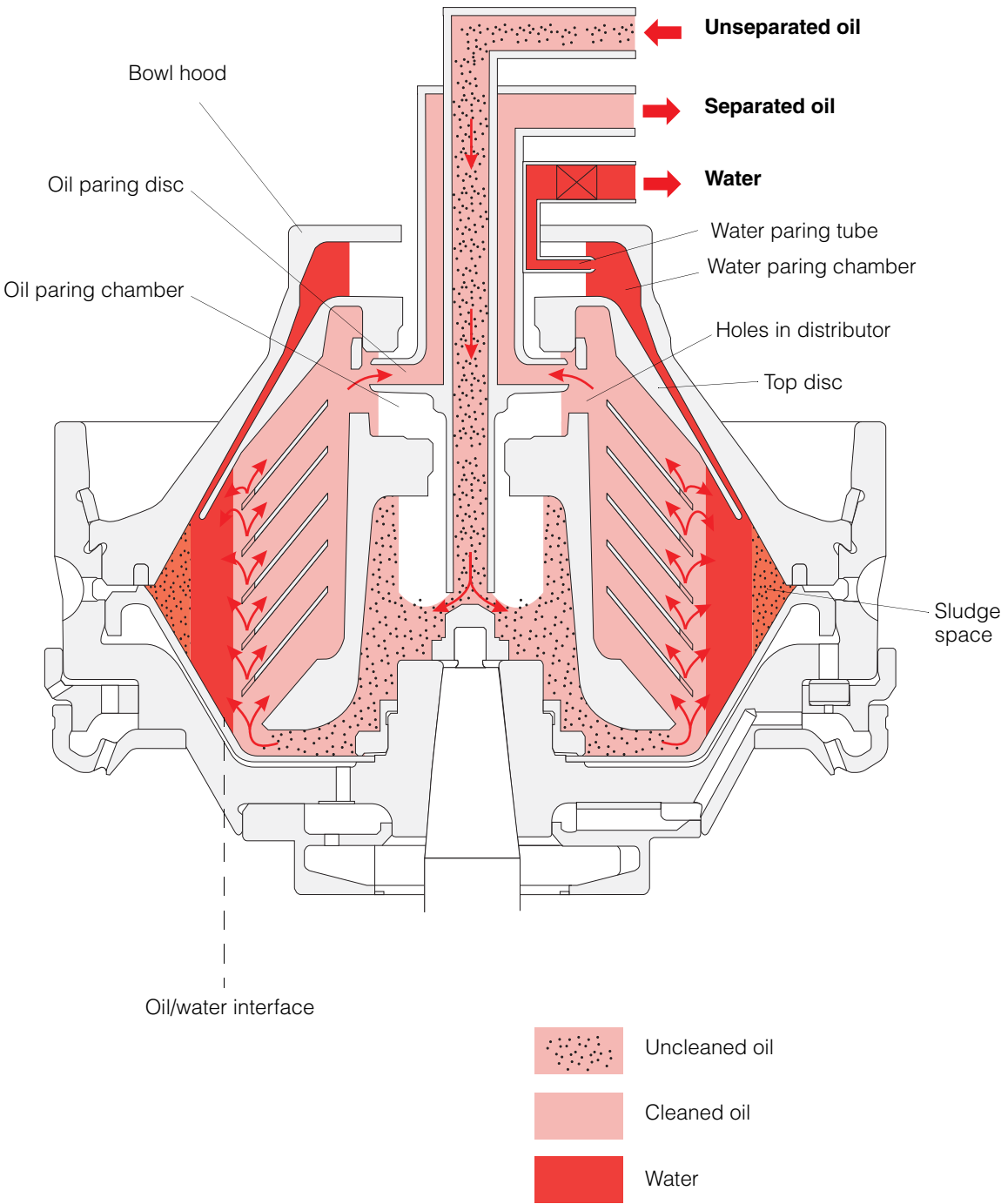
Which way is decided by the process control system.

4.5.4 ALCAP™ concept

When the sludge space is filled up and water enters the disc stack, traces of water will escape with the cleaned oil. The increase of water content in the cleaned oil is the sign of reduced separation efficiency.

This condition is monitored by the process control system, and water is removed from the bowl when minimal levels are recorded.

DISCHARGE OF WATER THROUGH WATER OUTLET



5 Operating Instructions

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

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

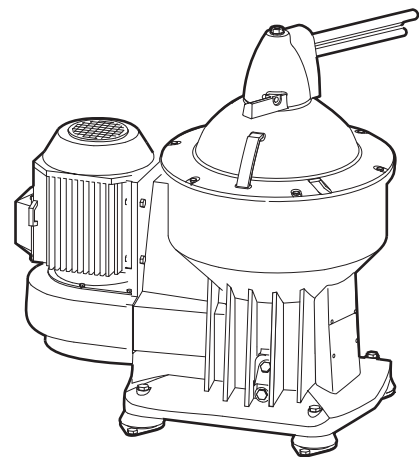
5.1 Before First Start-up

Technical demands for connections and limitations for the separator are listed in chapter *8 Technical Reference, page 147*:

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

Before first start:

- Ensure the machine is installed and assembled correctly and that feed lines and drains have been flushed clean.
- Fill oil in the oil bath. See *6.7 Oil Change, page 131*. Quality of oil see *6.7.6 Lubricating oils, page 137*.
- Make sure that the bearings on the spindle are pre-lubricated.
- Check the direction of rotation by doing a quick start/stop. The motor fan should rotate clockwise.



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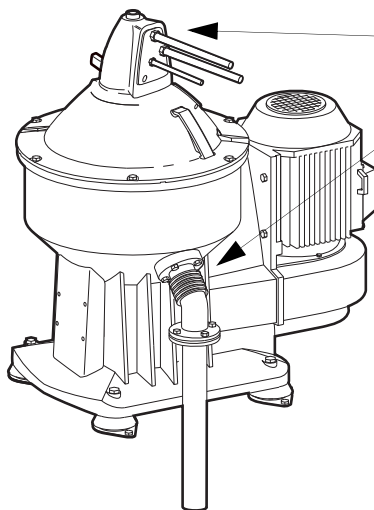
5.2 Start After Service

Pay special attention to any unusual sounds or vibrations when starting the separator after a service. Different fault symptoms are listed in chapter **7 Fault Finding, page 141**.

5.3 Before Normal Start

To achieve the best separation results, the bowl should be in a clean condition.

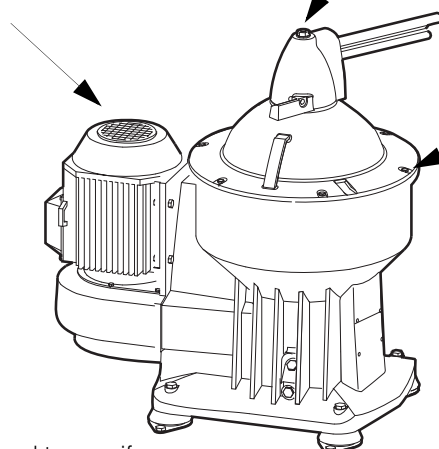
1 Check...



... that all couplings and connections are securely tightened to prevent leakages. Leaking hot liquid can cause burns.

... that the lock nut is fully tightened. Do not forget the washer.

... the direction of rotation by doing a quick start/stop. The motor fan should rotate clockwise.



... that all frame hood bolts as well as the clutch cover are fully tightened

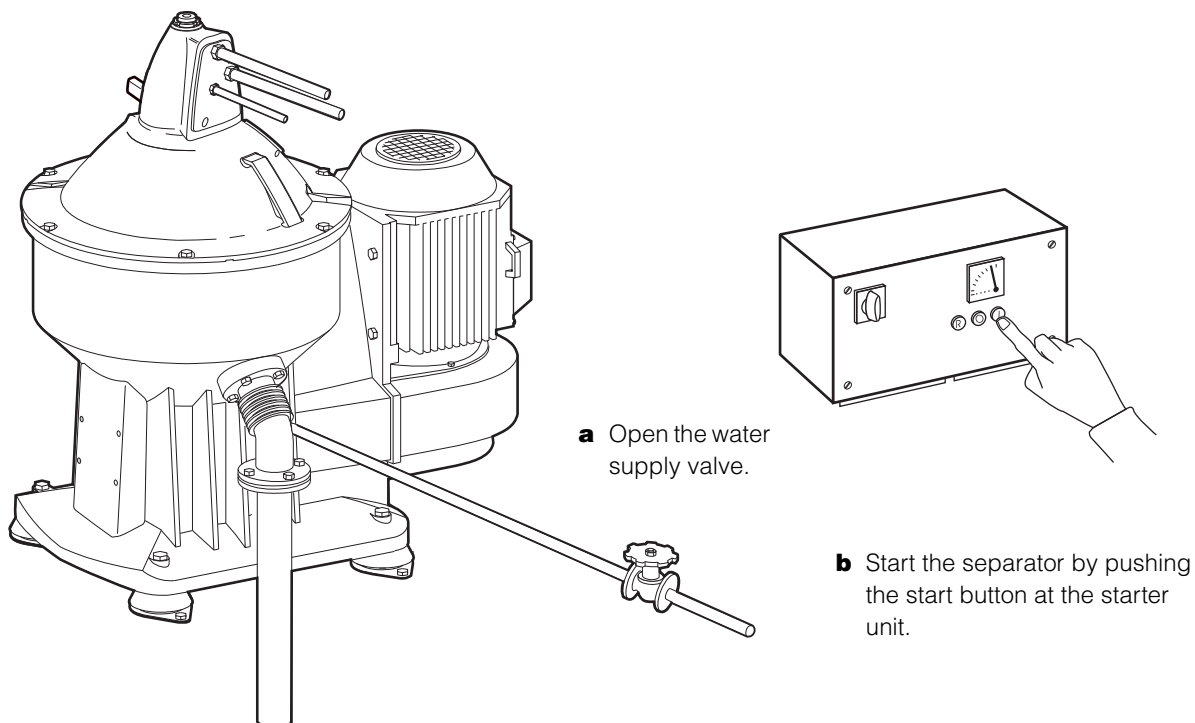
... the oil level and top up if necessary.

NOTE

The separator should be level and at standstill when oil is filled.

5.4 Start

1 Start of separator.



NOTE

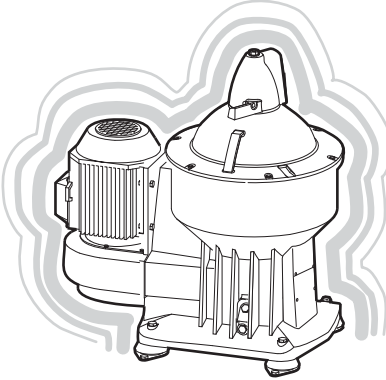
After every start the separator must always be run continuously for a minimum of 1 hour to ensure proper lubrication.

2 Check the separator for vibration.**Excessive vibration**

If vibration increases, or continues at full speed, keep bowl filled and stop the separator.

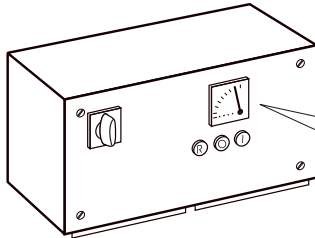
The cause of the vibration must be determined and corrected before starting again!

Excessive vibration may be due to incorrect assembly or insufficient cleaning of the bowl.

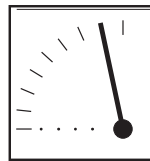
**NOTE****Normal vibration**

Vibration may occur during start up when passing critical speed. This is normal and should pass without danger.

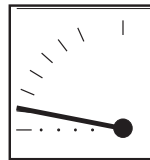
- 3** Ensure that the separator is at full speed (after about 60 - 150 seconds).



The time by full speed can be checked by studying the ammeter

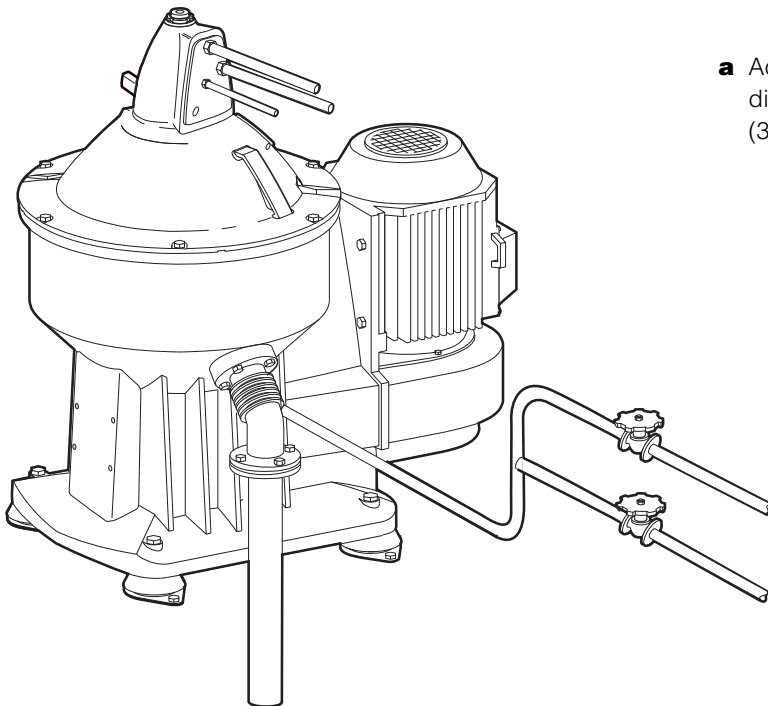


Current increases during start...



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

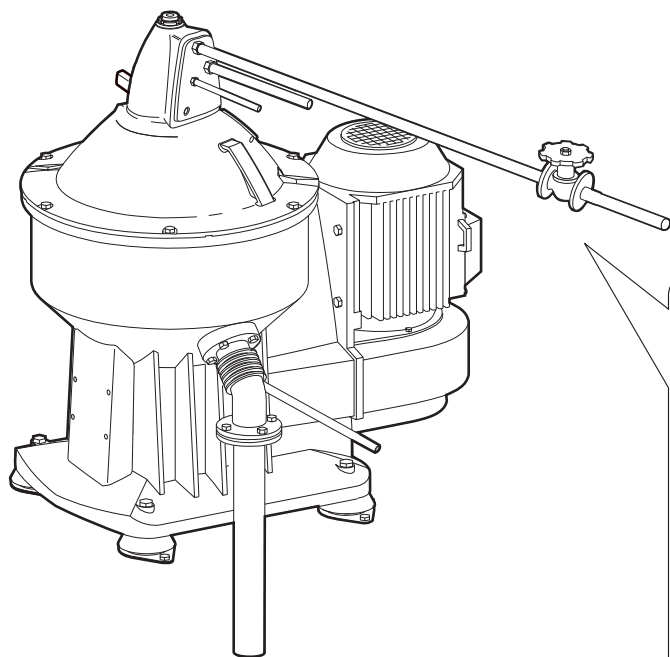
- 4** Perform a sludge discharge.



a Add opening water until a discharge sound is heard (3,0 seconds).

b Wait 15 seconds.

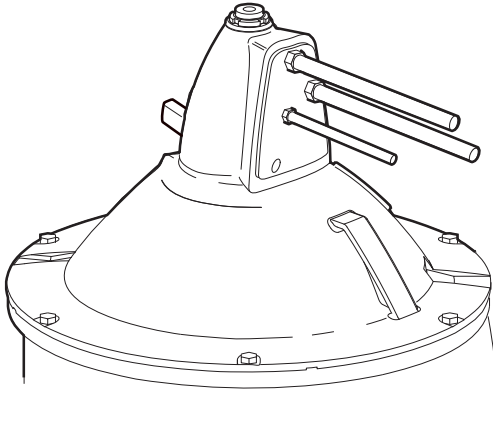
c Add closing water for 15 seconds.

5 Turn on the oil feed.**NOTE**

Before turning on the feed
make sure that the oil has the
correct temperature.

5.5 Operating

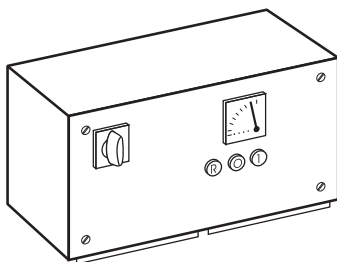
1 Checkpoints during operation:



a Check all connections for leakage.

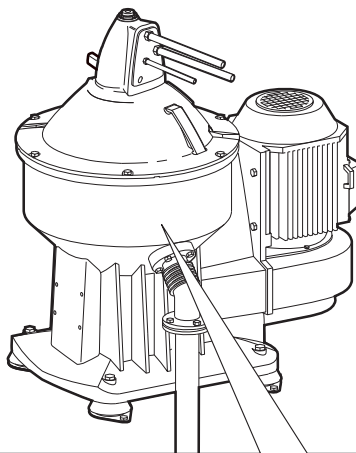
b Check that the feed has correct flow and temperature.

c Check the back pressure.



d Check that the starter ammeter reading is the normal low and steady value.

e Check for abnormal vibrations and sounds.



Disintegration hazard

Do not discharge a vibrating separator.
Vibration can increase if solidified
sludge is only partially discharged.

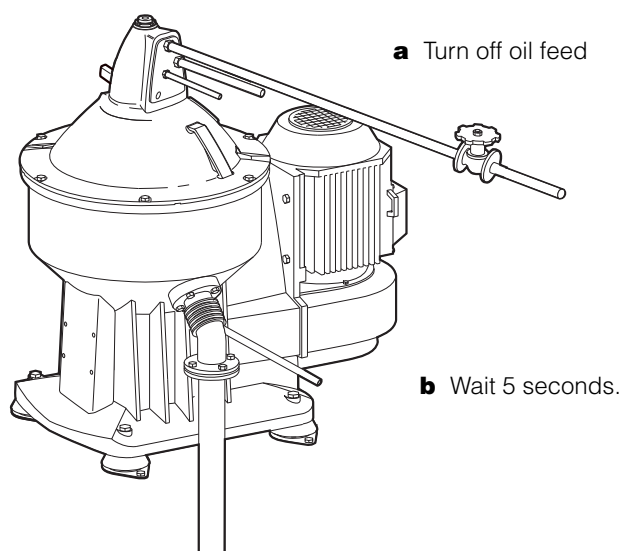


Burning hazard

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

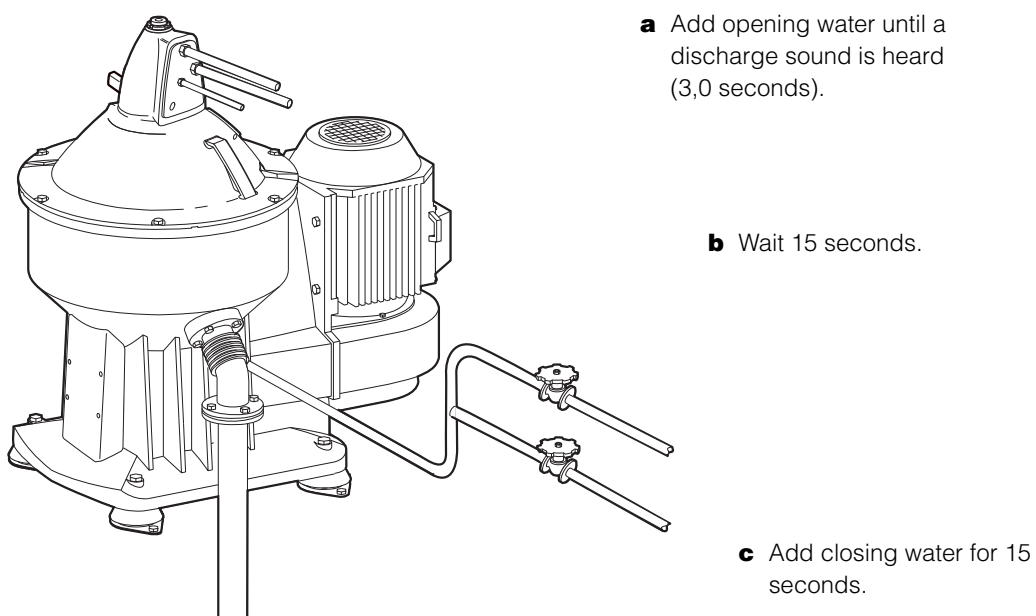
5.5.1 Sludge discharge during operation

- 1** Turn off the oil feed.

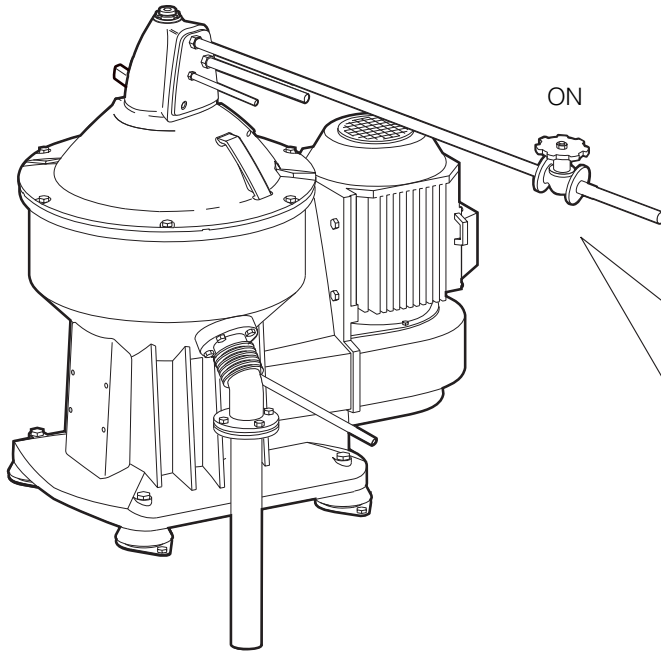


G0872241

- 2** Perform a sludge discharge.



G0872141

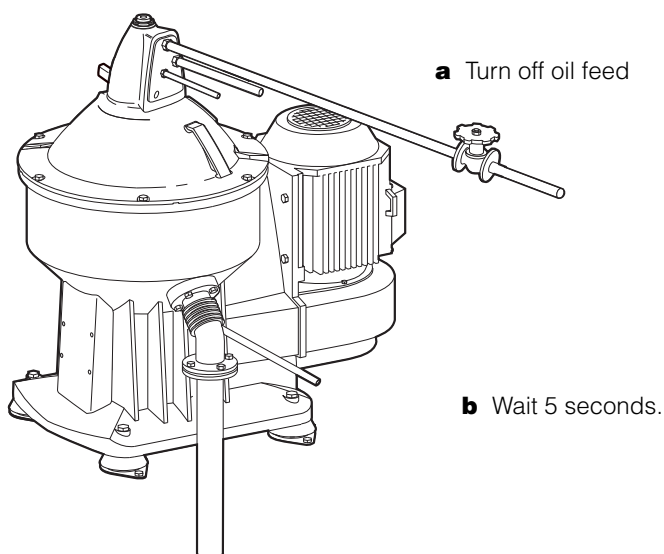
3 Turn on the oil feed.**NOTE**

Before turning on the feed,
make sure that the oil has the
correct temperature.

5.6 Stop

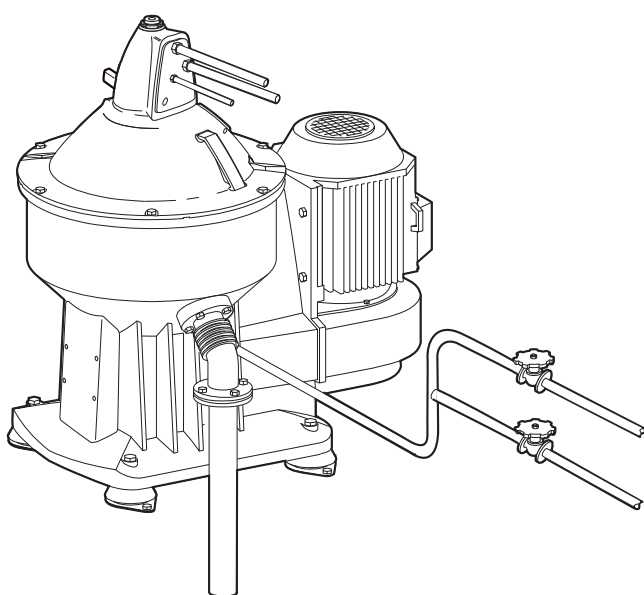
The bowl must be kept filled during stopping sequence.

- 1** Turn off the oil feed.



G0872241

- 2** Perform a sludge discharge.

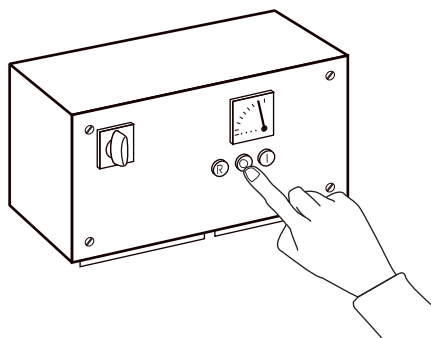


G0872141

- 3** Fill the bowl up with water and stop the separator.

NOTE

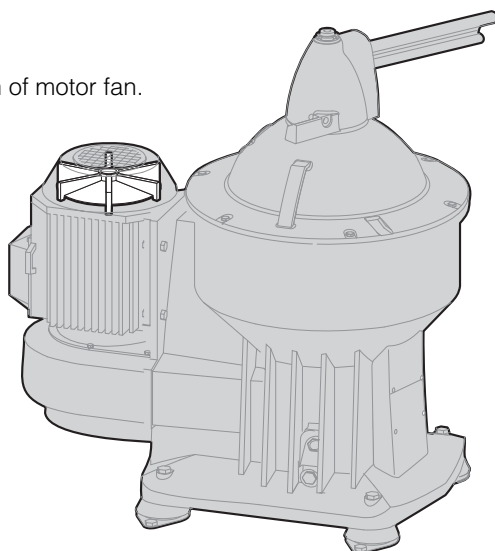
Keep the bowl filled during run-down to minimize the vibrations.



G0872311

- 4** Wait until the separator has stopped (after about 25 minutes).

Check rotation of motor fan.

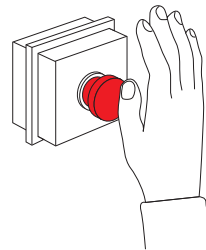
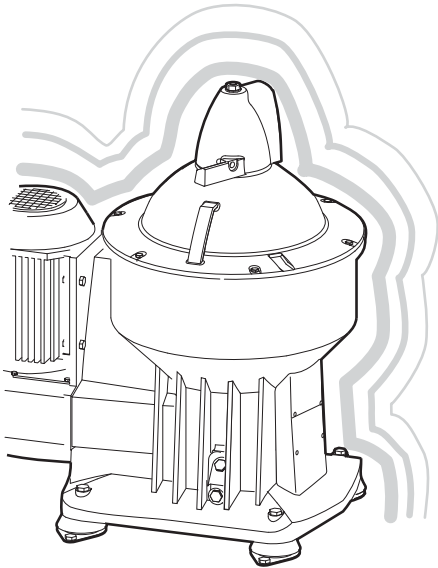


G0872441

5.7 Emergency Stop

1 If the separator vibrates excessively...

... push the emergency stop button.

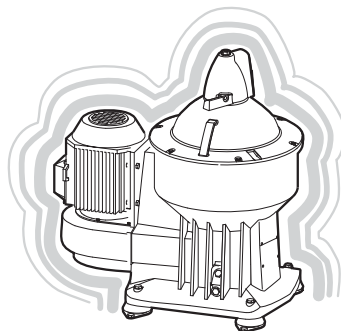


NOTE

Keep the bowl filled during run-down to minimize the vibrations.

G0871241

2 Evacuate the room.



Disintegration hazard
Never discharge a vibrating separator.



Disintegration hazard

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

If all parts have been checked and the cause not found, contact Alfa Laval for advice before restarting the separator.



Entrapment hazard

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

G0871341

6 Service, Dismantling, Assembly

6.1 Periodic Maintenance

Periodic (preventive) maintenance reduces the risk of unexpected stoppages and breakdowns. Follow the maintenance log in this chapter in order to facilitate the periodic maintenance.

6.1.1 Maintenance intervals

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

The maintenance log for each maintenance interval on page 43 gives a detailed list of actions to be performed.

Inspection

An Inspection consists of an overhaul of the separator bowl, inlet/outlet and operating water device at max. 6 months or 4000 operating hours.

Seals in bowl and gaskets in inlet/outlet device are renewed.

Overhaul

An Overhaul consists of an overhaul of the complete separator (including separator bowl, inlet/outlet and operating device) at max. 18 months or 12000 operating hours. Seals, bearings, friction blocks and flat belt in the separator are renewed.

Oil change

The oil should be changed every 4000 hours, or at least once every year if the total number of operating hours is less than 4000 hours/year.

6.1.2 Maintenance procedures

At each Inspection and/or Overhaul, take a copy of the maintenance log and use it to make notes during the service.

An inspection and overhaul should be carried out as follows:

- 1** Dismantle the parts as described in 6.3 *Dismantling, page 46*.

Place the separator parts on clean, soft surfaces such as pallets.
- 2** Inspect and clean the dismantled separator parts according to the maintenance log and description in 6.4 *Actions Before Assembly, page 80*.
- 3** Fit all the parts delivered in the service kit while assembling the separator as described in chapter 6.5 *Assembly, page 89*.
- 4** When the separator is assembled, make final checks described in 6.6 *Actions After Assembly, page 129*.



Disintegration Hazards

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



Burn and Corrode Hazards

Escaping hot and/or corroding process material, which can be hazardous, may still remain in the separator after stop.

The use of service symbols in the dismantling/assembly instructions

Parts that have to be renewed from the service kits (see below) are marked  and/or  in the assembly instructions.

Example:

a Fit the O-ring .

When dismantling and assembling between the service periods, some procedures do not have to be carried out. These procedures are marked  and/or .

Example:

5 Renew the valve plugs on the operating slide .

All symbols used in the instructions refer to activities mentioned in the maintenance logs.

6.1.3 Tightening of screws

Tightening all screws with the correct torque value is important.

These figures apply unless otherwise stated:

Torque						
Metric thread	Stainless steel			Carbon steel		
	Nm	kpm	lb.ft	Nm	kpm	lb.ft
M4	1,7	0,17	1,2	2,25	0,25	1,8
M5	3,4	0,34	2,5	4,9	0,49	3,6
M6	7	0,7	5	8	0,8	5,9
M8	17	1,7	13	20	2	14,7
M10	33	3,4	24	39	3,9	28,7
M12	57	5,8	42	68	6,9	50
M16	140	14	100	155	15,8	114
M20	270	28	200	325	33	239
M24	470	48	340	570	58	420

The figures apply to lubricated screws tightened with a torque wrench.

6.1.4 Service kits

A Commissioning kit is included in the delivery which contain various O-rings that might need to be changed when assembly for the first time.

Special service kits are available for Inspection and Overhaul.

For other services, a Support kit is available. Spare parts not included in the Support kit have to be ordered separately.

Note that the parts for Inspection **are** included in the Overhaul kit.

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

NOTE

Always use Alfa Laval genuine parts as otherwise the warranty may 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 spare parts may cause severe damage.

6.1.5 Cleaning

CIP (Cleaning In Place)

To prolong the intervals between manual cleaning of the separator the use of CIP together with repeated discharges can be used.

Some CIP liquids can be corrosive to brass- and aluminium alloy parts which are included in the separator.

CAUTION

Use only Alfa Laval recommended CIP liquids.

6.2 Maintenance Log

Name of ship/plant:	Local identification:
Separator: S 811 & S 816	Manufacture No./Year:
Total running hours:	Product No.: 881200-02-01/3 & 881200-01-01/4
Date:	Signature:

Part	Inspection 	Overhaul 	Check	Action	Page	Note
In and outlet device						
- All parts	x	x		Clean	80	
- All parts	x	x		Check for corrosion	82	
- All parts	x	x		Check for cracks	83	
- Connecting housing	x	x		Check for erosion damages	84	
	x	x		Renew O-rings for hoses	-	
- Frame hood	x	x		Renew O-ring	122	
		x		Control measure of paring disc height	123	
		x		Check height adjusting rings	123	
		x		Renew the spring	124	
- Inlet pipe	x	x		Lubricate the thread	125	
Bowl						
- All parts	x	x		Clean	80	
- All parts	x	x		Check for corrosion	82	
- All parts	x	x		Check for cracks	83	
- All parts	x	x		Check for erosion damages	84	
- Bowl body	x	x		Check for impact marks and corrosion	109	
	x	x		Renew rectangular ring	110	
	x	x		Renew O-rings	111, 114	
	x	x		Renew holder screws and washers	110	
- Operating slide	x	x		Renew rectangular ring	110	
	x	x		Renew valve plugs	109	
- Discharge slide	x	x		Renew rectangular ring	114	
- In and outlet pipe	x	x		Renew O-rings	117	
	x	x		Renew splash sealing	117	
- Paring tube	x	x		Renew O-ring	117	
- Bowl hood	x	x		Renew seal ring	119	
	x	x		Renew O-ring	119	
- Operating water ring	x	x		Renew seal ring and screws	111	

Part	 Inspection	 Overhaul	 Check	Action	Page	Note
Frame						
- Frame feet				Renew frame feet (including washers and screws)	85	Has to be ordered separately
- Drain and oil filling holes	x	x		Renew washers	108	
- Oil pin	x	x		Renew O-ring	108	
Driving device						
- All parts		x		Clean	80	
- All parts		x		Check for corrosion	82	
- All parts		x		Check for cracks	83	
- Bottom bearing housing		x		Renew O-ring	96	
- Labyrinth ring holder		x		Renew labyrinth ring	97	
		x		Renew O-ring	97	
- Top bearing housing		x		Renew springs	100	
- Flat belt		x		Renew flat belt	104	
- Bowl spindle		x		Pre-lubricate and renew ball bearing	99	
		x		Pre-lubricate and renew self-aligning roller bearing	101	
		x		Lubricate the spindle	109	
		x		Measure the radial wobble	107	
- Lubricating oil orifice		x		Renew O-ring	102	
- Neck bearing cover		x		Renew O-ring	106	
- Deflector ring		x		Renew O-ring	106	
- Water inlet pipe		x		Renew O-ring	107	
- Operating water cover		x		Renew seal ring and O-ring	107	
- Fan		x		Renew the O-ring	103	
Coupling						
- All parts		x		Clean	80	
- All parts		x		Check for corrosion	82	
- All parts		x		Check for cracks	83	
- Coupling hub		x		Renew single row ball bearings	89	
		x		Renew snap rings	89	
- Friction blocks		x		Renew friction pads (if they are worn) or clean the pads if they are dirty	89	
Electrical motor						
- Electrical motor		x		Lubricate if nipples are fitted. See sign on motor	---	

Part	Inspection	Overhaul	Check	Action	Page	Note
						
Signs and labels on separator						
- Machine plate			x	Check attachment and legibility	129	
- Power supply frequency			x	Check attachment and legibility	129	
- Lifting instructions			x	Check attachment and legibility	129	
- Safety labels			x	Check attachment and legibility	129	
- Name plate			x	Check attachment and legibility	129	
- Representative label			x	Check attachment and legibility	129	

6.3 Dismantling

6.3.1 Introduction

The frame hood and heavy bowl parts must be lifted by means of a hoist. Position the hoist exactly above the bowl centre. Use a lifting sling and lifting hooks with safety catches.

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.

NOTE

For safety reasons, it is essential that all personnel who work with the separator read this manual thoroughly and completely.

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

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

6.3.2 Tools

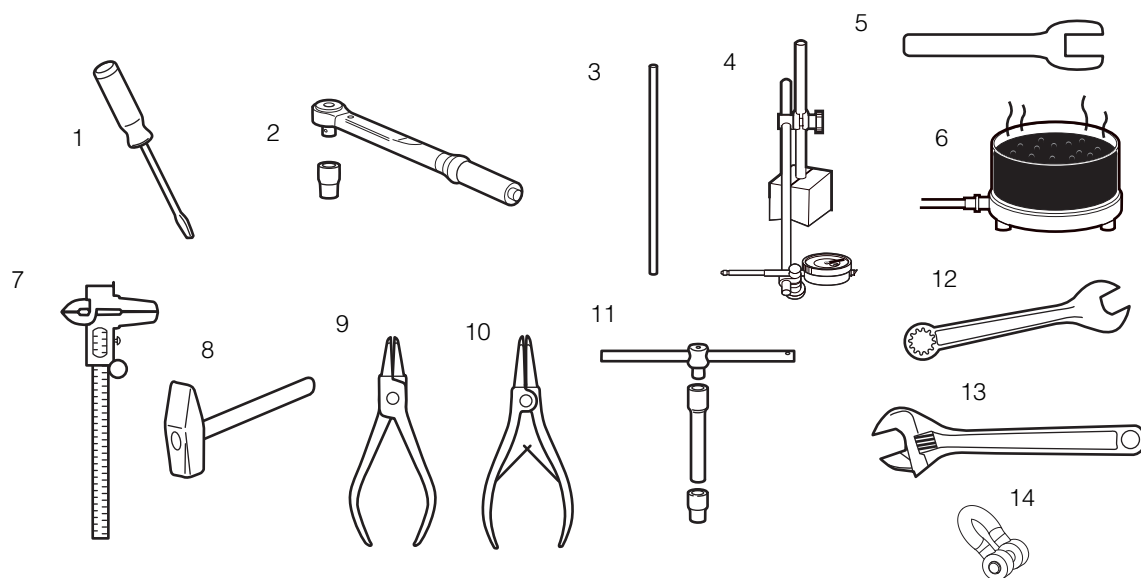
Special tools from the tool kit must be used for dismantling and assembly, as well as **Standard tools** (not included). The special tools are specified in the *Spare Parts Catalogue* and are illustrated at the beginning of each dismantling section.



Entrapment hazard

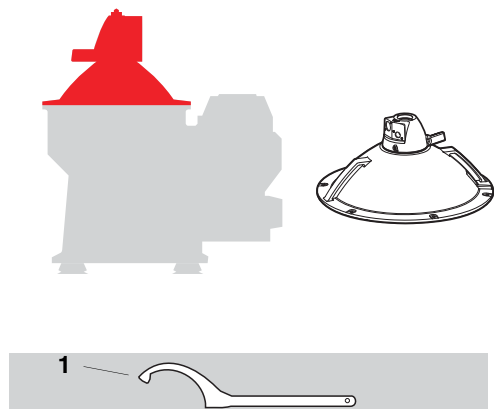
To avoid accidental start, switch off and lock-out power supply before starting any dismantling work.

Make sure that machine has come to a complete standstill before starting any dismantling work (takes about 22 minutes from switch off).

Standard Tools

- 1** Screwdriver
- 2** Torque wrench (capacity 0-200 Nm)
- 3** Drift (Ø 4 mm)
- 4** Dial indicator with magnetic base
- 5** Spanner for clutch
- 6** Heating equipment for bearings
- 7** Sliding calliper
- 8** Hammers (standard and soft-faced)
- 9** Pliers for internal snap rings
- 10** Pliers for external snap rings
- 11** T-handle with extension rod, sockets
(13, 16, 17, 18, 19, 27, 30 mm)
- 12** Spanners (various sizes)
- 13** Adjustable spanner
- 14** Shackle

6.3.3 Frame hood



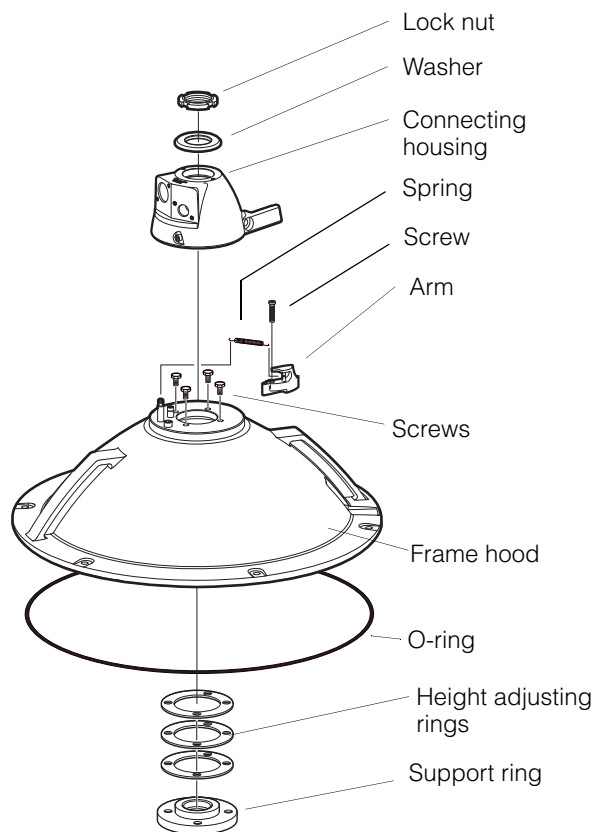
1 Hook spanner (lock nut)



Entrapment hazard

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

Make sure that machine has come to a complete standstill before starting any dismantling work (after about 25 minutes from switch off).



G0863481

1 Removing the connecting housing.

- a Lubricate the inlet pipe thread
- b Remove the lock nut using the hook spanner.



The nut must not be removed before the separator has stopped.

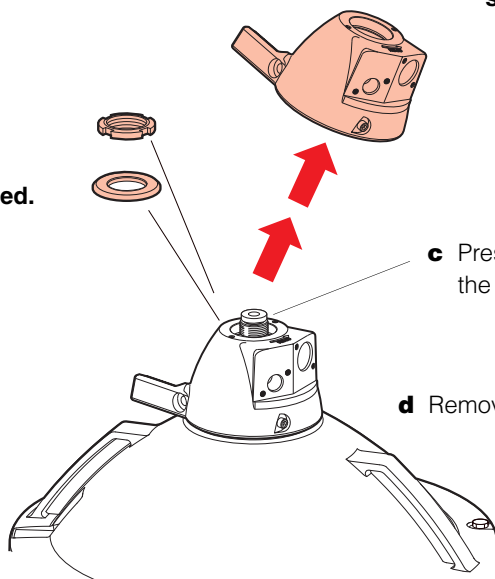
Remove the washer



Right hand thread.



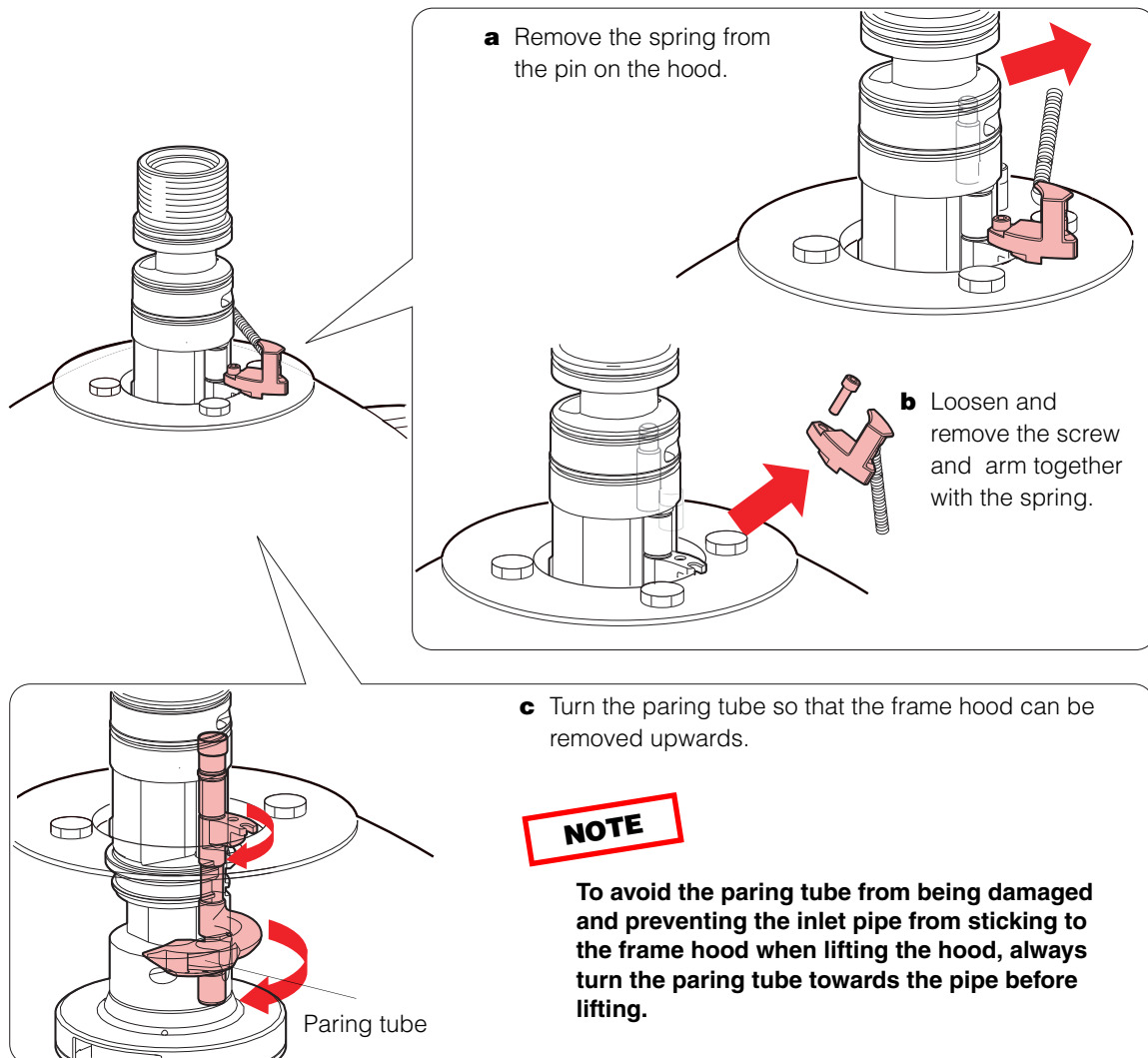
Remove connections before starting dismantling.



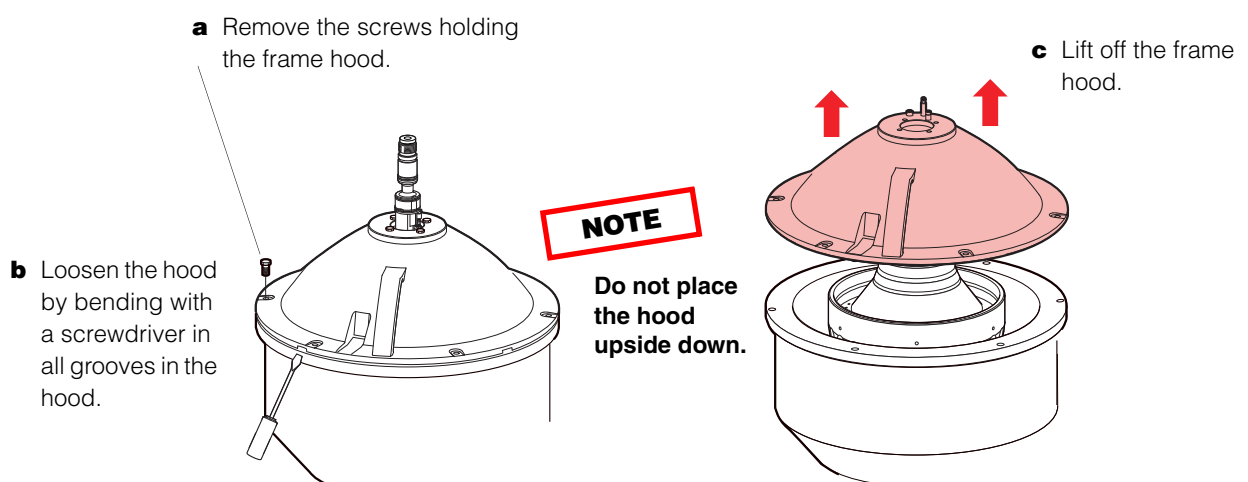
- c Press the pipe down to loosen the connecting housing.

- d Remove the connecting housing

G0863581

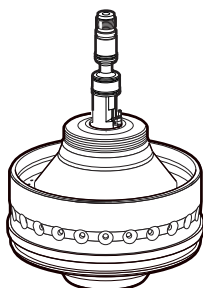
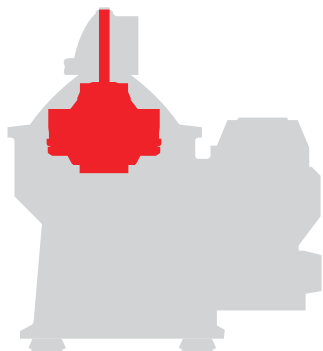
2 Removing the spring and arm.

G0863691

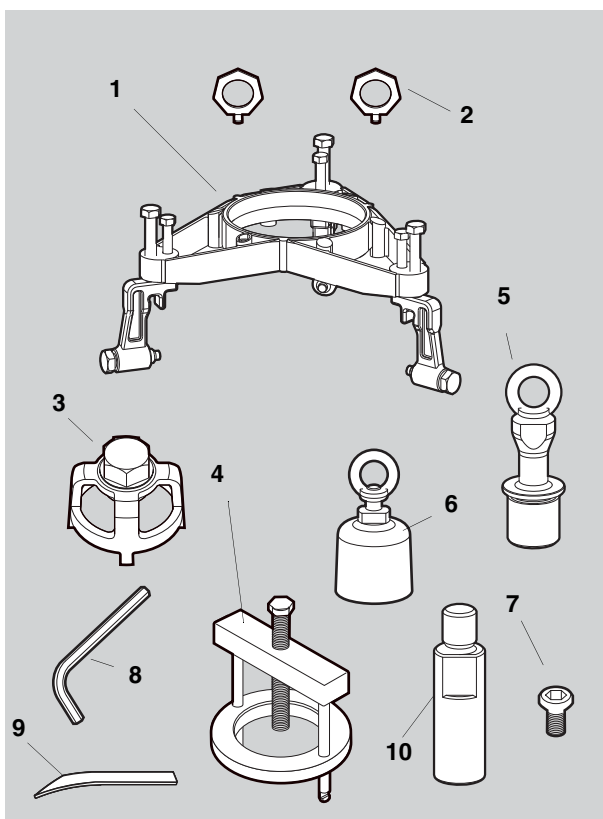
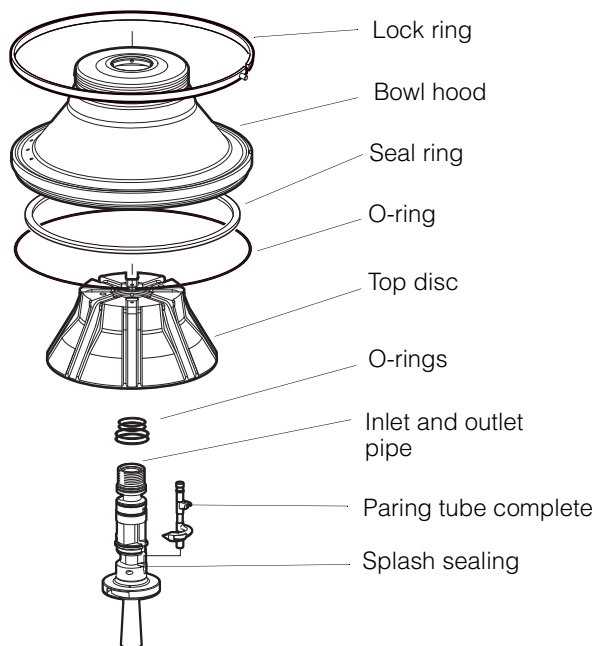
3 Removing the frame hood.

G0863671

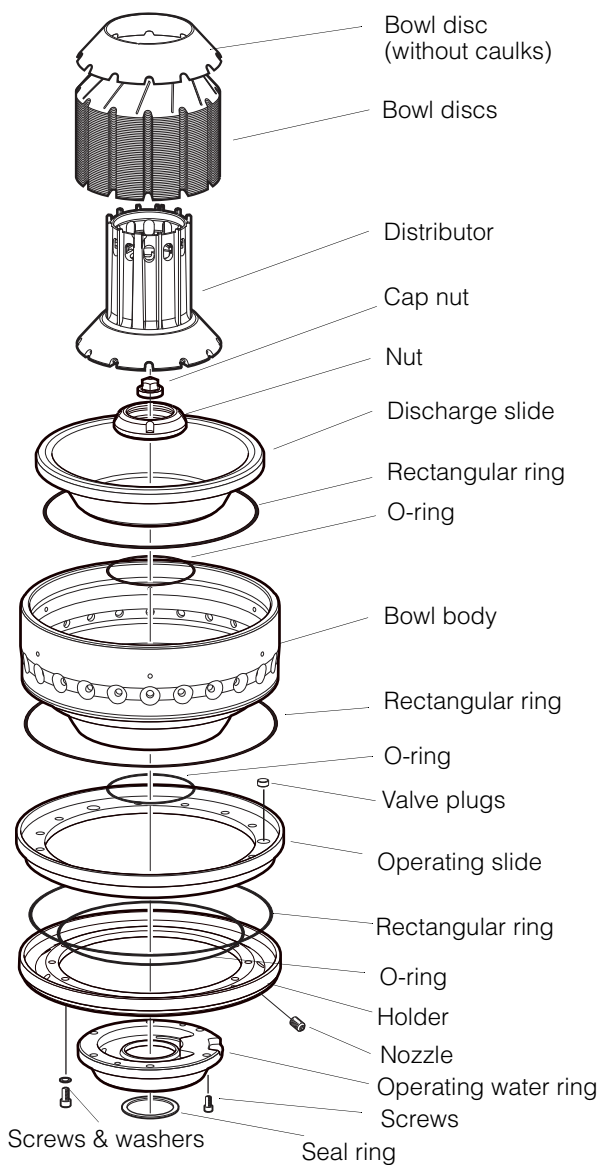
6.3.4 Bowl



G0861621

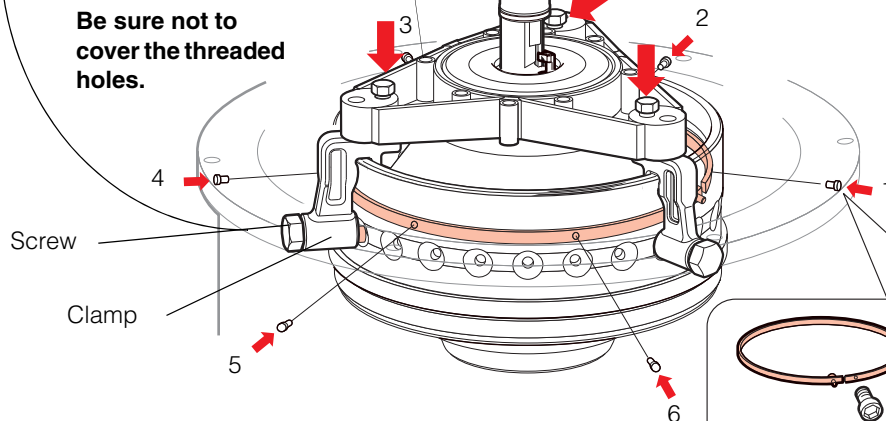


G0860511

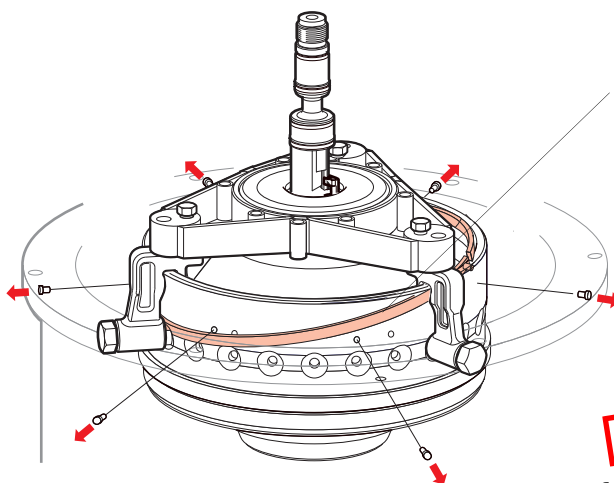


G0862651

- 1 Compressing tool (lock ring)
- 2 Lifting eyes
- 3 Spanner for nut (nut/discharge slide)
- 4 Puller (discharge slide)
- 5 Lifting tool (distributor, spindle)
- 6 Puller (Bowl body)
- 7 Screw (lock ring) (M5)
- 8 Hexagon head key
- 9 Chisel (seal ring)
- 10 Pin (distributor/lifting tool)

1 Removing the lock ring**a** Fit the compressing tool.**b** Fit the clamps and the screws to stop.**NOTE****Be sure not to cover the threaded holes.****c** Compress the disc stack by alternately tightening the inner screws on the compressing tool to a maximum of 60 Nm.

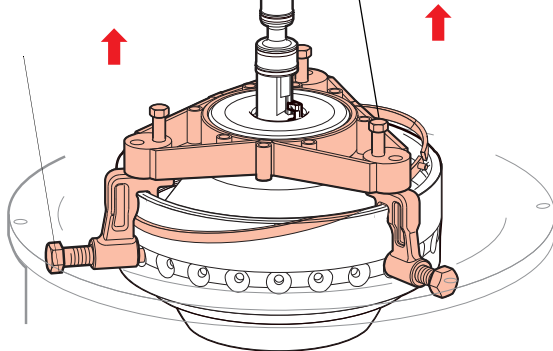
d Fit the dismantling screws to the bowl body and press out the lock ring by tightening the screws successively according to the numbering on the illustration (1-6). Start with the screw nearest the lock ring end (1). The lock ring can be removed when it has passed the edge of the groove.

e Remove the lock ring from the groove.**NOTE****f** Remove the dismantling screws.

2 Removing the bowl hood.

a Remove the compressing screws.

b Loosen the screws on the clamp tool. Remove the tool. Remove the lock ring.

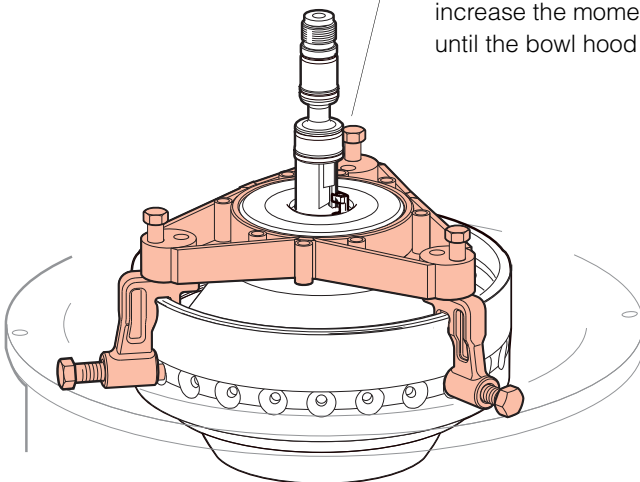


NOTE

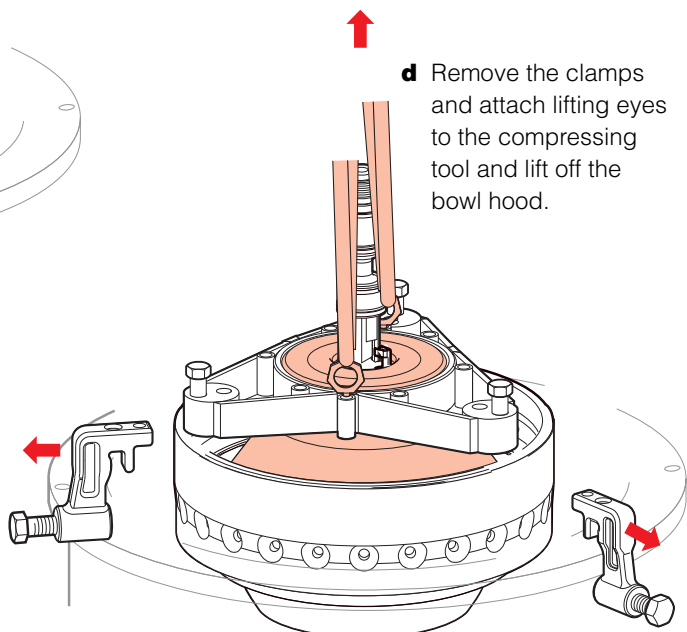
The bowl hood must be pulled off straight up, in order not to get stuck.

Recommendation: Take measurements with a calliper around the bowl, between the upper edge of the bowl body and the bowl hood, to check that the bowl hood is being pulled off straight up.

c Fit the compressing tool and the puller screws. Pull the bowl hood off by screwing the screws alternately (max. 1/2 turn) and gradually increase the momentum evenly until the bowl hood come loose.



d Remove the clamps and attach lifting eyes to the compressing tool and lift off the bowl hood.

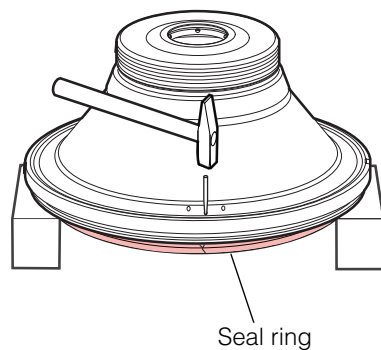


Crush hazard

The top disc can adhere to the bowl hood when lifting. Be careful not to accidentally drop it.

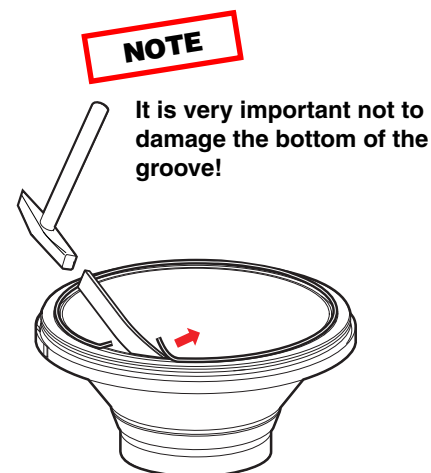
3 Removing the seal ring.

- a** Place the bowl hood on a support and tap out a piece of the seal ring using a drift in the holes.



Risk for eye injury from flying seal ring parts
The seal ring breaks when removed from the bowl hood.

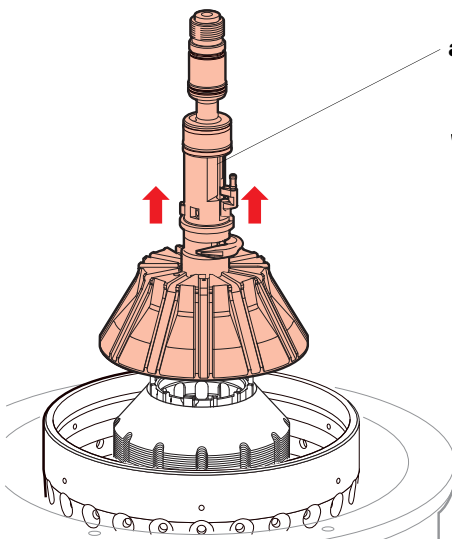
- b** Turn the bowl hood upside down and remove the seal ring by carefully knock pieces of the seal ring out of the groove, using the special tool: chisel.



G0862441

4 Removing the inlet/outlet pipe and top disc.

- a** Lift out the in- and outlet pipe together with the top disc.

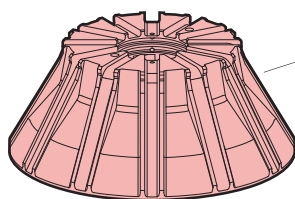


Crush hazard

The distributor and disc stack can adhere to the top disc. Separate them from the top disc so that they do not accidentally drop.

G0862951

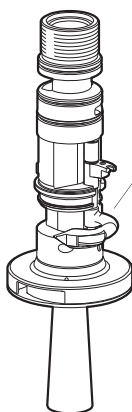
5 Removing the paring tube.



- a** Remove the top disc from the inlet and outlet pipe.

NOTE

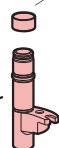
To avoid damaging the paring tube, turn it towards the centre of the pipe.



- b** Remove the splash sealing.



Bearing bushing



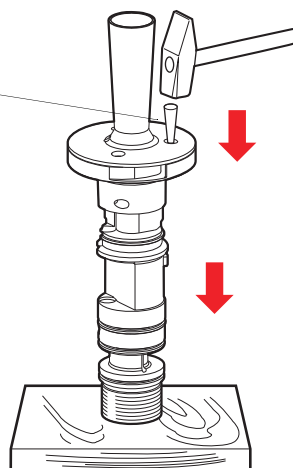
- d** Lift up and remove the paring tube.

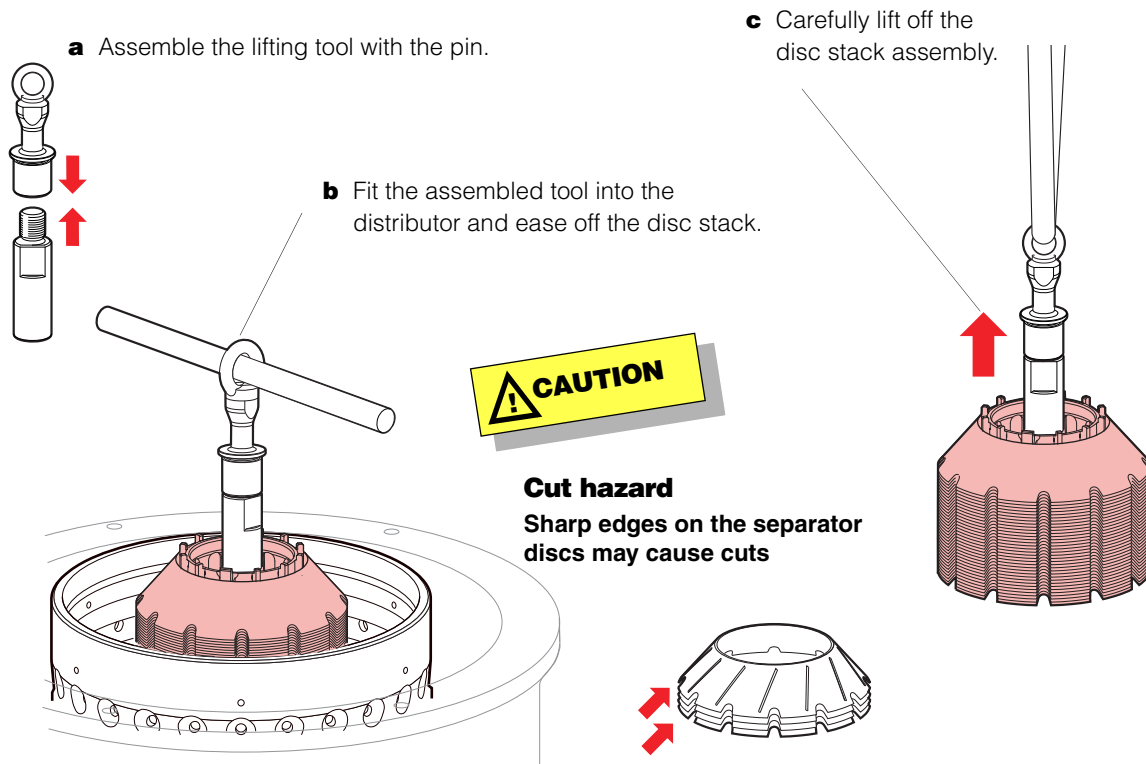
Flanged bushing

Bearing holder

NOTE

If the paring tube sticks; turn the assembly upside down and use a drift to carefully tap out the plug.



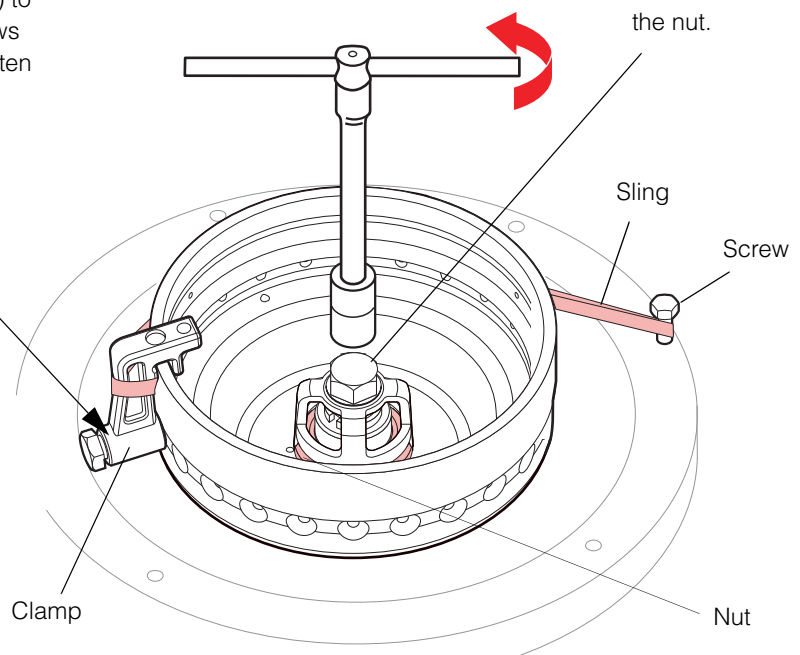
6 Removing the disc stack and distributor.

G0863161

7 Removing the nut

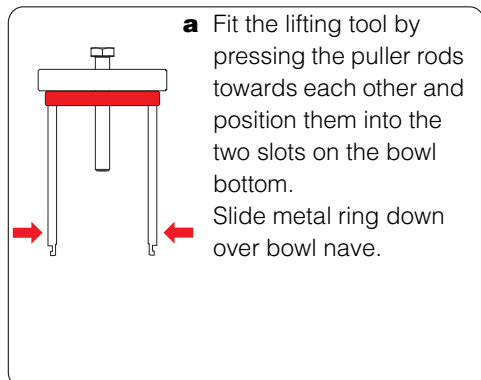
- a** To prevent the bowl body from rotating when removing the nut; Fit one of the clamps (see page 51) to the bowl body and one of the screws for the frame hood in the frame. Fasten a sling between the clamp and the screw around the bowl body.

- b** Use the spanner for nut to remove the nut.



G0923861

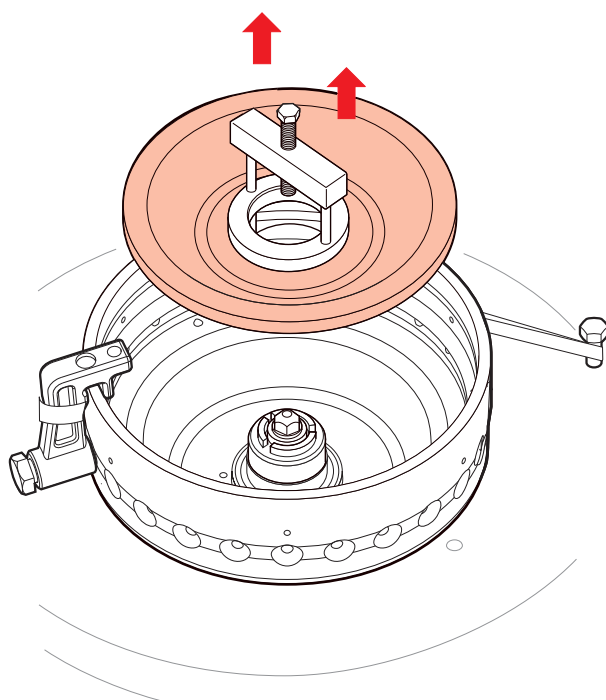
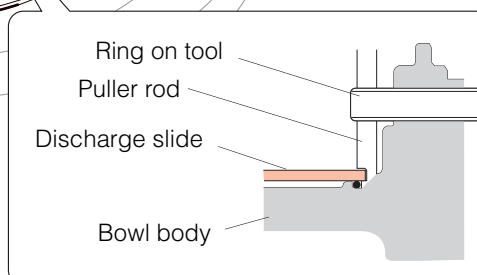
8 Removing the discharge slide.



b Ease off the discharge slide by turning the central screw.

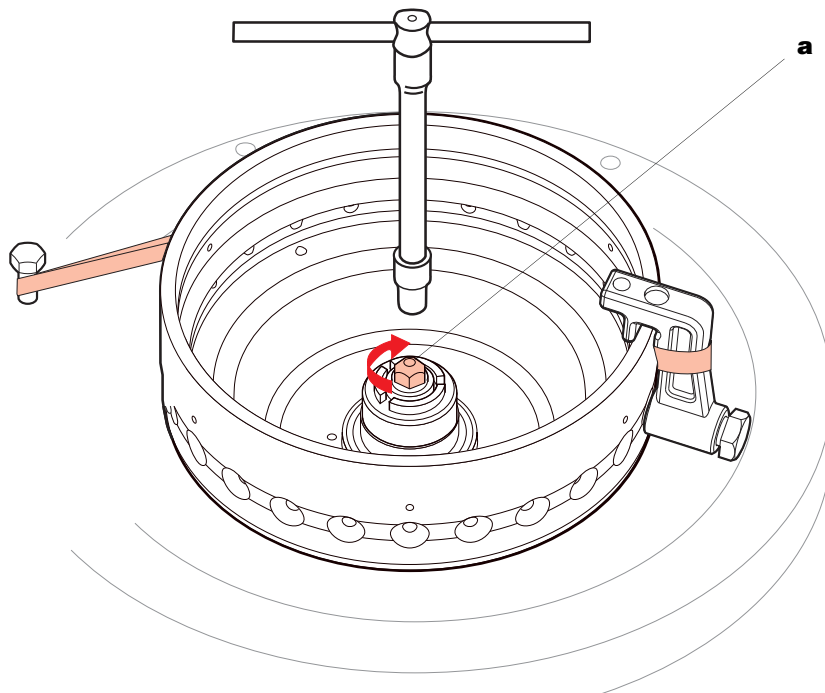
NOTE

If discharge slide is difficult to remove, tap lightly on outside edge with a soft faced hammer.

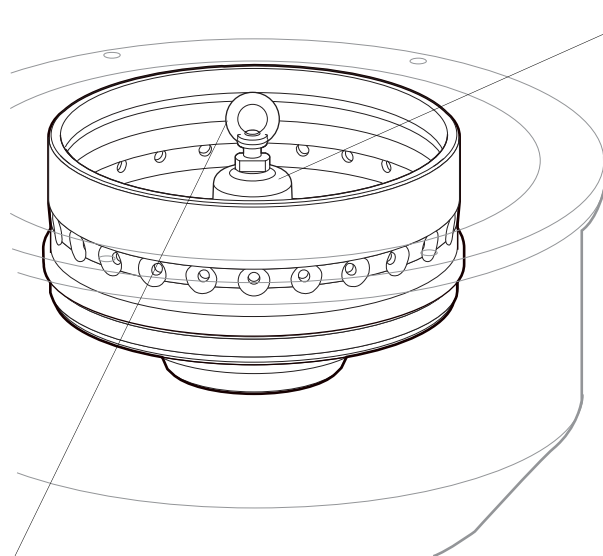
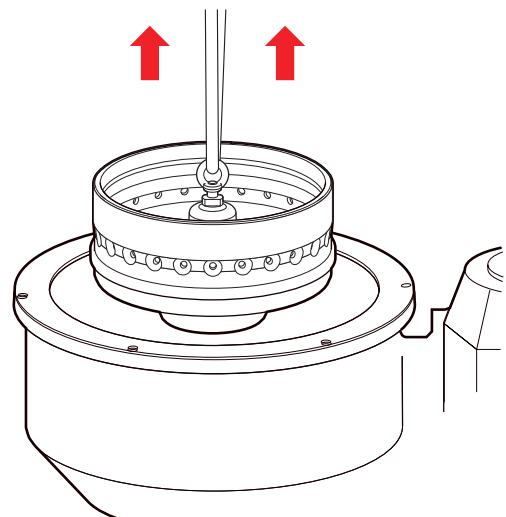


Crush hazard

The ring on the lifting tool must be pushed down against the discharge slide, otherwise the discharge slide may come loose from the tool.

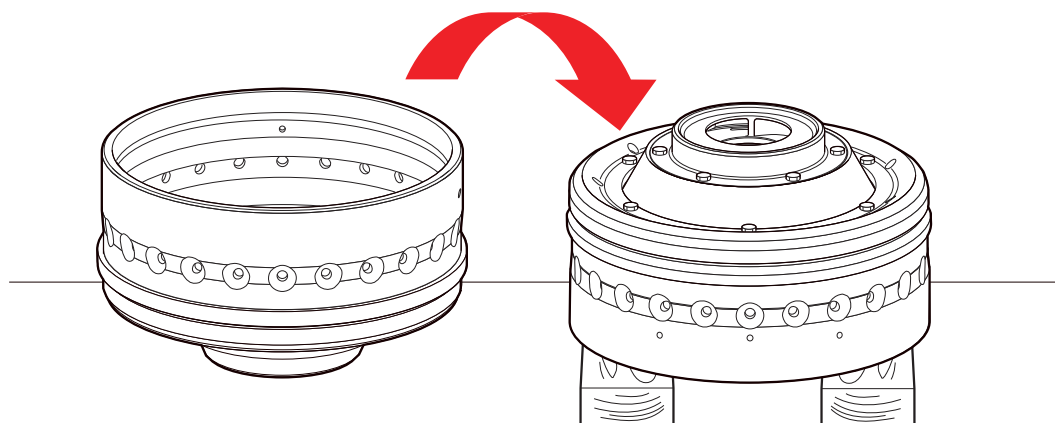
9 Removing the cap nut.**a** Remove the cap nut**NOTE**

Left-hand thread!

10 Removing the bowl body**a** Fit the lifting tool to the bowl body.**b** Raise the bowl body off the spindle taper by turning the lifting eye clock-wise.**c** Lift off the bowl body

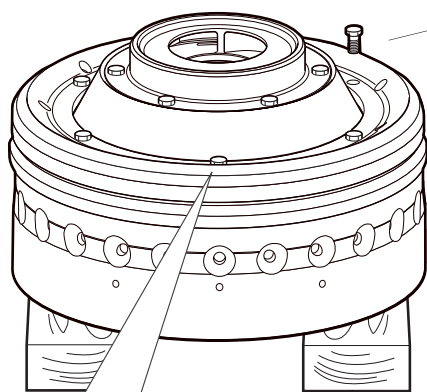
G0860661

G0860731

11 Turn the bowl body upside down.**Crush hazard**

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

G0860821

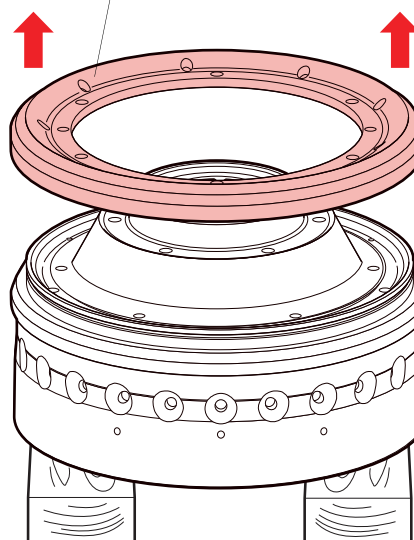
12 Removing the holder.

- a** Remove and discard the screws and washers.
New screws and washers are included in the Inspection kit.

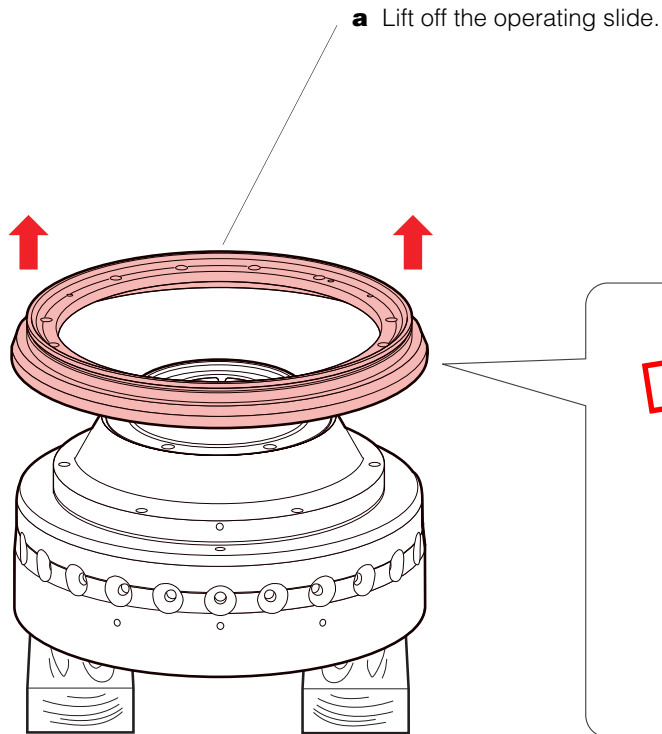
NOTE

If the ring sticks, use two M10 screws in threaded holes to raise the operating slide holder up and away from the bowl body.

- b** Lift off the holder.

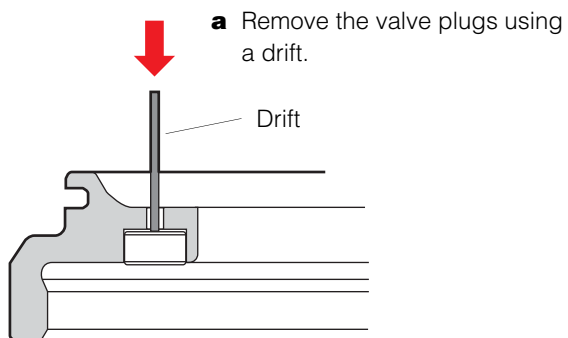


G0860921

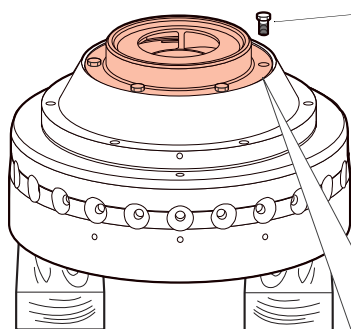
13 Removing the operating slide.**NOTE**

If the ring sticks, use two M10 screws in threaded holes to raise the operating slide holder up and away from the bowl body.

G0861021

14 Removing the valve plugs from the operating slide.

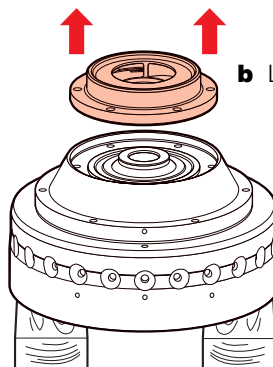
G0874881

15 Removing the operating water ring.

- a** Remove and discard the screws.
New screws are included in the Inspection kit.

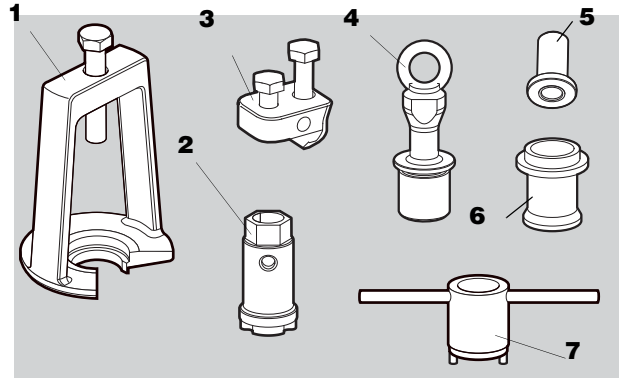
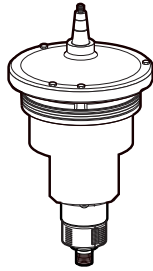
NOTE

If the ring sticks, use two M8 screws in threaded holes to raise the water ring up and away from the bowl body.



- b** Lift off the ring.

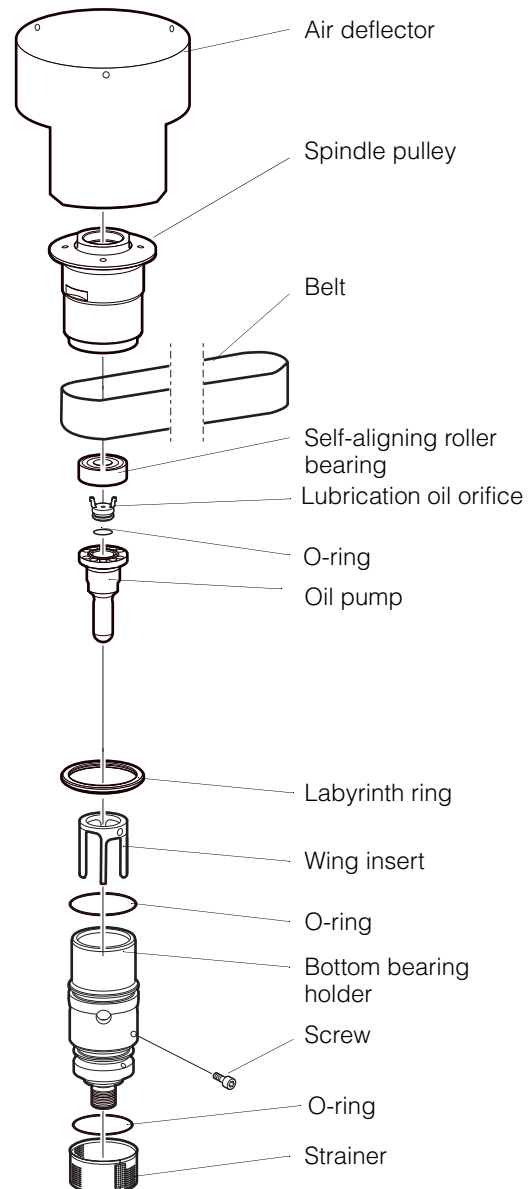
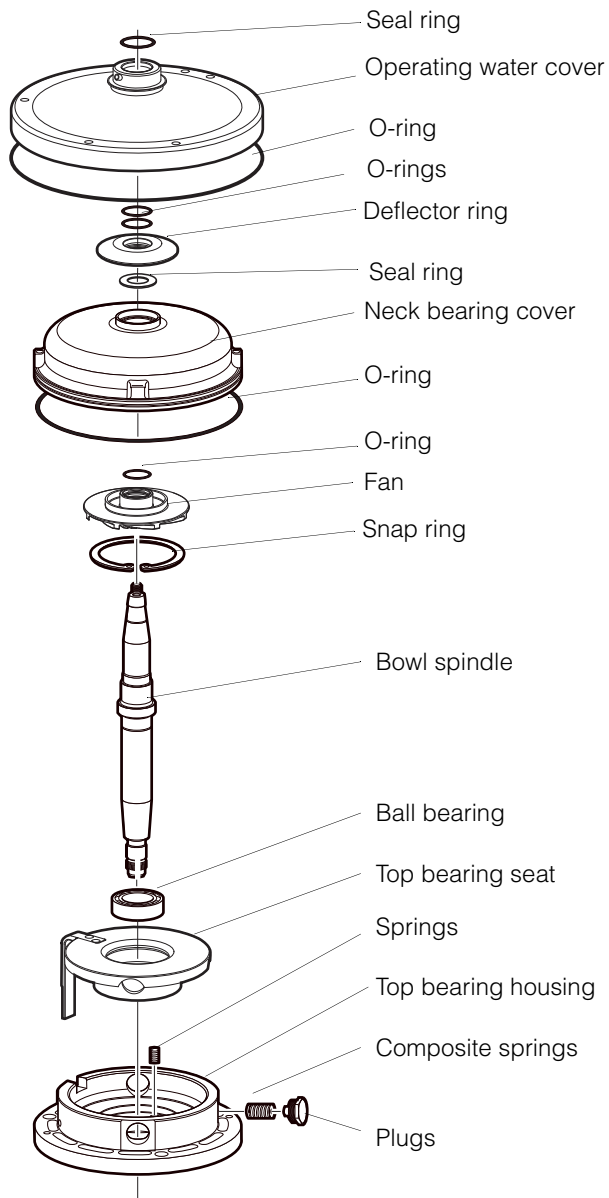
6.3.5 Driving device



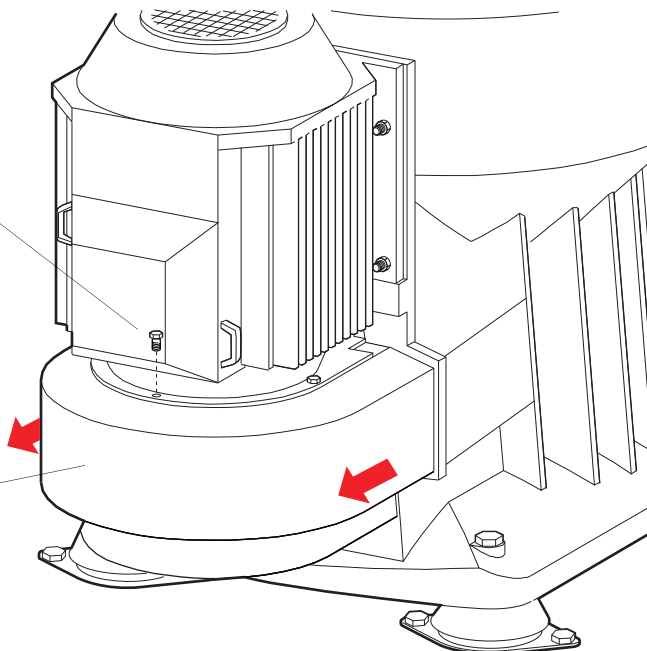
G0857821

G0857972

- | | |
|---|--|
| 1 Puller (spindle pulley, ball bearing). | 4 Lifting tool (spindle assembly) |
| 2 Tool (bearing housing). | 5 Drift (bottom bearing). |
| 3 Cover puller (neck bearing cover). | 6 Sleeve (ball bearing in top bearing seat) |
| | 7 Pin spanner (oil fan). |



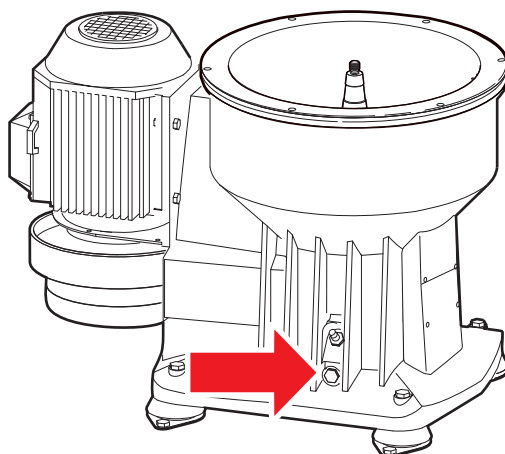
G0859831

1 Removing the clutch cover.**a** Remove the screws.**b** Remove the clutch cover.

G0858131

2 Empty the oil sump.

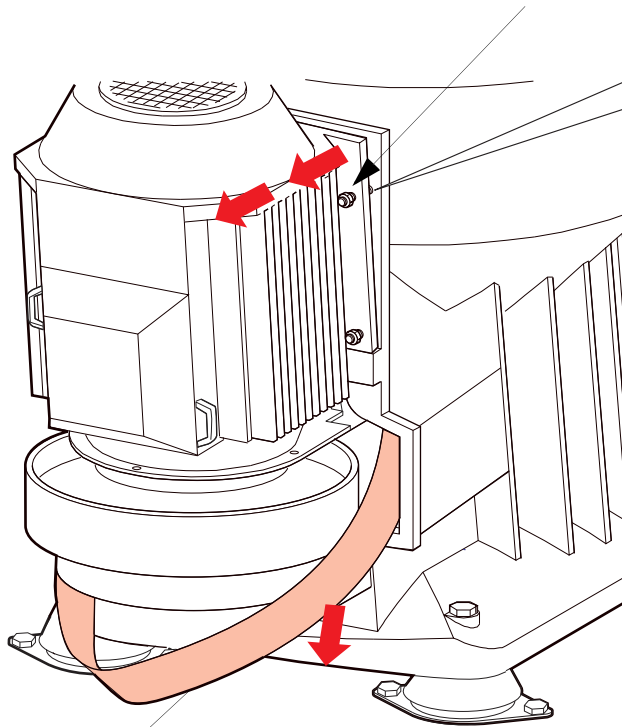
Unscrew the oil plug and empty the oil sump.



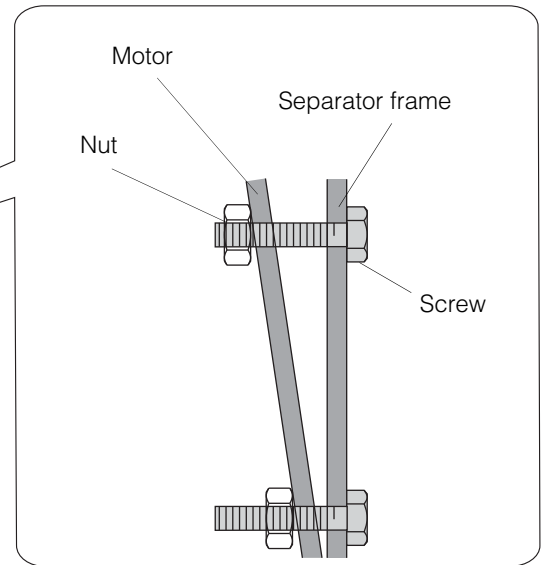
G0868571

3 Loosen the flat belt, by tilting the motor.

- a** Loosen, but do not remove, the screws holding the motor. Start with the two screws at the bottom. Do not loosen more than shown in the illustration.



- c** Remove the flat belt from the motor pulley.

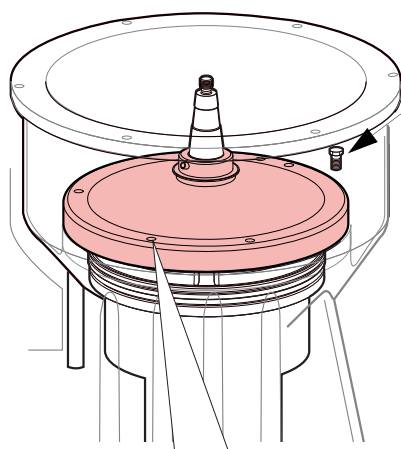


- b** Loosen the two upper screws a little bit more so that the motor can be tilted. Do not loosen more than shown in the illustration.

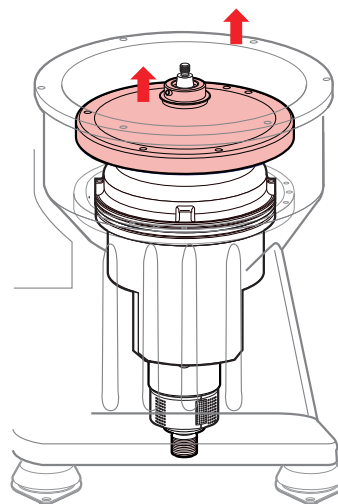


Crush hazard

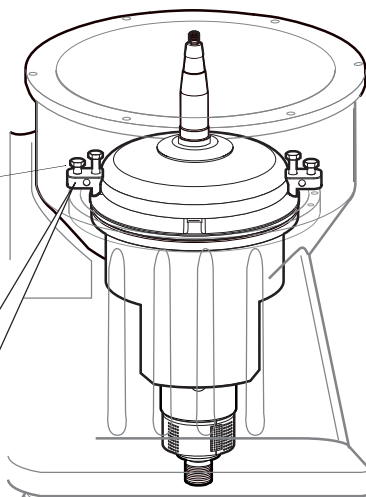
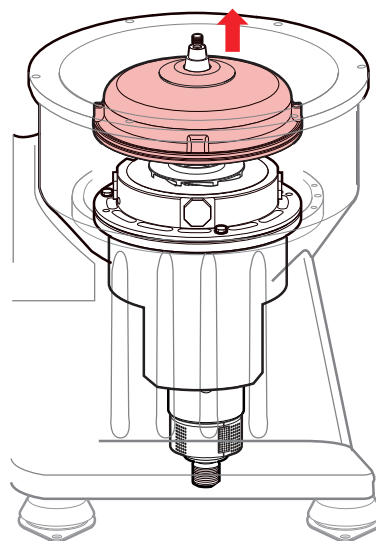
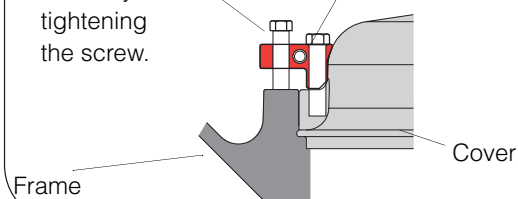
The motor will come off if the screws are unscrewed.

4 Removing the operating water cover.**a** Remove the screws.**NOTE**

If the cover sticks, fit two M8 screws to the threaded holes and tighten.

b Lift off the operating water cover.

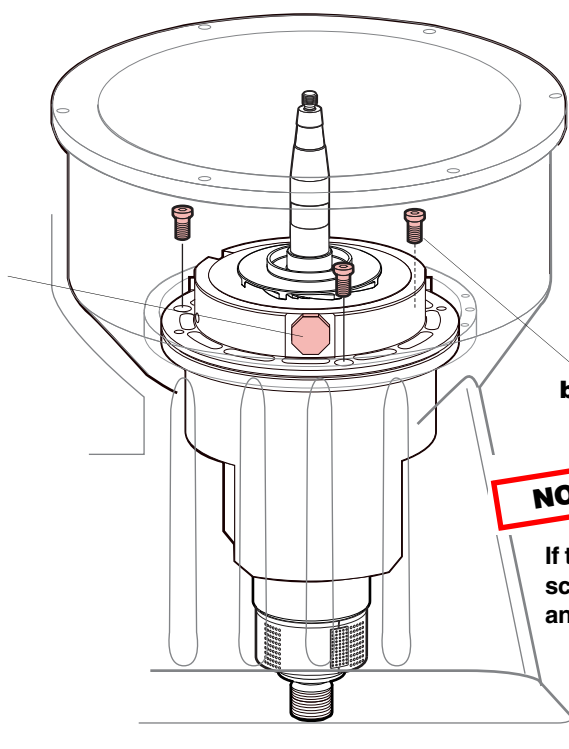
G0858931

5 Removing the neck bearing cover and deflector ring.**a** Attach the tools.**d** Lift off the neck bearing cover together with the deflector ring.**c** Ease off the cover by tightening the screw.**b** Fasten the tool to the cover.

G0859051

6 Prepare for removal of spindle assembly.**NOTE**

- a** To facilitate later removal of plugs, loosen (do not remove) the plugs on the bearing housing.



- b** Remove the screws

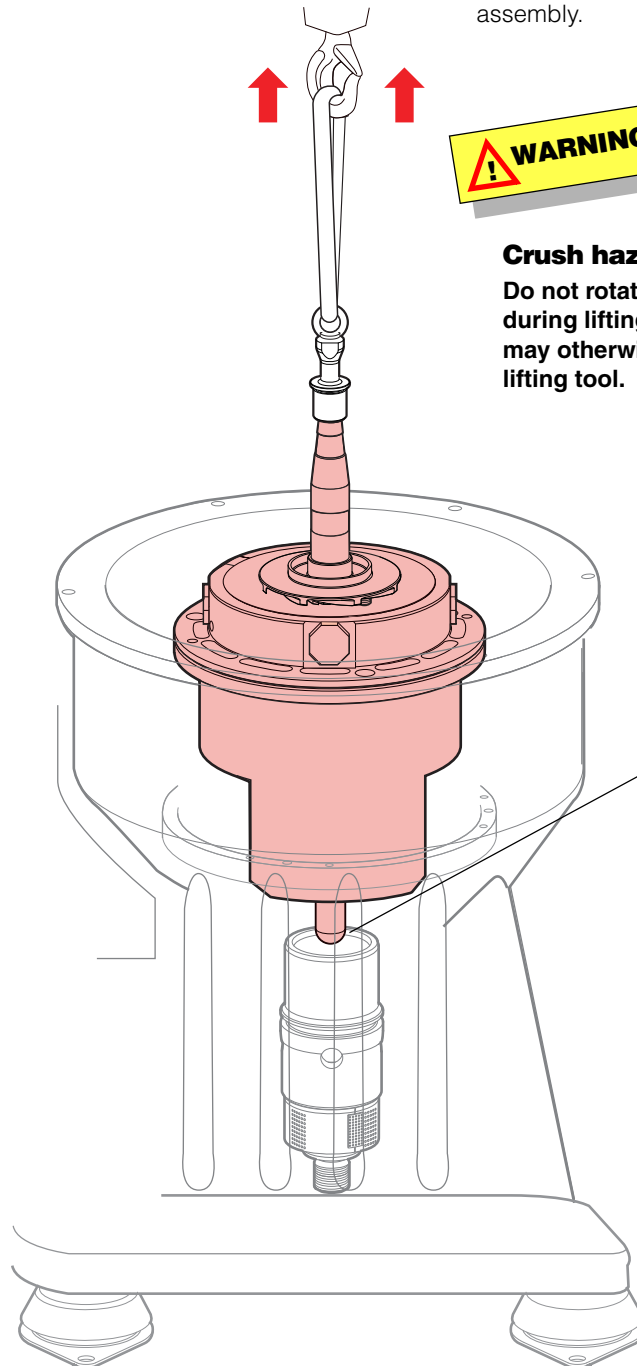
NOTE

If the cover sticks, fit two M10 screws to the threaded holes and tighten.

7 Lifting the spindle assembly from the frame.

a Fit the lifting tool to the spindle end.

b Slowly raise and lift out the spindle assembly.

**Crush hazard**

Do not rotate the spindle assembly during lifting. The spindle assembly may otherwise come loose from the lifting tool.

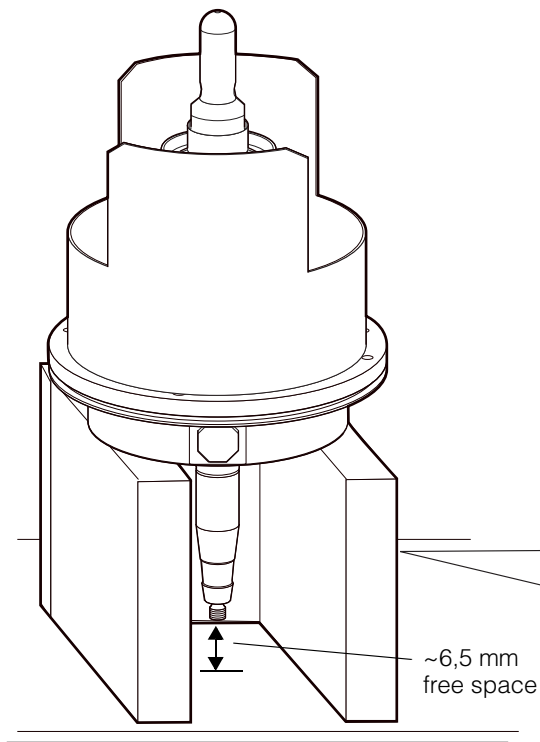
NOTE

Take care not to damage the oil pump.

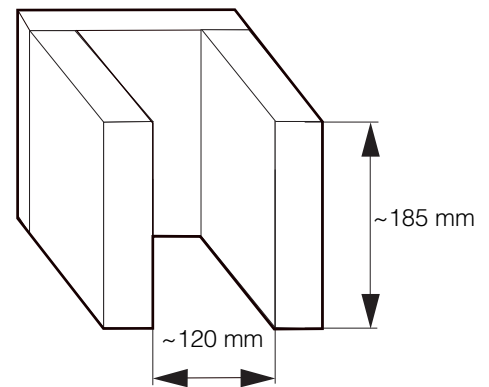
NOTE

Protect the inside of the frame by covering the hole.

- 8** Place the spindle assembly upside down on a support.

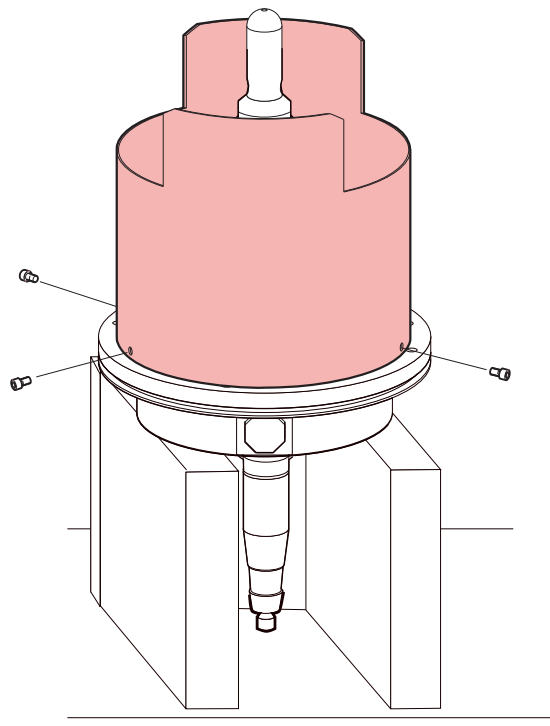


Make a support



G0859211

- 9** Removing the air deflector.



Remove the screws and the air deflector.

G0859241

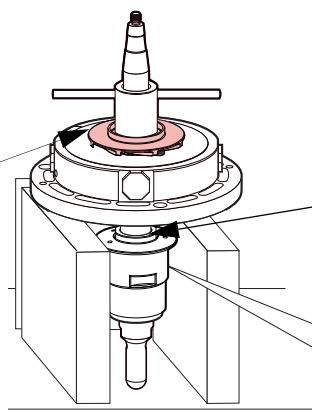
10 Removing the fan.

- a** Turn the spindle assembly the right way up.

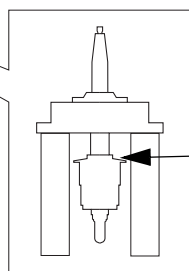
- c** Fit the pin spanner and remove the fan.

NOTE

Left-hand thread!



- b** Place a spanner (or similar) on the spindle pulley key-grip, as holder-up.

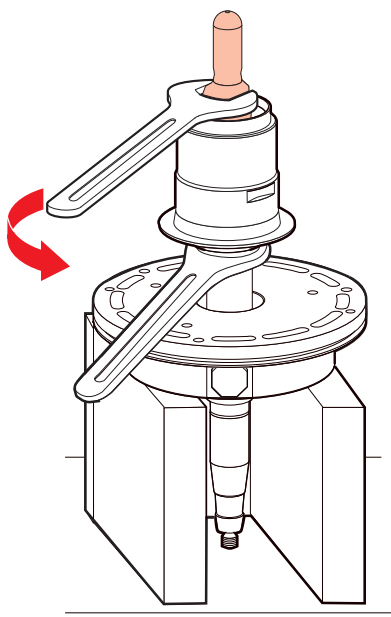


Key-grip

G0923921

11 Removing the bottom bearing assembly.

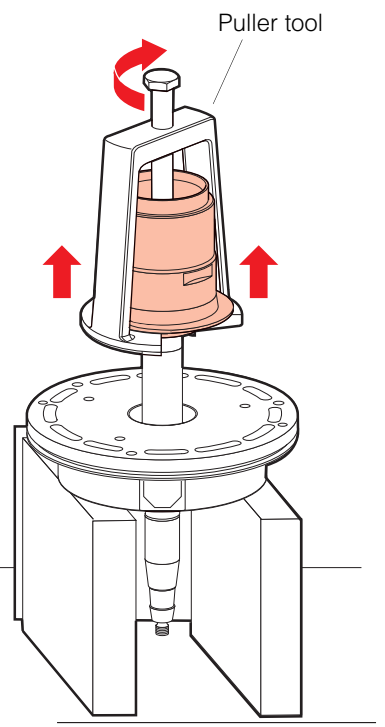
- a** Turn the spindle assembly up-side down and remove the oil pump by using spanners.



- b** Pull off the belt pulley and the self-aligning roller bearing using the puller tool.

NOTE

Always discard a used bearing.



Lubrication oil orifice

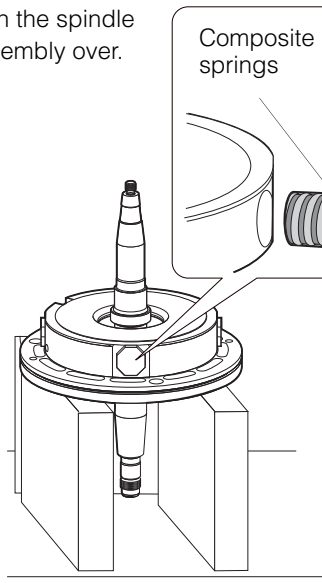
Compressed air

- c** Cover the the oil orifice and blow compressed air through the bottom hole of the oil pump and slowly ease out the lubrication oil orifice.

G0865981

12 Removing the top bearing housing.

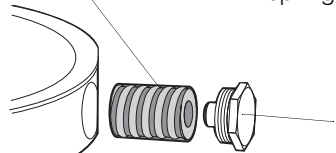
a Turn the spindle assembly over.



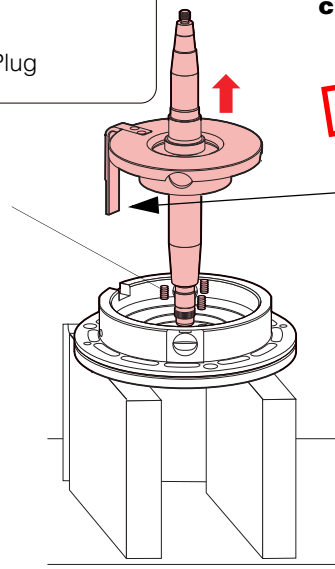
Composite springs

b Remove the plugs and the composite springs.

Plug



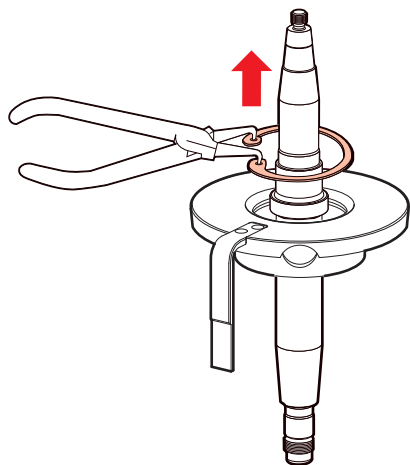
d Collect the axial springs.



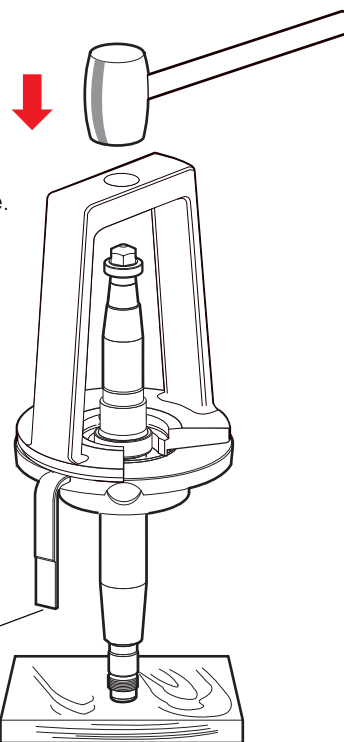
c Carefully remove the spindle from the top bearing seat.

NOTE

Be careful not to damage the vibration indicator.

13 Removing the ball bearing.**a** Remove the snap ring.**Risk for eye injury from flying snap ring**

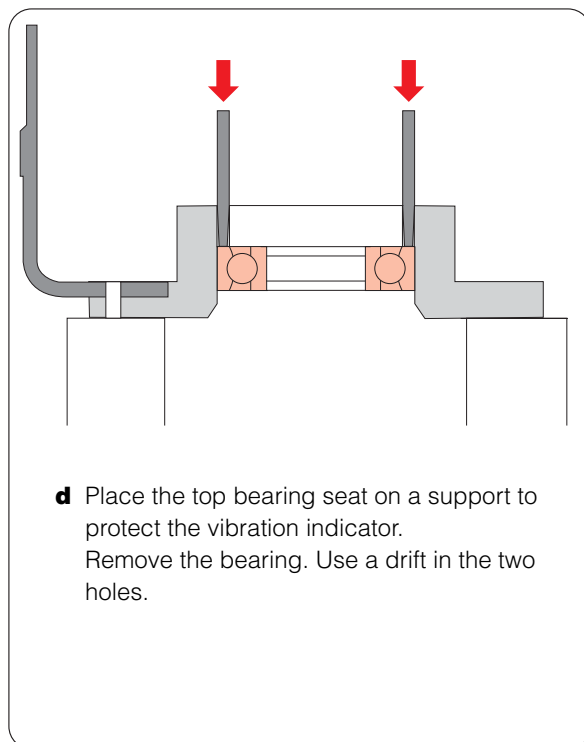
Use the correct pliers for dismantling of snap ring to avoid accidental release.

b Fit the cap nut on the spindle to protect the threads.**c** Use the puller tool to remove the top bearing seat from the spindle.**NOTE**

Do not damage threads on spindle.

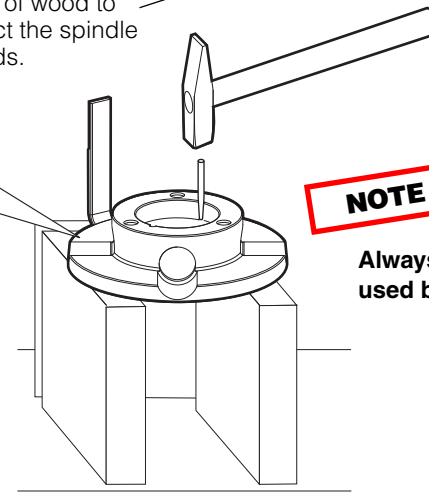
NOTE

Take care not to damage the vibration indicator when separating the top bearing seat from the spindle.

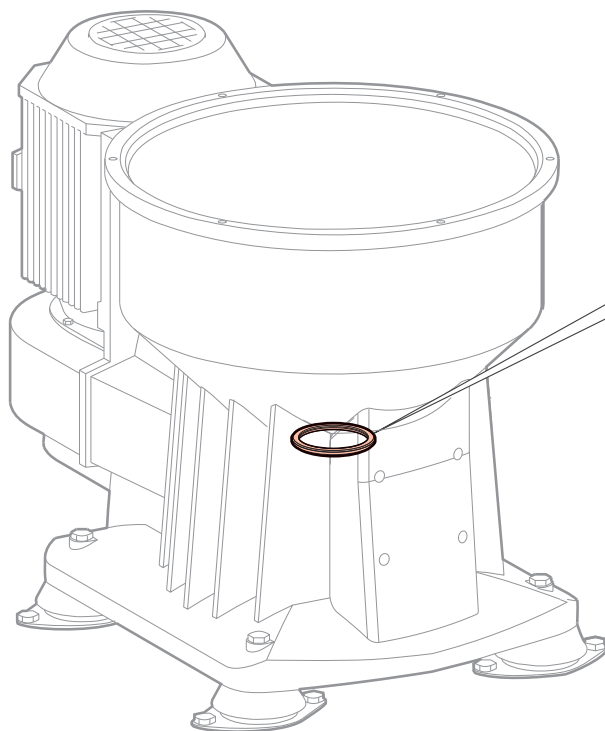


d Place the top bearing seat on a support to protect the vibration indicator. Remove the bearing. Use a drift in the two holes.

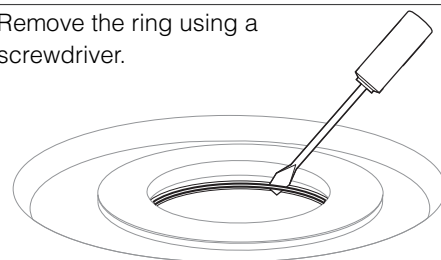
Vibration indicator
Piece of wood to protect the spindle threads.

**NOTE**

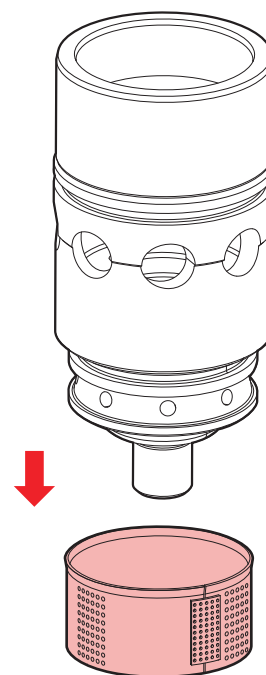
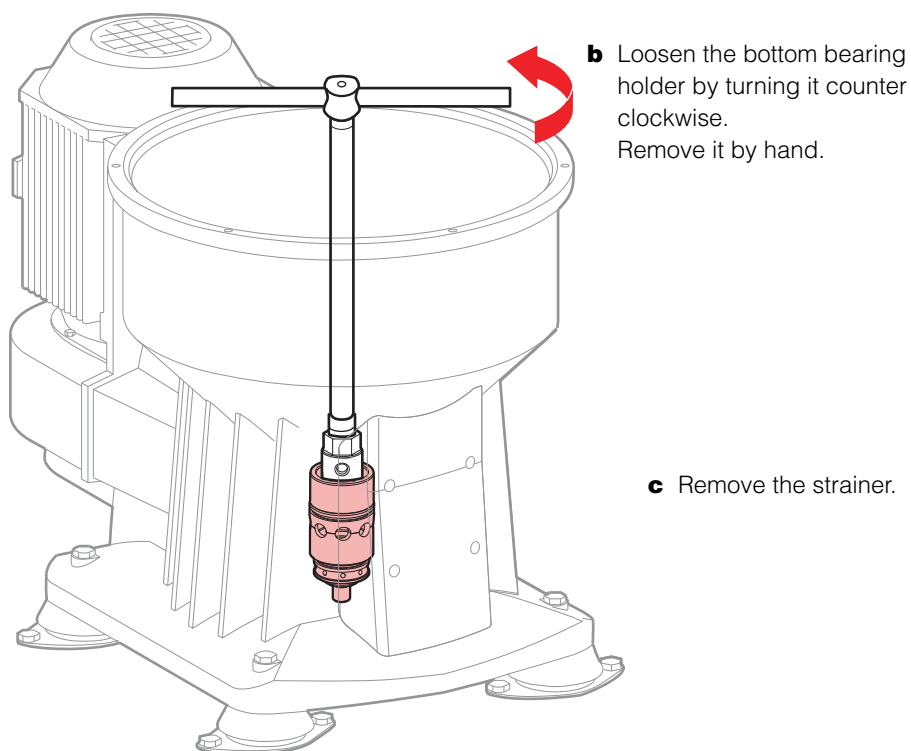
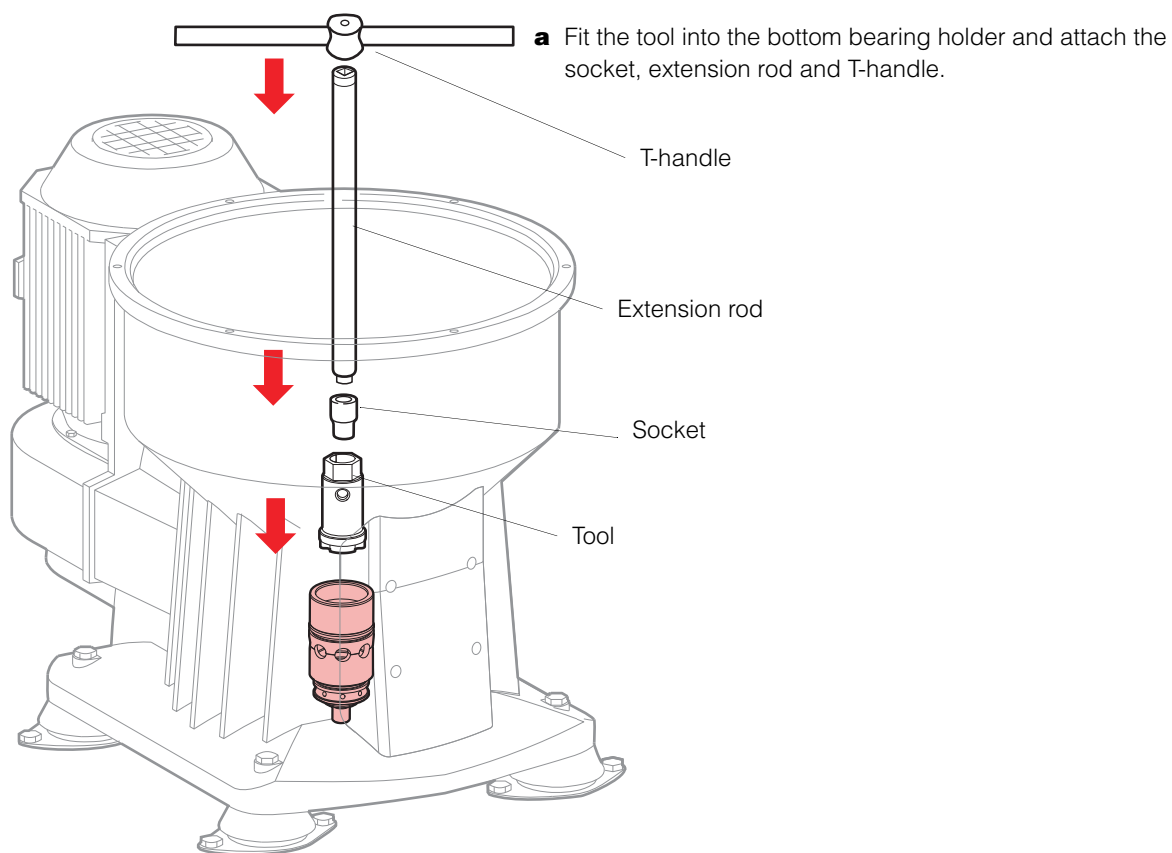
Always discard used bearings.

14 Removing the labyrinth ring.

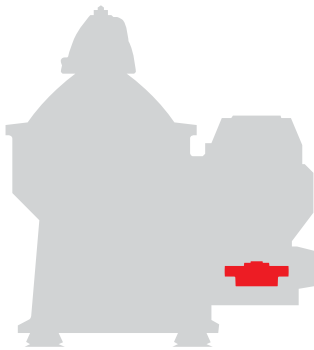
a Remove the ring using a screwdriver.

**NOTE**

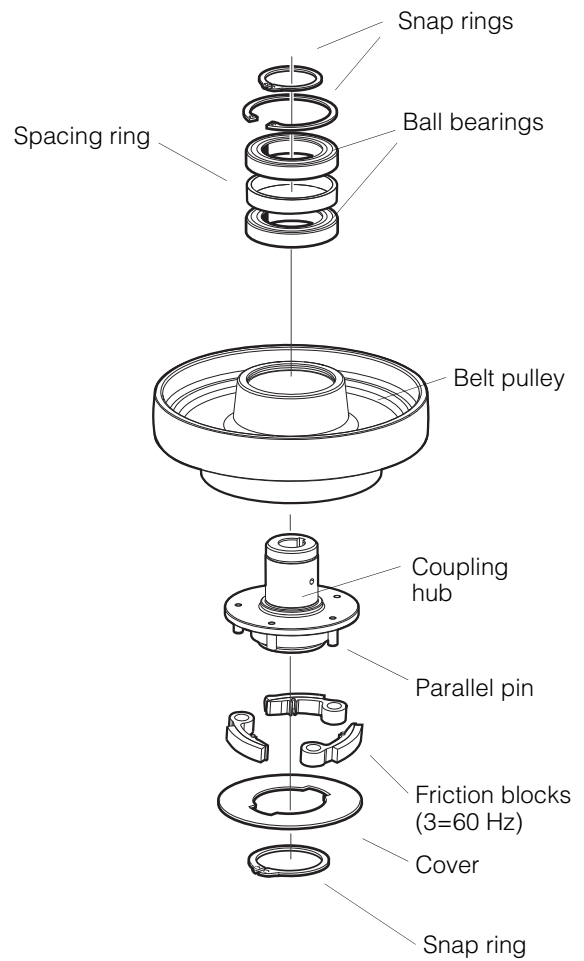
Be careful not to damage the groove.

15 Removing the bottom bearing holder.

6.3.6 Centrifugal clutch



G0864751



G08651B1



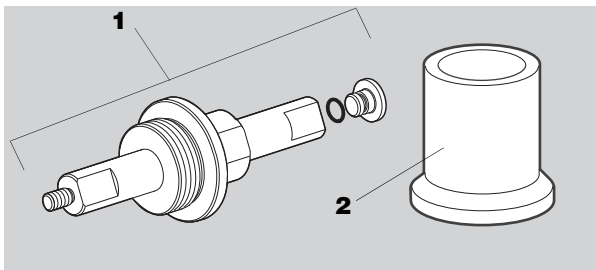
Entrapment hazard

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

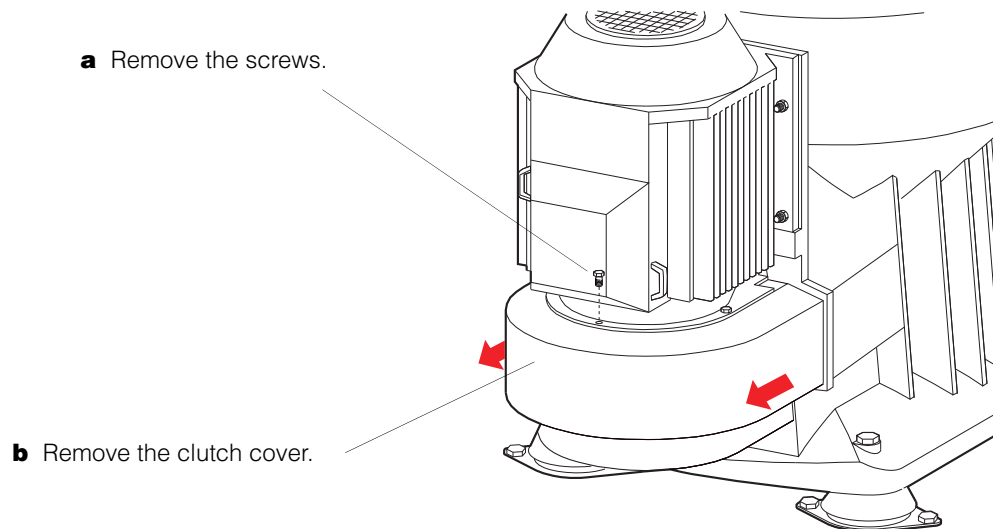
Make sure that machine has come to a complete standstill before starting any dismantling work (takes about 22 minutes from switch off).



50 Hz = 5 Friction blocks
60 Hz = 3 Friction blocks



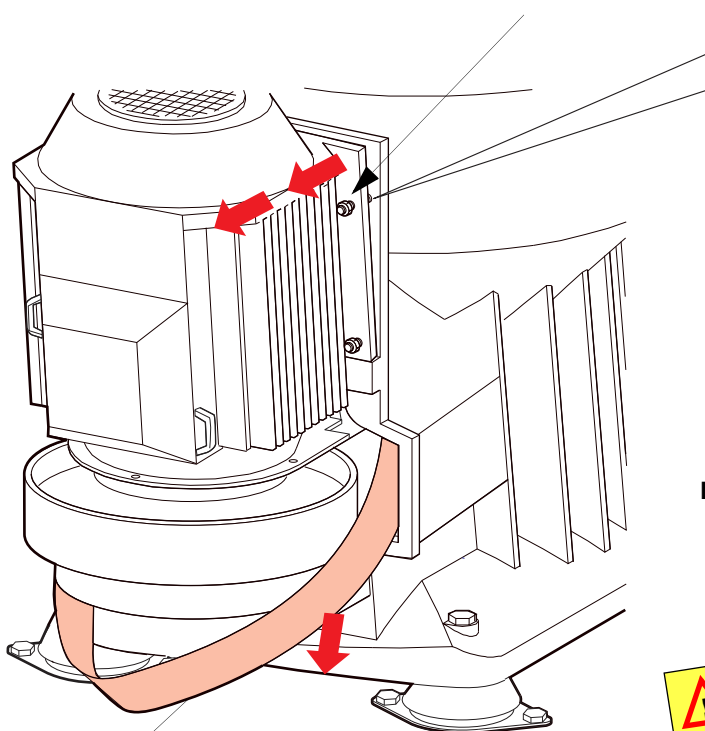
G0865041

1 Removing the clutch cover.

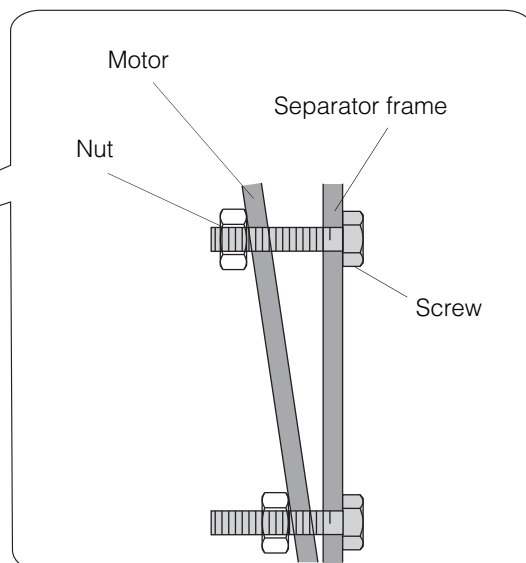
G0858131

2 Loosen the flat belt, by tilting the motor.

a Loosen, but do not remove, the screws holding the motor. Start with the two screws at the bottom. Do not loosen more than shown in the illustration.



c Remove the flat belt from the motor pulley.



b Loosen the two upper screws a little bit more so that the motor can be tilted. Do not loosen more than shown in the illustration.

**Crush hazard**

The motor will come off if the screws are unscrewed.

G08586A1

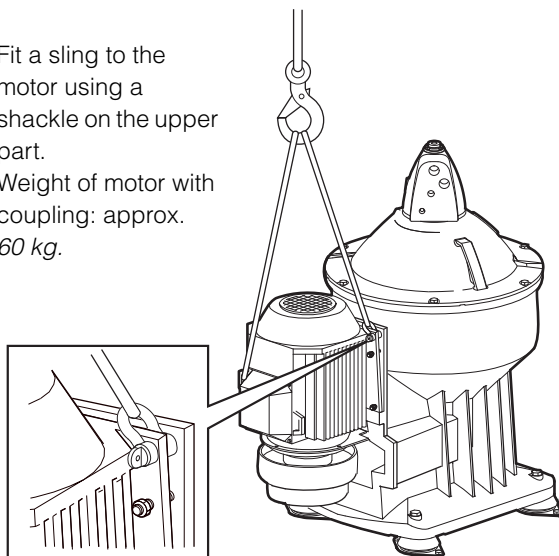
3 Removing the motor.

- a** Disconnect the electrical cables.

**Electrical hazard**

If the cables are not disconnected during lifting procedures, they may become damaged.

- b** Fit a sling to the motor using a shackle on the upper part. Weight of motor with coupling: approx. 60 kg.



- c** Tense the lifting sling to support the motor and remove the screws. Lift the motor while supported.

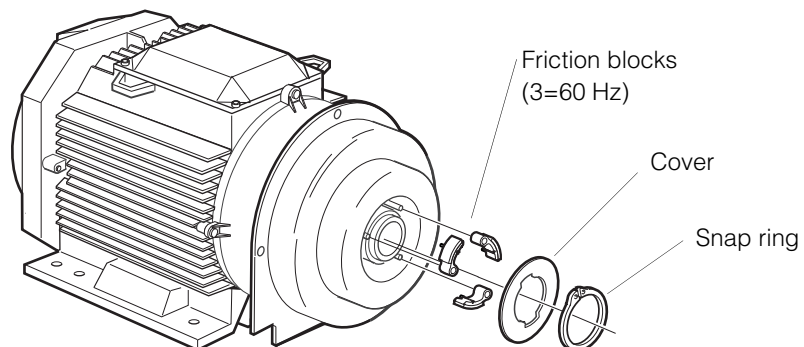
**Crush hazard**

If not supported, the motor with coupling will drop when removing the screws.

- d** Lower the motor onto a suitable pallet.

4 Removing the friction blocks.

- a** Remove the snap ring, cover and friction blocks.



50 Hz = 5 Friction blocks
60 Hz = 3 Friction blocks

5 Checking the condition of the friction blocks .



Inhalation hazard

When handling friction blocks/pads wear a mask to avoid inhalation of dust.

Do not use compressed air to remove dust. Remove dust using vacuum or a damp cloth.

If the blocks are worn:

Fit new friction blocks.

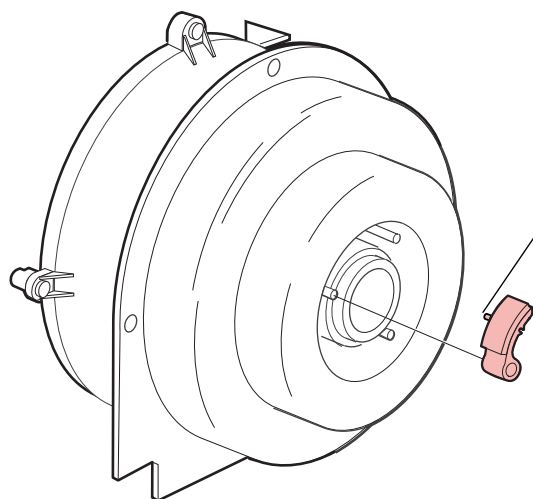


Replace all blocks, even if only one is worn.

- a Clean the pins of coupling hub and apply a thin film of lubricating paste to the pins.



Make sure that there is no oil on the pads.



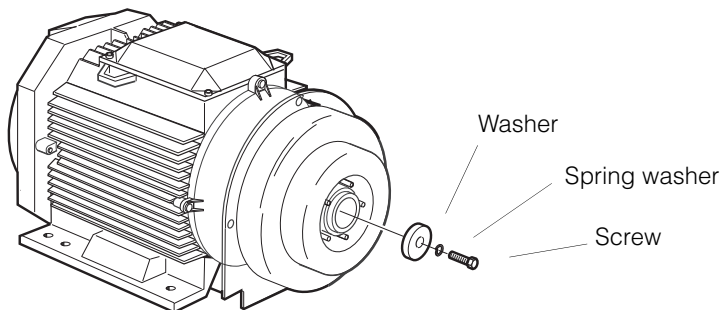
Be sure that the pins on the back of the blocks project into the grooves in the clutch hub.

- b If only friction block service is to be done, proceed to *"Assembly of friction blocks" on page 92.*

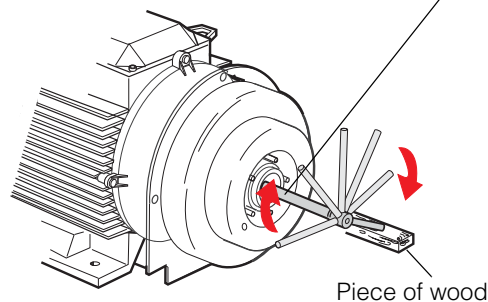
Complete dismantling of centrifugal clutch

6 Removing the coupling from the motor.

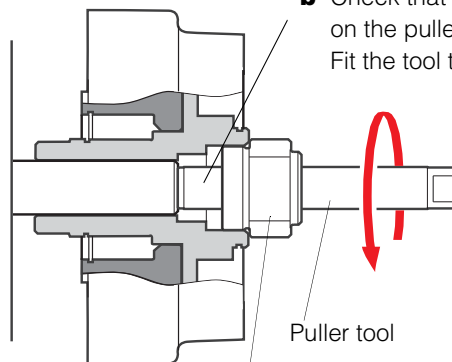
a Remove the screw, spring washer and washer.



Attach a socket with extension rod and handle to the screw. Place a piece of wood according to the illustration. Push the handle to start the rotor moving, when the handle hits the piece of wood, the weight and movement of the rotor loosens the screw. Repeat until screw is loose.



b Check that the brass plug is mounted on the puller tool. Fit the tool to the friction clutch.



Flat areas for spanner.

c Ease off the friction coupling.



Crush hazard

The centrifugal clutch is heavy and can fall, causing injury, when loosened from the motor shaft.

NOTE

See dismantling with optional hydraulic puller tool (if purchased) on next page.

7 Removing the coupling from the motor using the optional hydraulic tool.

NOTE

First remove the screw, spring washer and washer according to instructions a -b, on previous page.

- a** Fit the sleeve to the stud bolt.

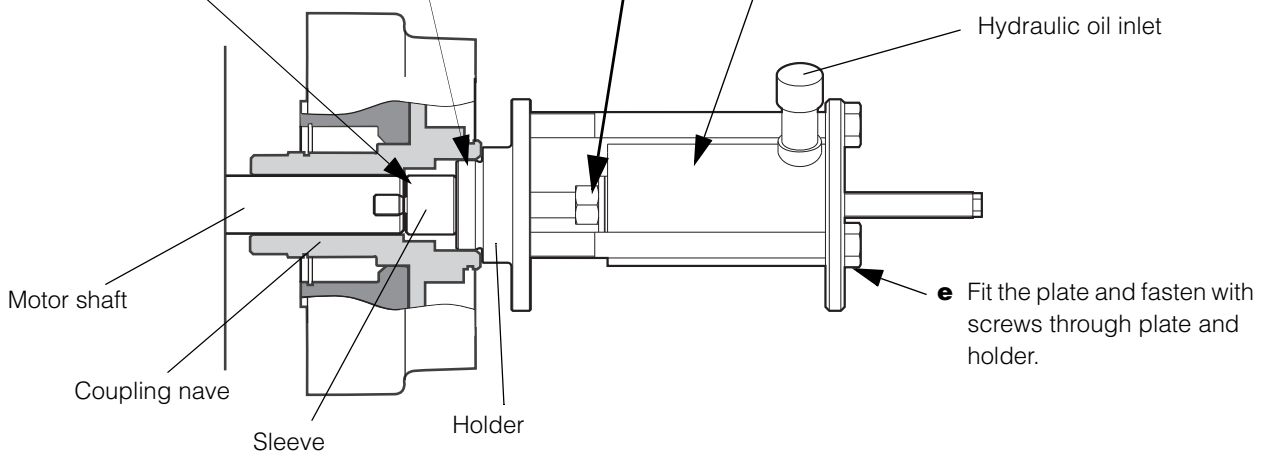
Fit the stud bolt with sleeve to the motor shaft.

- b** Fit the holder to the coupling nave.

- c** Fit nut and sleeve to the stud bolt as shown.

- d** Fit hydraulic cylinder as shown.

Hydraulic oil inlet



- e** Fit the plate and fasten with screws through plate and holder.

- f** Attach the hose from the hand pump to the hydraulic oil inlet.

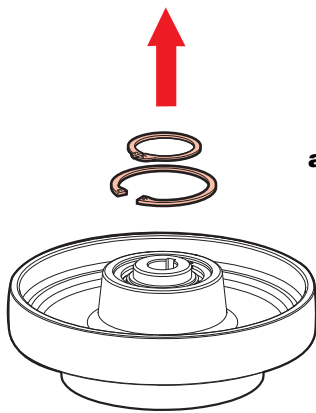
Ease off the friction coupling by pumping the handle on the pump until stop.
Release pressure on the hand pump and adjust the nut on the stud bolt.

Repeat until coupling is loose.



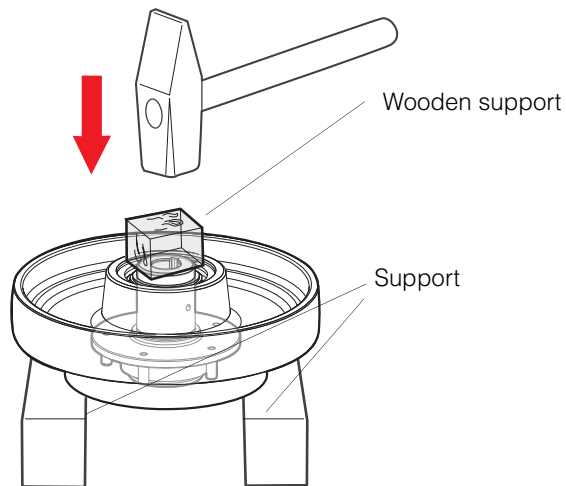
Crush hazard

The centrifugal clutch is heavy and can fall, causing injury, when loosened from the motor shaft.

8 Dismantling of the coupling assembly.

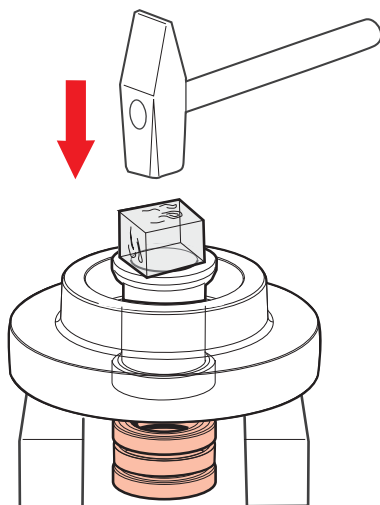
a Remove the snap rings.

b Drive out the coupling hub.



Wooden support

Support



c Turn the coupling the other way round and drive out the ball bearings using the mounting tool.

NOTE

Always discard used bearings.

6.4 Actions Before Assembly

6.4.1 Cleaning

Clean the separator parts according to the diagram below. Afterwards, protect all cleaned carbon steel parts against corrosion by oiling.

Part	Procedure	Cleaning agents
Frame and motor	The external cleaning of the frame and motor should be restricted to brushing, sponging or wiping while the motor is running or still is hot.  WARNING Electrical hazard Never wash down a separator with a direct water stream. Never play a water jet on the motor. Totally enclosed motors can be damaged by direct hosing to the same extent as open motors, resulting in short-circuit and internal corrosion. Clean the inside of the frame with a clean cloth and remove visible particles.	Water and de-greasing agent.

Part	Procedure	Cleaning agents
Bowl Inlet/ outlet	Cleaning of bowl discs Handle the bowl discs carefully in order to avoid damage to the surfaces during cleaning 1 Remove the bowl discs from the distributor and place them individually in the cleaning agent. 2 Allow the discs to remain in the cleaning agent until the deposits have been dissolved. This will normally take between two and four hours. 3 Lastly, clean the discs with a soft brush. Cleaning of holder for operating slide, operating water ring and operating slide with nozzle. Use 10% acetic acid solution to dissolve lime deposits. The acid should be heated to 80 °C. Clean the nozzle on the operating slide using a soft iron wire or a similar object.	A chemical cleaning agent must dissolve the deposits quickly without attacking the material of the separator parts. <i>Fuel oil</i> sludge mainly consists of complex organic substances such as asphaltenes. The most important property of a cleaning liquid for the removal of fuel oil sludge is the ability to dissolve these asphaltenes.  Cut hazard Sharp edges on the separator discs may cause cuts.
Driving device	Use a sponge or a soft brush and clean the oil orifice, bearing holder and oil pump thoroughly.	White spirit, cleaning-grade kerosene or diesel oil.
Centrifugal clutch	Use a sponge or a soft brush.	White spirit, cleaning-grade kerosene or diesel oil.
Belt pulley	Use a a steel brush.	Solvent

6.4.2 Inspection for corrosion

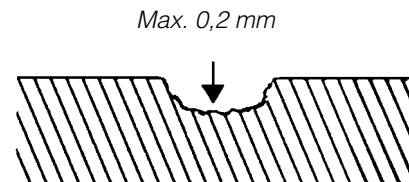


Inspect the separator parts for corrosion. Evidence of corrosion attacks should be looked for and rectified each time the separator is dismantled.



Disintegration hazards

Always contact your Alfa Laval representative if you suspect that the depth of the corrosion damage exceeds 0,2 mm for bowl body and bowl hood (0,5 for other parts) 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.



G0205241

Material	Type of corrosive environment	Appearance	Measure
Non-stainless steel and cast iron parts	Water or dampness	Rust	If damage exceeds 0,5 mm, contact Alfa Laval.
Stainless steel	Chlorides or acidic solutions	Acidic solutions cause general corrosion. Chloride corrosion begins as small dark spots that can be difficult to detect, and goes on to local damage such as pitting, grooves or cracks.	Polish dark-coloured spots and other corrosion marks with a fine grain emery cloth. This may prevent further damage. If damage exceeds 0,5 mm (0,2 mm for bowl body and bowl hood) contact Alfa Laval.
Other metal parts	"Aggressive" environment	Possible corrosion damage can be in the form of pits and/or cracks.	If damage exceeds 0,5 mm, contact Alfa Laval.



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 any part where corrosion can be suspected of affecting its strength or function.

6.4.3 Inspection for cracks

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



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.

Cracks can occur from cyclic material stresses and corrosion. Keeping the separator and its parts clean and free from deposits will help to prevent corrosion attacks.



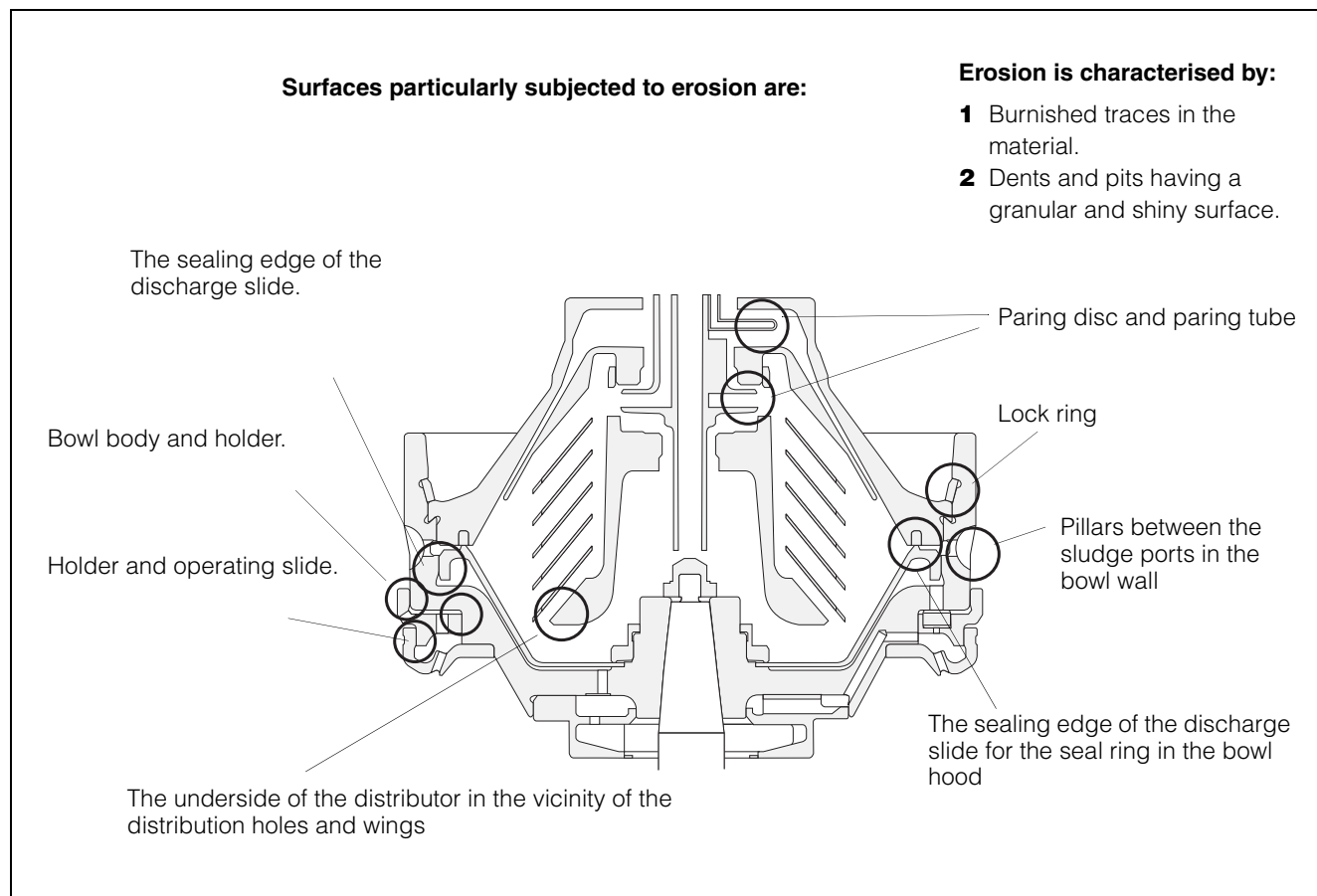
Disintegration hazards

Always contact your Alfa Laval representative if you suspect that the depth of the damage exceeds 0,2 mm for bowl body and bowl hood (0,5 for other parts).

Do not continue to use the separator until it has been inspected and given clearance for operation by Alfa Laval.

6.4.4 Inspection for erosion

Erosion may occur when particles suspended in the process liquid slide along or strike against a surface.



1 Inspect the bowl and inlet/outlet parts for erosion damages.

2 Replace parts if erosion is suspected.

NOTE

Always contact your Alfa Laval representative if you suspect that the depth of the damage exceeds 0,2 mm for bowl body and bowl hood (0,5 for other parts). Do not continue to use the separator until it has been inspected and cleared for operation by Alfa Laval.

WARNING

Disintegration hazard

Erosion damage weakens parts by reducing the thickness of the material.

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

Replace parts if erosion is suspected of affecting strength or function.

6.4.5 Exchange of frame feet

The frame feet have to be changed occasionally due to rubber deterioration from age.

When replacing the frame feet, the separator must be lifted. Follow [6.8.1 Lifting the separator](#), page 139.

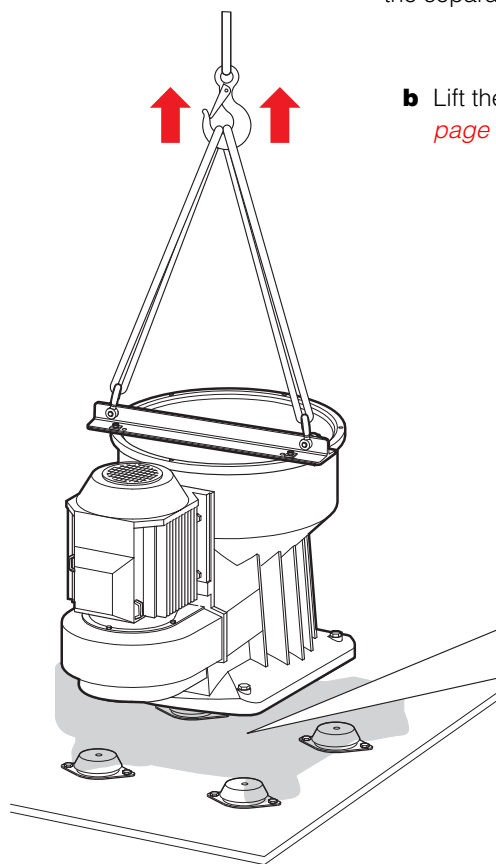
NOTE

Discard the old frame feet, screws and washers.

- a** Loosen the bolts and prepare to remove the separator frame

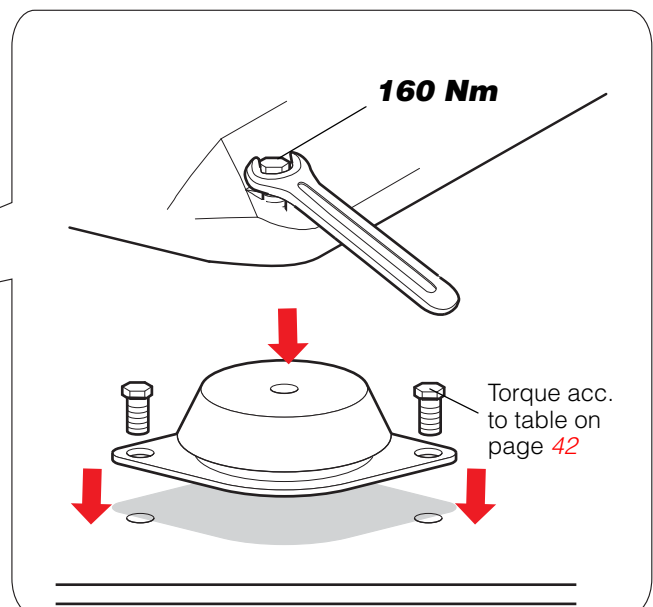
- b** Lift the separator. See "[Lifting the separator](#)" on page 139

- c** Remove the existing frame feet.



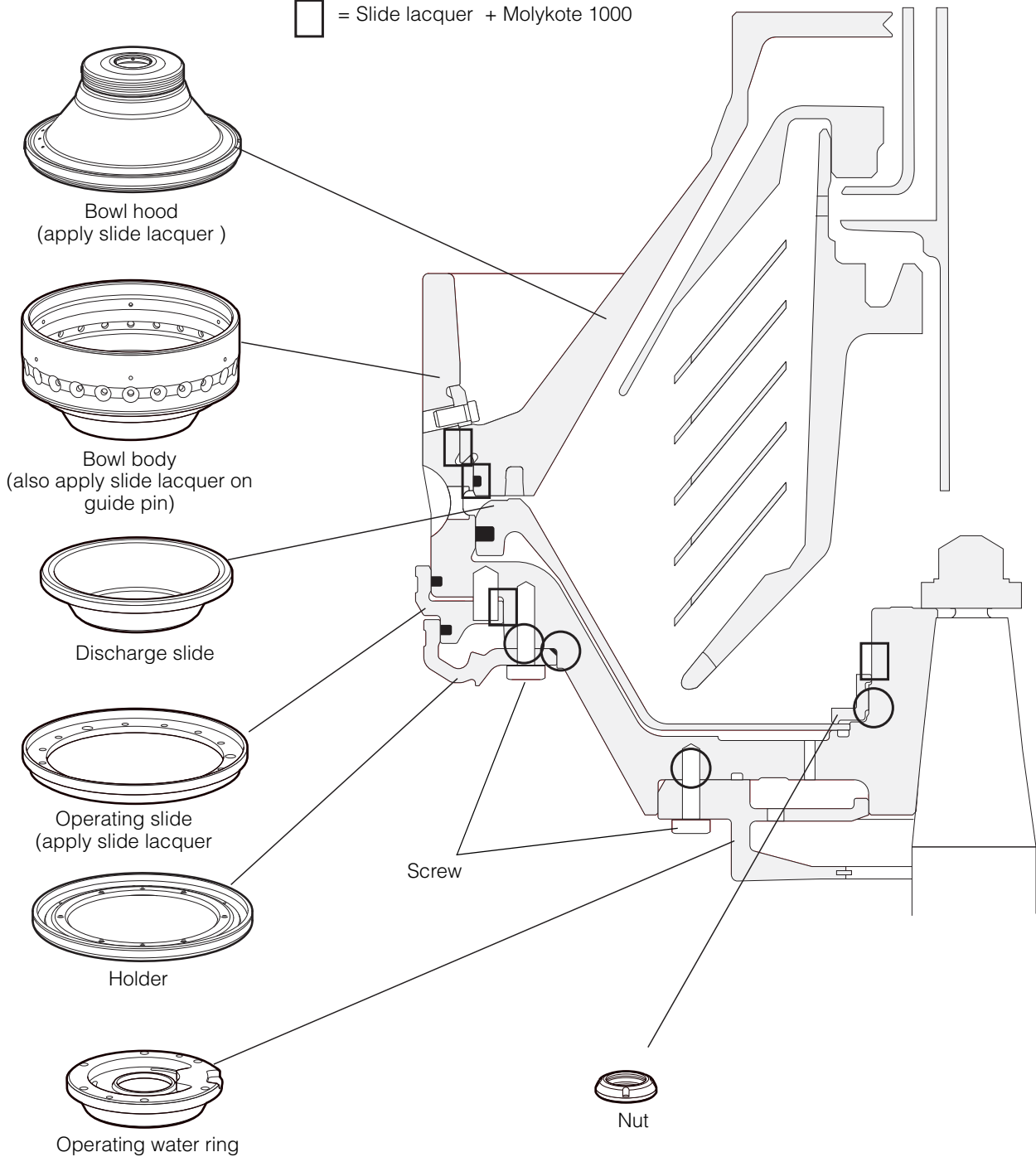
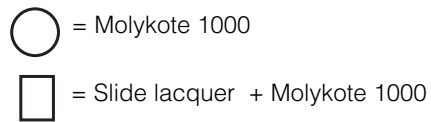
- d** Fit the new feet, screws and washers.

- e** Place the separator in its original position and fasten the mounting bolts. Tightening torque: 160 Nm.

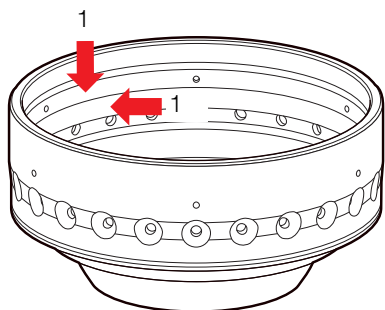


6.4.6 Lubrication of bowl parts

- a** Apply a thin layer of Molykote 1000, or equivalent lubrication, on all the following contact surfaces. Apply slide lacquer on the operating slide and the bowl body, guide pin and bowl hood.



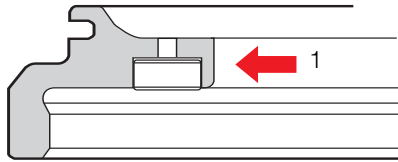
6.4.7 How to lubricate bowl parts with slide lacquer

**NOTE**

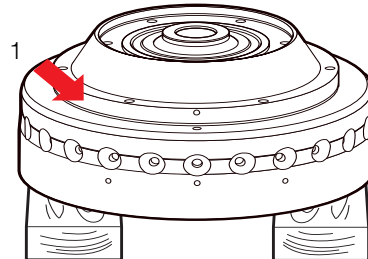
This instruction is also valid for the operating slide and the holder.

- a** Carefully clean the contact surfaces (1) on bowl body and bowl hood.
- b** Apply slide lacquer with a sponge.
- c** Rub the slide lacquer on the surfaces to a thin, evenly distributed layer using the sponge.
- d** Finish the treatment by lubricating the contact surfaces with Alfa Laval lubricating paste or Molykote 1000 paste. Use a well cleaned brush and rub it into the surface, do not leave any excessive paste.

6.4.8 Check for galling on operating slide and bowl body



If any friction marks are found on the guide surfaces (1) of operating slide and bowl body, proceed as follows:



- a** Clean the surface thoroughly with a degreasing agent, i.e. white spirit.
This is important!
- b** Using an emery cloth (e.g. No. 320) to smooth the metal edges.
- c** Finish by polishing the damaged spots with polishing paper (e.g. No. 600).
- d** Apply slide lacquer with a sponge.
- e** Rub the slide lacquer on the surfaces to a thin, evenly distributed layer using the sponge.
- f** Finish the treatment by lubricating the guiding surfaces with Alfa Laval lubricating paste or Molykote 1000 paste. Use a well cleaned brush. Rub it into the surface, do not leave any excessive paste.

NOTE

To avoid the risk of galling, the guiding surface of the operating slide should be primed with a slide lacquer at every inspection service.

6.5 Assembly

6.5.1 Centrifugal clutch

1 Assembly of the coupling.

- a** Slip the belt pulley over the coupling hub and place them on a firm and level foundation.

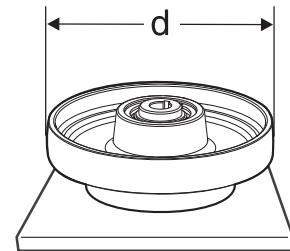


Disintegration Hazard

If the belt pulley must be renewed, check that the new pulley has the correct diameter. An incorrect pulley will cause the separator bowl to run at either an excessive or insufficient speed.

d=283 mm 50 Hz

d=235 mm 60 Hz



NOTE

Remove rust from the belt pulley using a steel brush.



- b** Apply a thin film of oil onto the external and internal surfaces of the ball bearings .

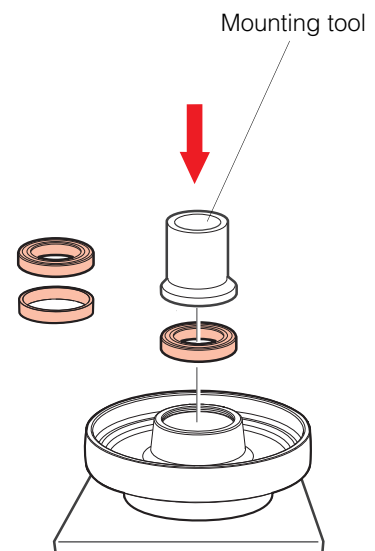
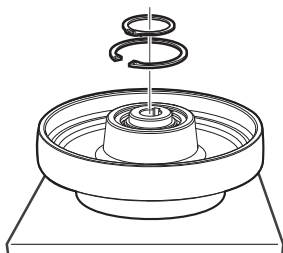
- c** Press the ball bearings down one at a time into the coupling hub, preferably using a hydraulic press. Place the spacing ring between them.

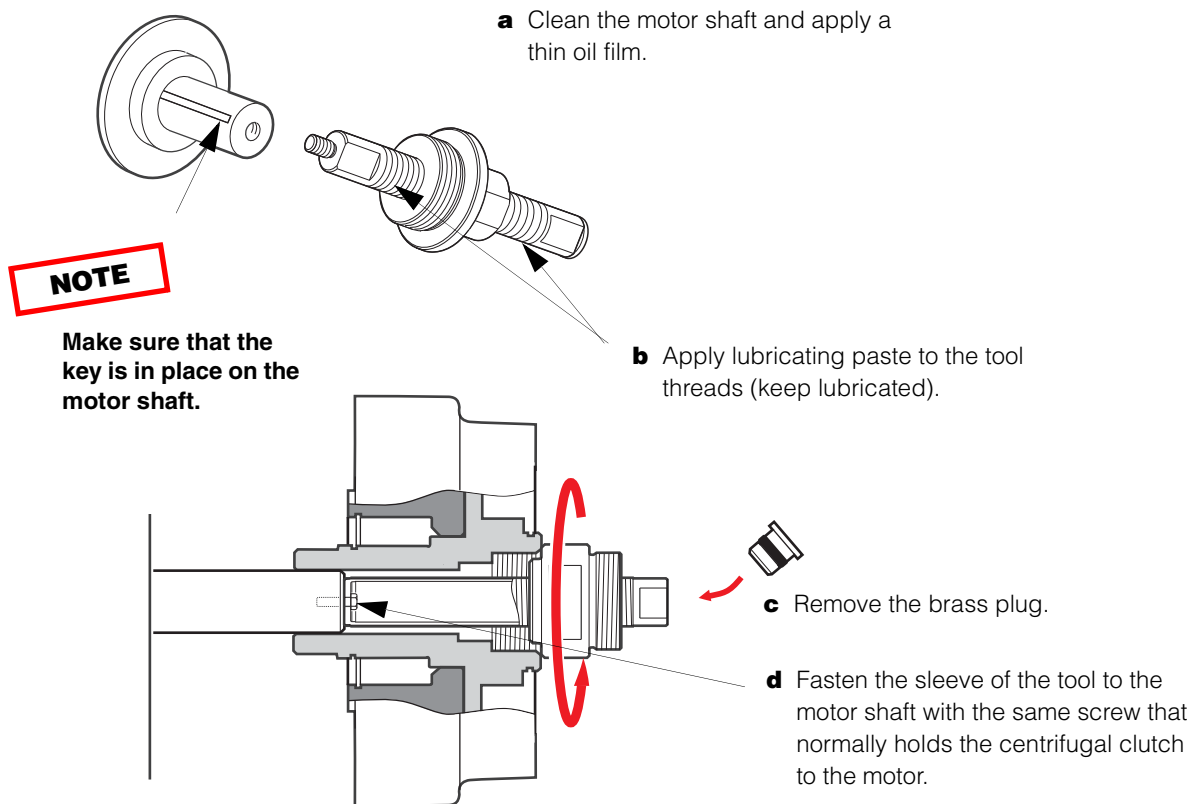
NOTE

Never re-fit used ball bearings.

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

- d** Fit the snap rings .



2 Fitting the coupling to the motor.**NOTE**

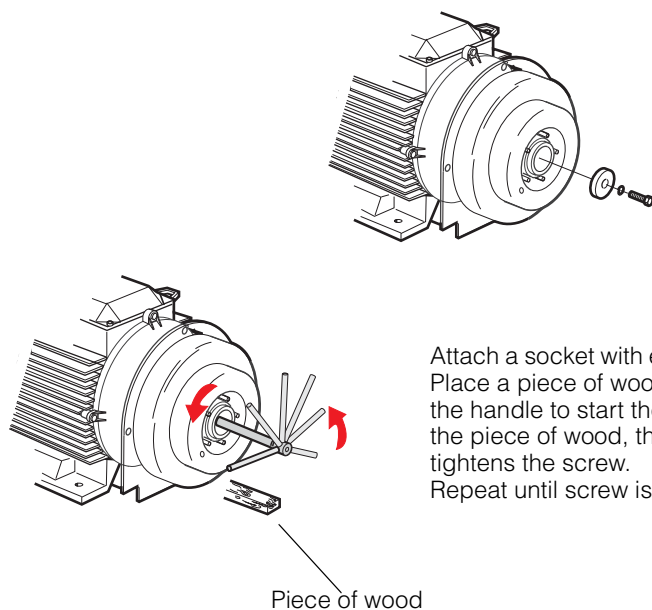
Make sure that the key is in place on the motor shaft.

NOTE

See mounting with optional hydraulic puller tool (if purchased) on next page.

e Use a spanner to turn the nut on the tool. This will press the centrifugal clutch on to the shaft. Remove the tool.

f Install and tighten the washer, spring washer and screw.



Attach a socket with extension rod and handle to the screw. Place a piece of wood according to the illustration. Push the handle to start the rotor moving, when the handle hits the piece of wood, the weight and movement of the rotor tightens the screw. Repeat until screw is fastened.

3 Fitting the coupling to the motor with optional hydraulic tool.

a Clean the motor shaft and apply a thin oil film.

NOTE
Make sure that the key is in place on the motor shaft.

b Fit the sleeve to the stud bolt.
Fit the stud bolt with sleeve to the motor shaft.

c Screw the holder to the coupling nave.

d Fit hydraulic cylinder as shown.

e Fit the sleeve and secure with the nut.

f Attach the hose from the hand pump to the hydraulic oil inlet.
Fit the friction coupling by pumping the handle on the pump until stop.
Release pressure on the hand pump and adjust the nut on the stud bolt.

Repeat procedure until coupling is mounted. Note! The pressure on the hand pump should not exceed 200 bar.

g Remove the hydraulic tool.

h Install and tighten the washer, spring washer and screw.

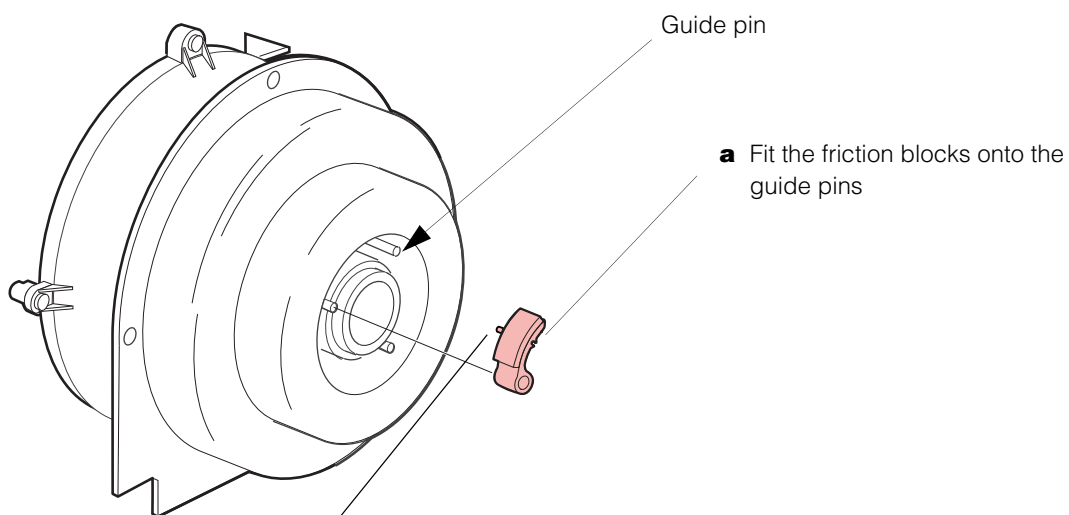
Attach a socket with extension rod and handle to the screw. Place a piece of wood according to the illustration.

Push the handle to start the rotor moving, when the handle hits the piece of wood, the weight and movement of the rotor tightens the screw.

Repeat until screw is fastened.

Assembly of friction blocks

4 Fitting the friction blocks.

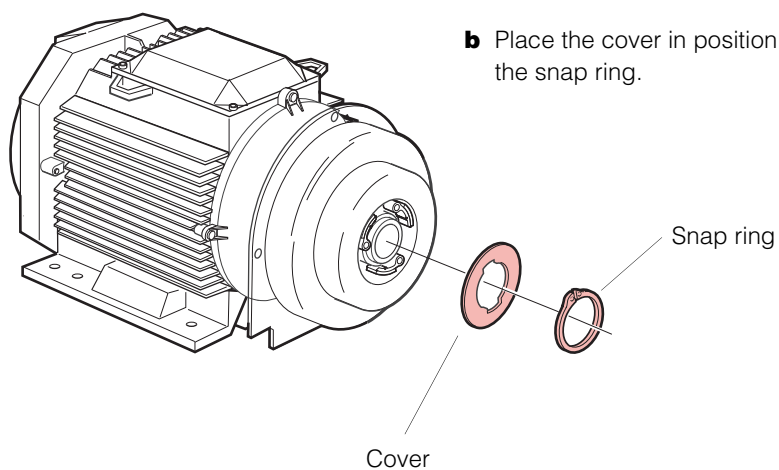


NOTE

Be sure that the pins on the back of the blocks project into the grooves in the clutch hub.

NOTE

50 Hz = 5 Friction blocks
60 Hz = 3 Friction blocks



5 Fitting the motor.

- a** Fit a lifting sling to the motor.
Use a shackle from the separator lifting tool.
Weight of motor with coupling: approx. 80 kg.

- b** Lower the motor (while supported) on to the separator frame.
It will set on the ledge.

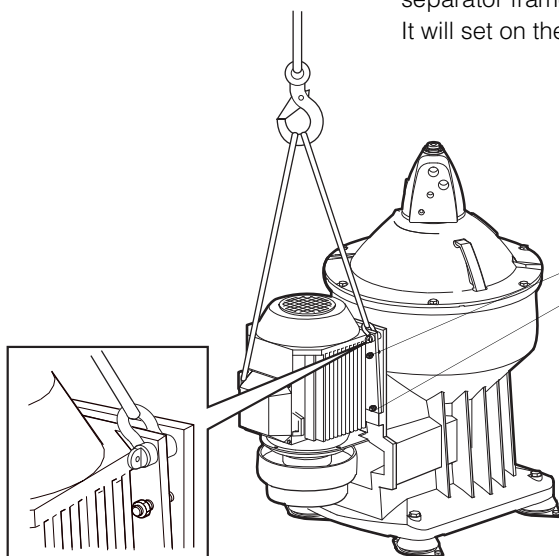


Crush hazard

If not supported, the motor with coupling may drop when lifted.

- c** Fit the screws.
Do not tighten until the belt has been mounted.

- d** Connect the electrical cables.



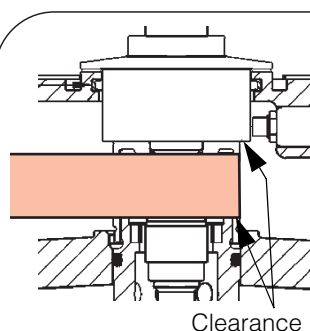
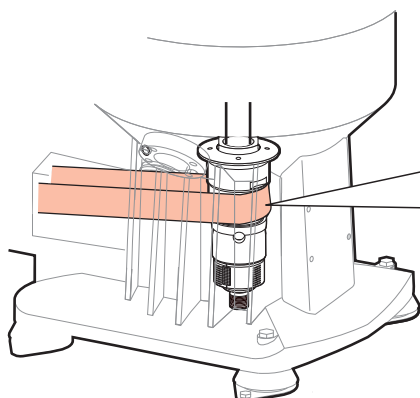
NOTE

If carrying out change of friction blocks only, continue with steps 6 to 7.
If carrying out a complete machine assembly, continue with the driving device instructions on page 96.

6 Fitting the flat belt.**NOTE**

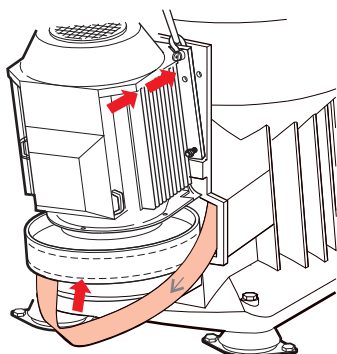
Clean the inside of the frame before fitting the flat belt, and make sure that there is no oil on the belt.

- a** Lift up the belt to the middle (centre) of the spindle pulley.

**NOTE**

For correct position, centre the belt on the spindle pulley camber.

- b** Fit the flat belt to the motor belt pulley.



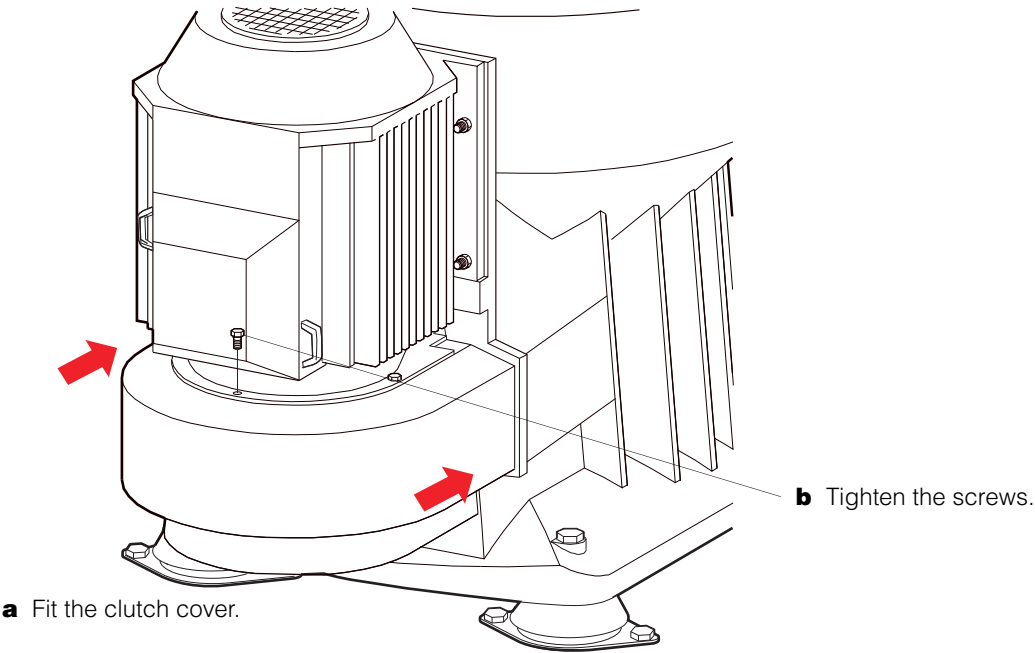
- c** Tighten the two upper screws.

- d** Tighten all motor attachment screws.

NOTE

Do not turn the spindle until the motor is tightened properly to the frame.

7 Fitting the clutch cover.



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6.5.2 Driving device

1 Fitting the bottom bearing holder.

- a** Fit the wing insert, O-rings and strainer.

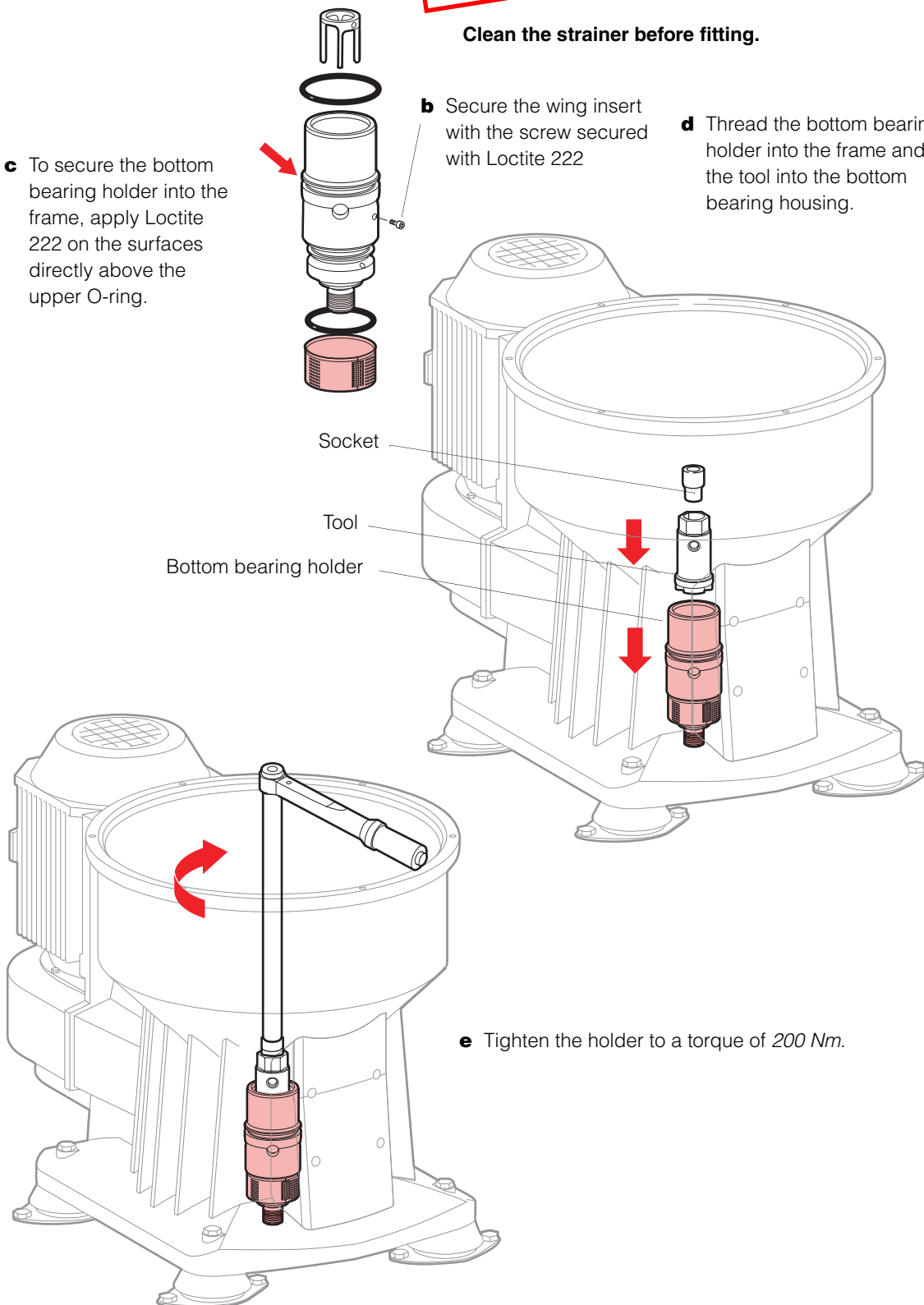
NOTE

Clean the strainer before fitting.

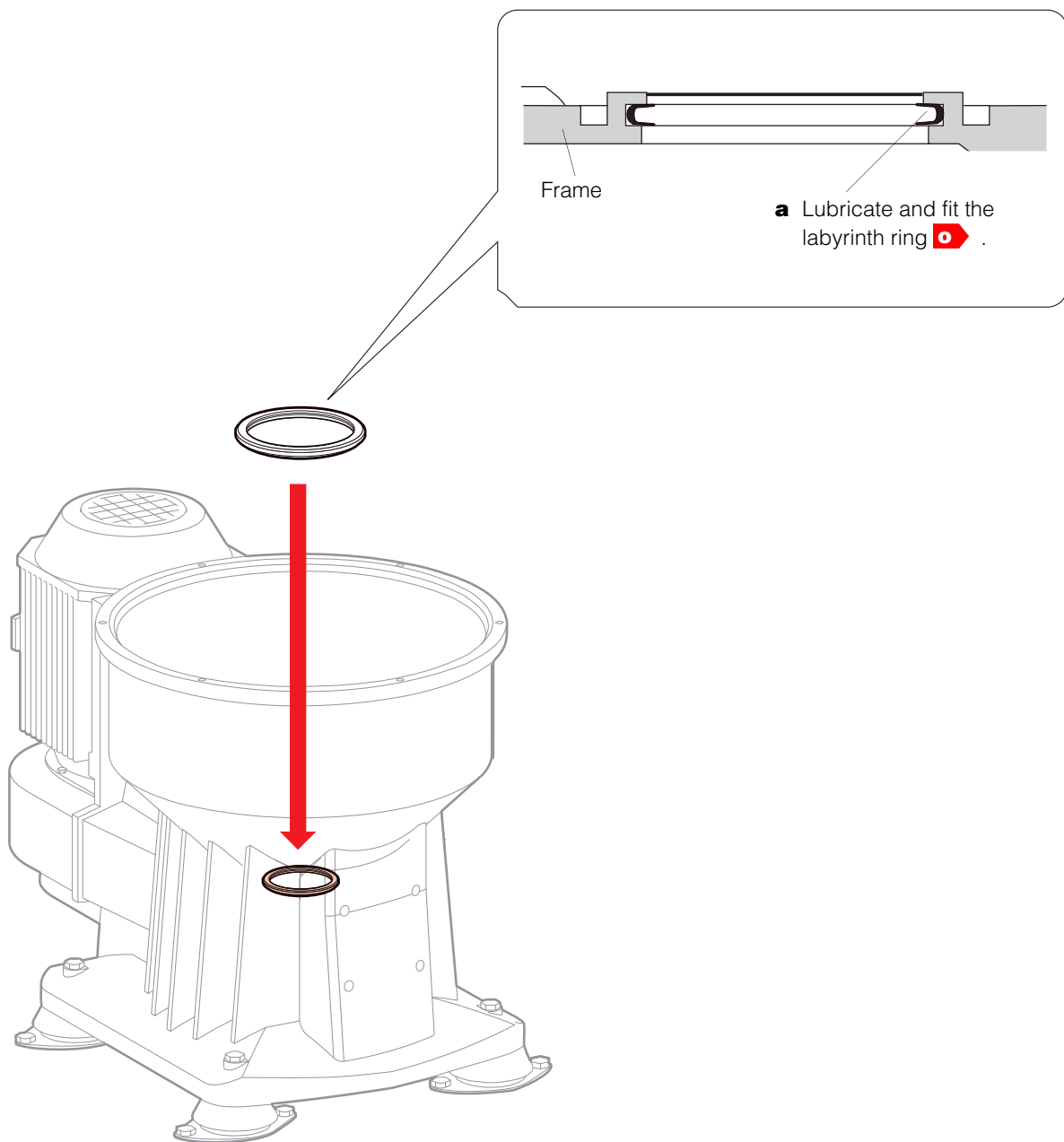
- c** To secure the bottom bearing holder into the frame, apply Loctite 222 on the surfaces directly above the upper O-ring.

- b** Secure the wing insert with the screw secured with Loctite 222

- d** Thread the bottom bearing holder into the frame and fit the tool into the bottom bearing housing.

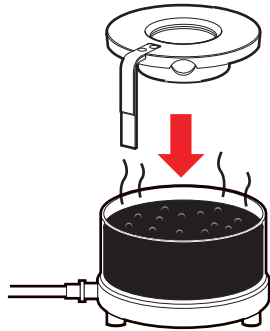


- e** Tighten the holder to a torque of 200 Nm.

2 Fitting the labyrinth ring.

3 Fitting the ball bearing to the top bearing seat .

- a** Heat the top bearing seat in oil to +80°C above room temperature (max. 125 °C).



Burn hazard
Use protective gloves when handling any heated parts.

- b** Fit the ball bearing.

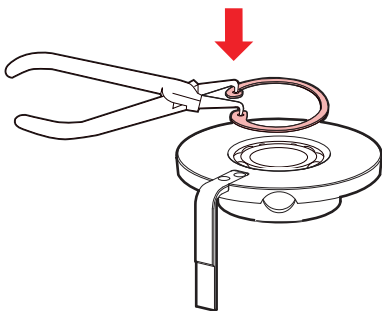


Always fit a new bearing.
Pre-lubricate before fitting.

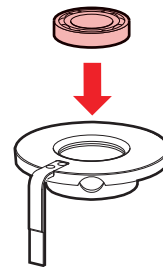


Drop some frame oil onto the bearing.

- c** Fit the snap ring.

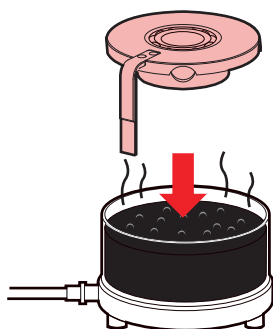


Risk for eye injury from flying snap ring
Use the correct pliers for assembly of snap ring to avoid accidental release.



4 Fitting the top bearing seat with bearing to the spindle.

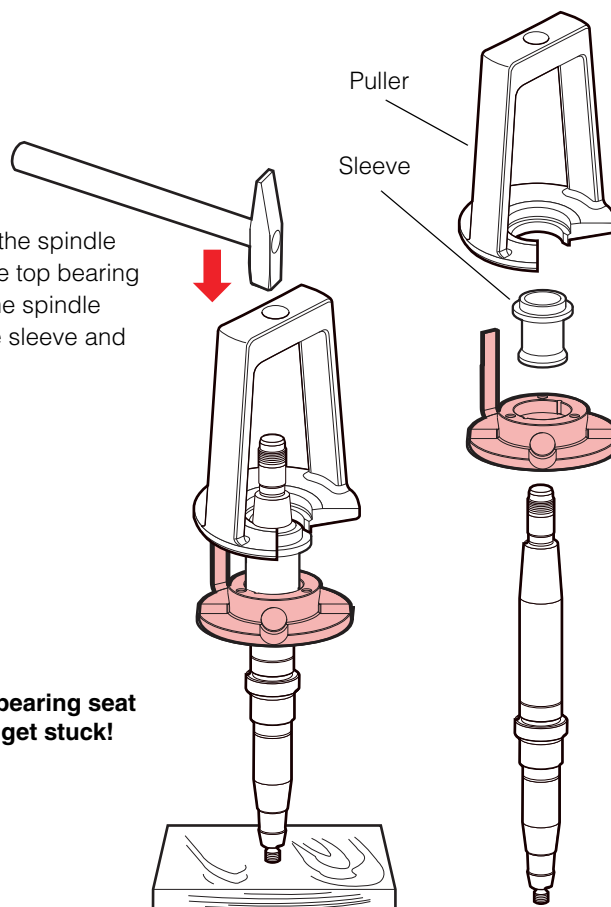
- a** Heat the top bearing seat together with the bearing in oil to +80°C above room temperature (max. 125 °C).



- b** Wipe off the spindle and fit the top bearing seat to the spindle using the sleeve and puller.

NOTE

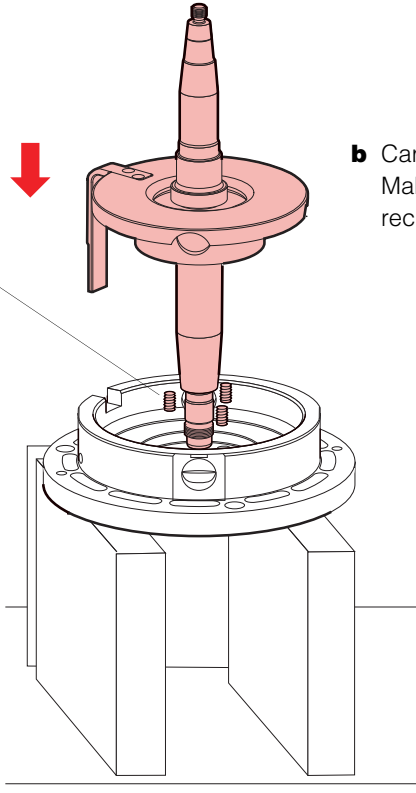
Make sure to fit the bearing seat correctly or it might get stuck!



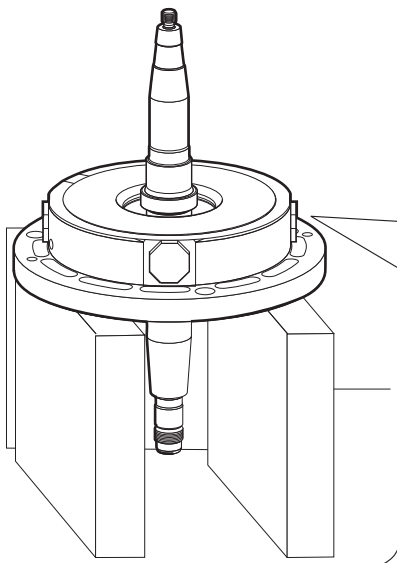
5 Fitting the top bearing housing.

- a** Fit the axial springs  to the top bearing housing.

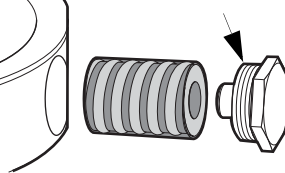
Axial springs



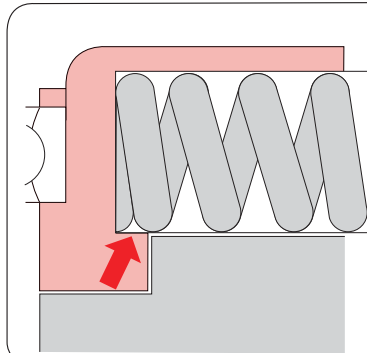
- b** Carefully lower the bowl spindle. Make sure that the springs enter the recesses on the top bearing seat.



- c** Lubricate the threads with oil before assembly.



- d** Fit the composite springs  and plugs to the top bearing housing. Do not tighten the plugs. Make sure that the springs enter the recesses in the top bearing seat. The plugs should be tightened when the spindle assembly is mounted into the frame.

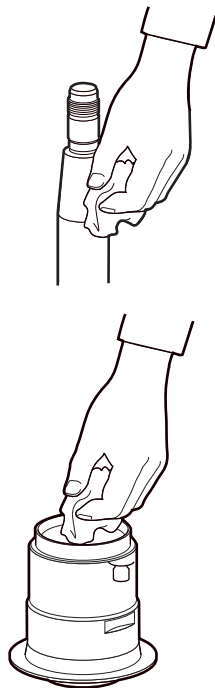


6 Fitting the spindle pulley.

a Turn the spindle assembly upside down.

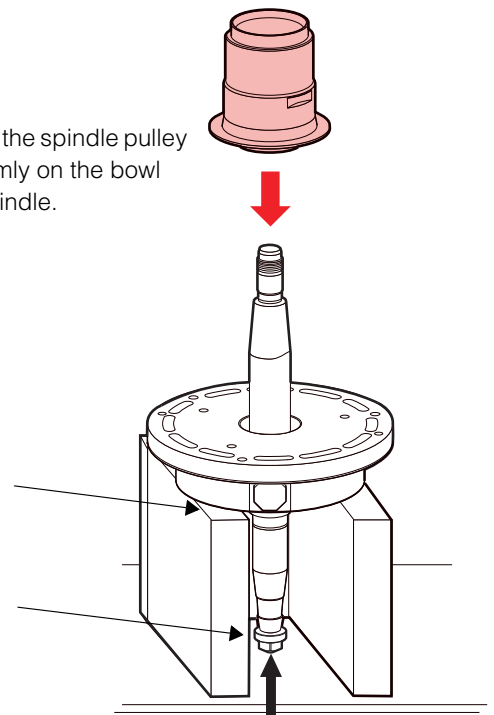
b Wipe off the spindle pulley seat on the spindle and nave bore in the spindle pulley with a dry cloth.

c Fit the spindle pulley firmly on the bowl spindle.

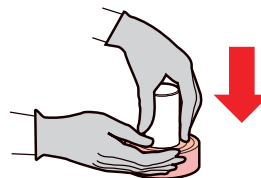
**NOTE**

At least 1mm free space between support and spindle assembly to protect the bearing.

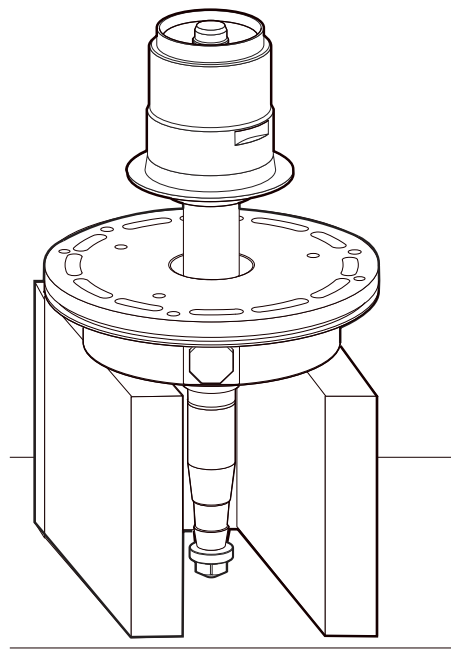
Mount the cap nut to protect the threads and support the spindle.

**7** Fitting the self-aligning roller bearing .**NOTE**

Always fit a new bearing.
Pre-lubricate before fitting.



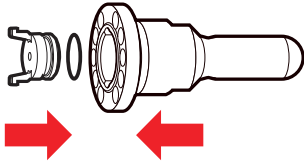
a Lower the bearing onto the spindle and press down onto the spindle pulley using the special drift tool.



8 Fitting the oil pump.

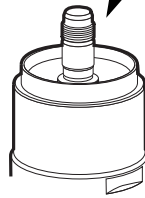
a Fit O-ring  onto lubrication oil orifice. Spread oil film on O-ring.

b Push lubrication oil orifice into oil pump. Be sure to line up tabs on orifice with slots in pump.

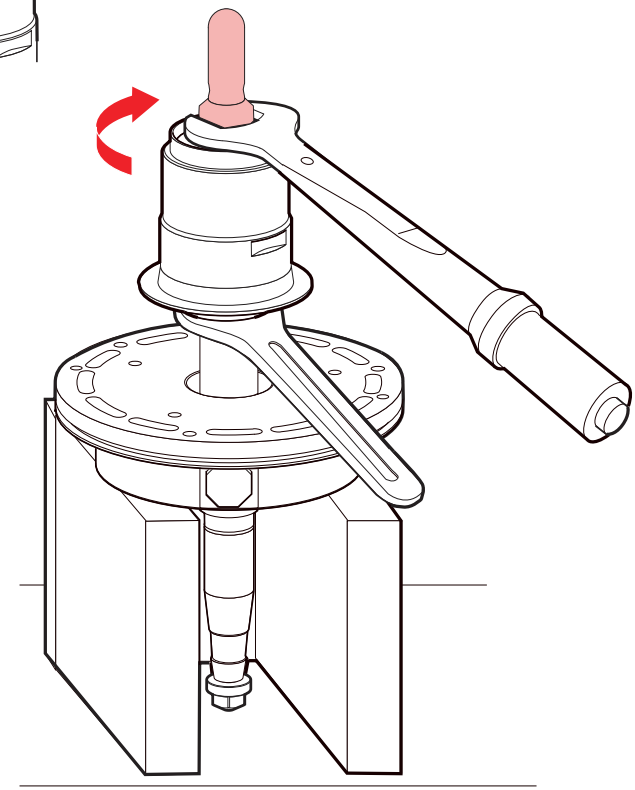
**NOTE**

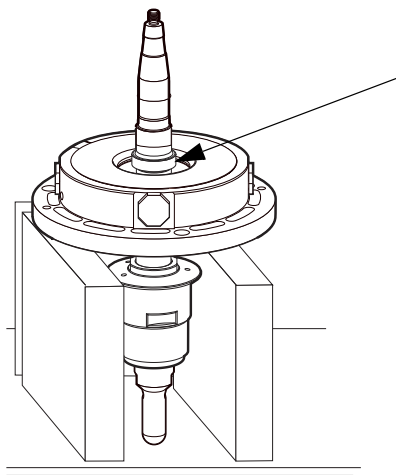
Clean the oil pump and make sure that the bottom hole is not clogged and that all parts have room temperature before mounting.

c Lubricate all threads before assembly.



d Fit the oil pump, tightening torque 150 Nm.



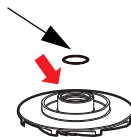
9 Fitting the fan

a Turn the spindle assembly up-side down.

NOTE

Ensure that the spindle is seated against the inner ring of the ball bearing.

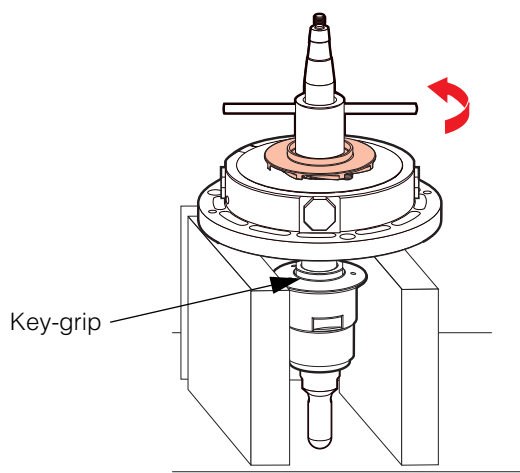
Oil



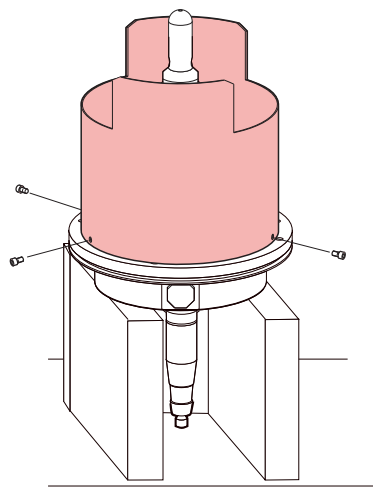
b Apply a thin layer of oil and fit the O-ring  into the fan.

NOTE

Make sure that the bearing is pre lubricated before fitting the fan.

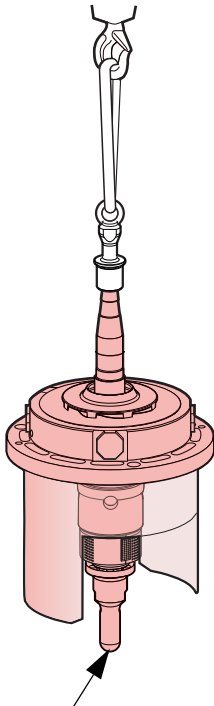


c Place a spanner (or similar) on the spindle pulley key-grip, as holder-up and fit the fan. Tighten firmly, by hand, with the pin spanner.

10 Fitting the air deflector.

11 Lowering the spindle assembly into the frame.

- a** Remove the cap nut from the spindle.
Fit the lifting tool to the spindle assembly and lift it.



Check the bottom hole.



Crush hazard

Do not rotate the spindle assembly during lifting. The spindle assembly may otherwise come loose from the lifting tool.



Check that the hole at the bottom of the oil pump is clean before lowering the assembly down.

- b** Position the flat belt  so that the spindle assembly can pass through when lowering. See note below.

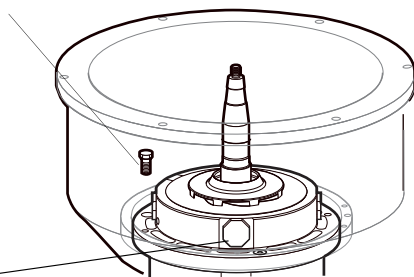
- c** Carefully lower the spindle assembly and position the bolt holes over the threaded frame holes. Make sure that the bottom bearing, enters the bottom bearing holder correctly. Do not use force.



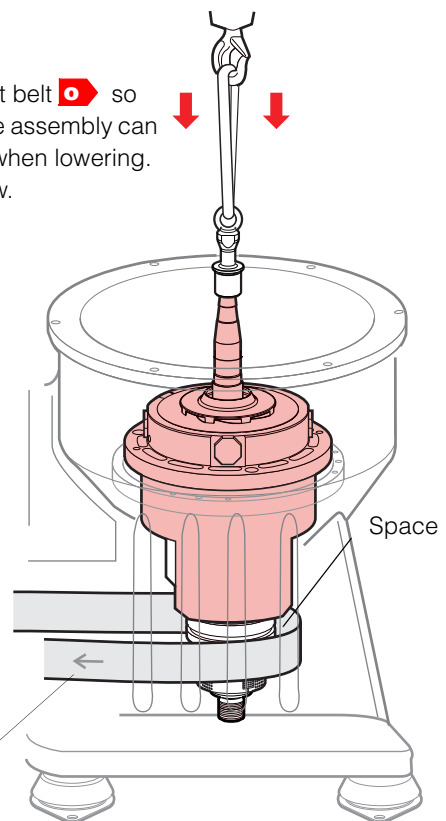
Cut hazard

Do not put fingers between the frame and air deflector while lowering the assembly.

- d** Fit and tighten the screws.



- e** Tighten the plugs firmly.



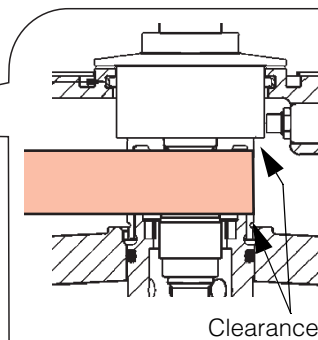
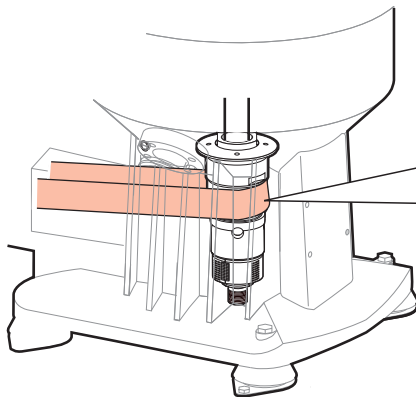
Check the direction arrows on the belt and the machine plate for correct position.

Make sure that the belt does not get smudged with oil or grease during handling.

12 Fitting the flat belt.**NOTE**

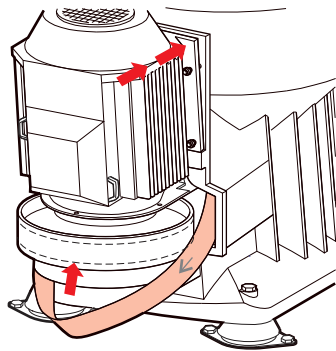
Clean the inside of the frame before fitting the flat belt, and make sure that the belt is clean.

- a** Lift up the belt to the middle (centre) of the spindle pulley.

**NOTE**

For correct position, centre the belt on the spindle pulley camber.

- b** Fit the flat belt to the motor belt pulley.



- c** Tighten the two upper screws.

- d** Tighten all motor attachment screws.

NOTE

Do not turn the spindle until the motor is tightened properly to the frame.

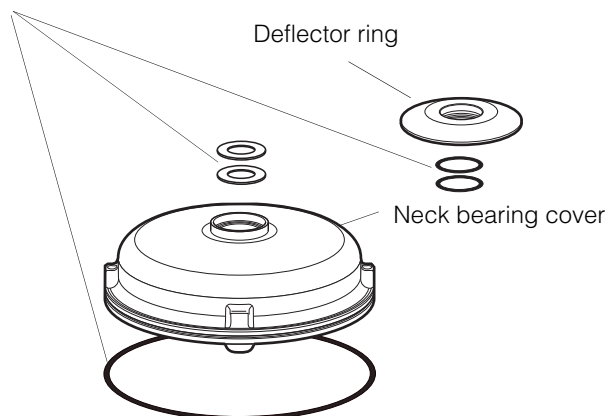
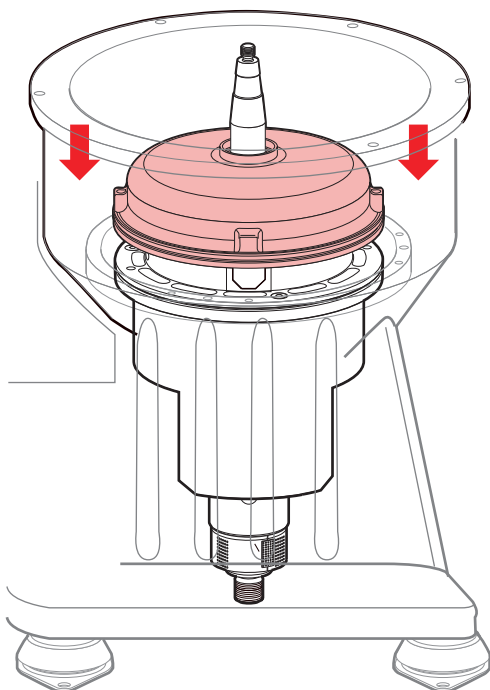
13 Fitting the neck bearing cover and deflector ring.

- a** Apply a thin layer of oil and fit the O-rings and the seal rings 

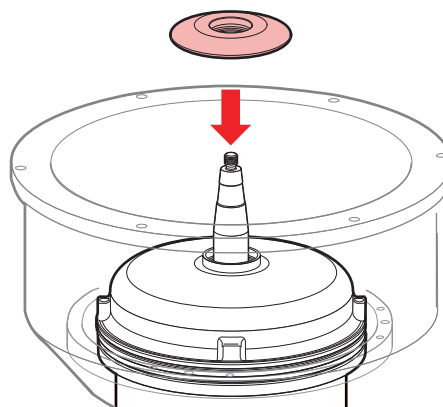
- b** Fit the neck bearing cover.

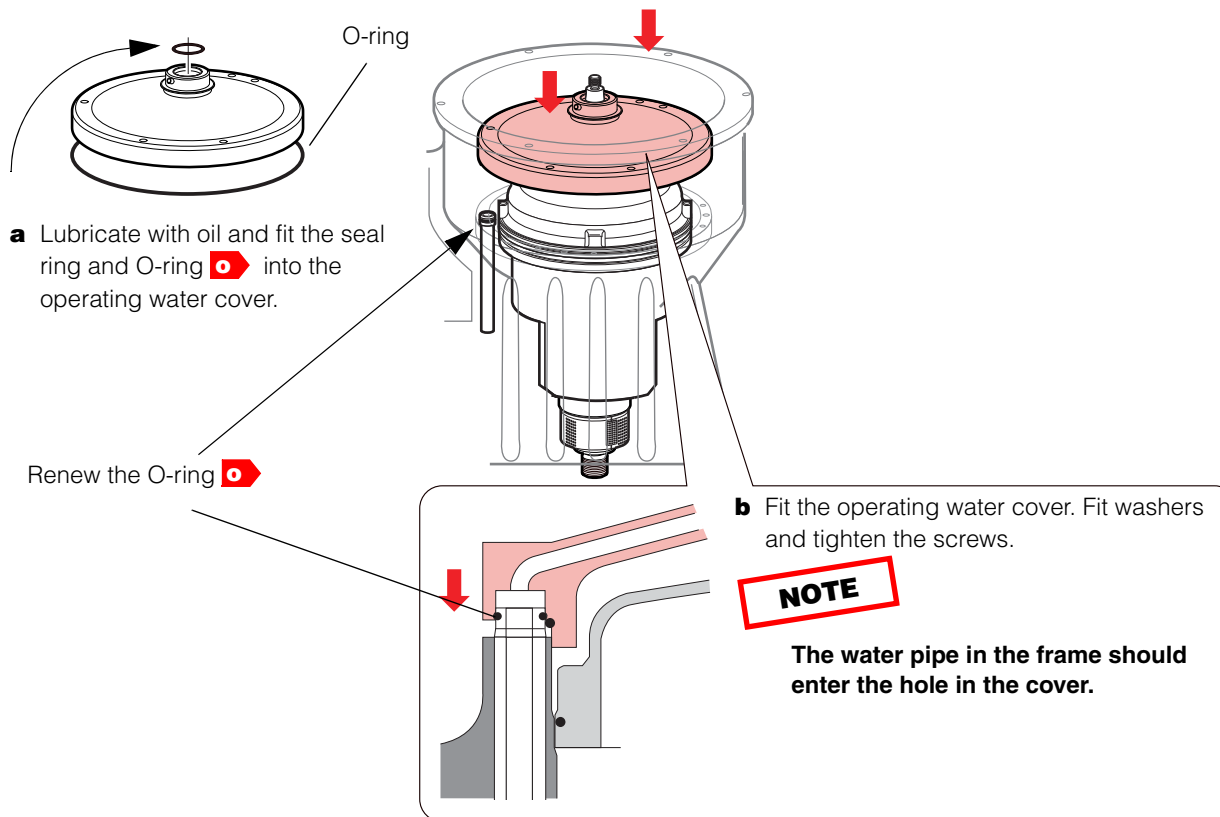
NOTE

The guide pin on the cover should enter one of the two holes in the bearing housing.

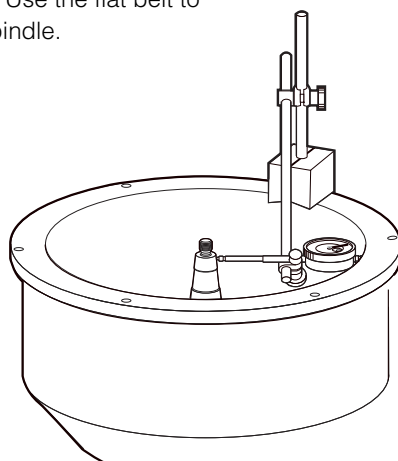


- c** Push the deflector ring down until it stops.



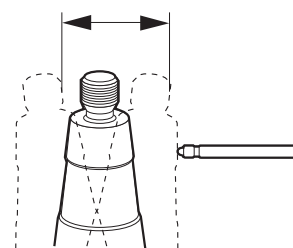
14 Fitting the operating water cover.**15** Measuring the radial wobble of the bowl spindle.

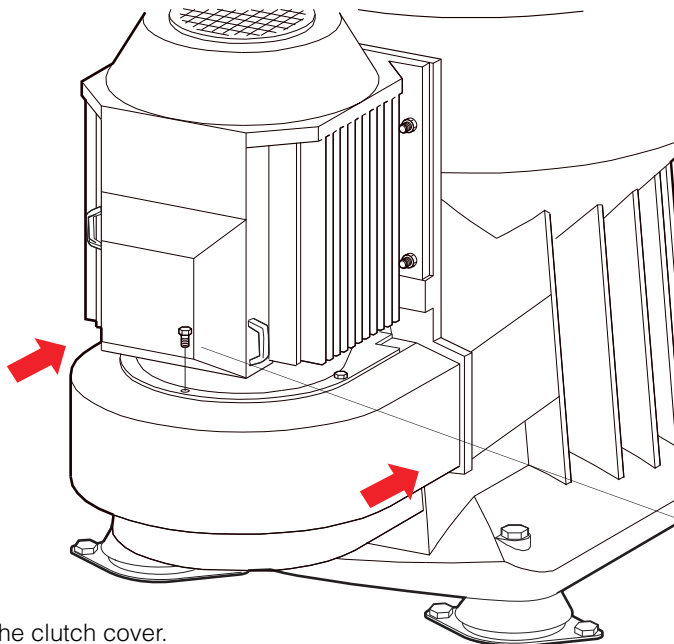
- a** Fit a dial indicator in a support and fasten it in position as illustrated. Use the flat belt to turn the spindle.

**NOTE**

Permissible radial wobble: max. 0,04 mm. If the spindle wobble exceeds this value, contact an Alfa Laval representative.

Max. 0,04 mm

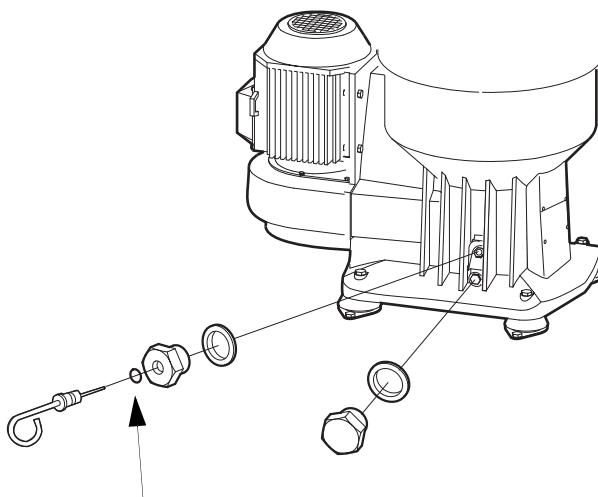


16 Fitting the clutch cover.**a** Fit the clutch cover.**b** Tighten the screws.

G0858141

17 Fill oil in the oil sump.**NOTE**

The separator should be level and at standstill when oil is filled.

a Remove the oil pin, plug and washer.**b** Fit new washer **i** and refit the drain plug.

c Fill with new oil until oil flows out from the filler hole.
For correct oil volume see
"Lubricating oil volume:" on page 148.

NOTE

For grade and quality of oil see
6.7.6 Lubricating oils, page 137

d Fit new O-ring **i** onto the oil pin.**e** Refit the plug with new washer **i****f** Fit the oil pin.

G08687G1

6.5.3 Bowl

- 1** Check for impact marks and corrosion in bowl body nave and on spindle taper  .



Disintegration hazard

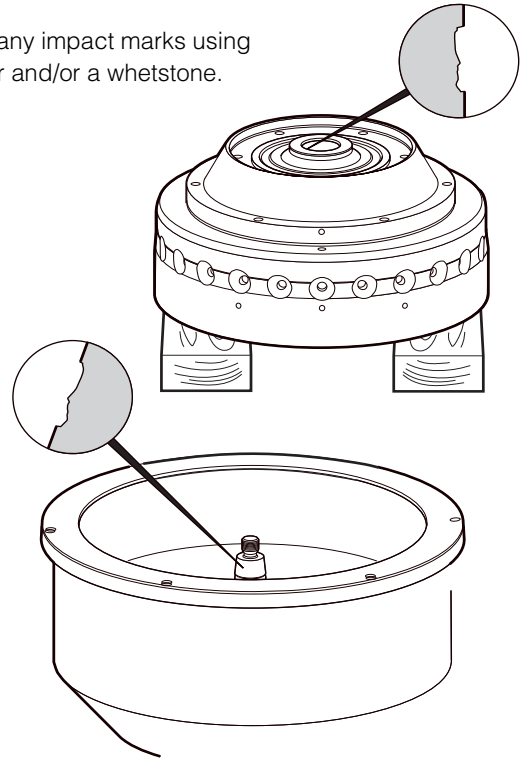
Impact marks may cause the separator to vibrate while running.

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

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

- c** Finish with polishing paper (e.g. No. 600).

- d** Lubricate to prevent further corrosion.



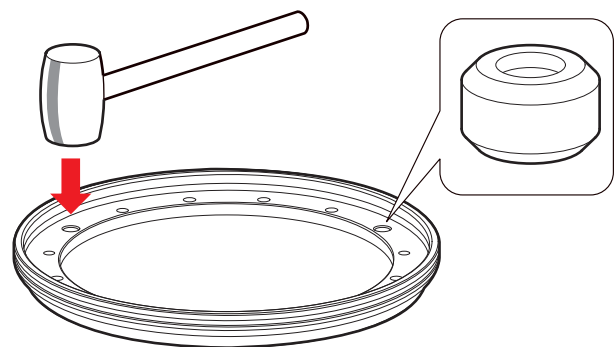
G0874611

- 2** Fitting new valve plugs on the operating slide .

- b** Carefully tap in new valve plugs, using a clean, soft-faced hammer.



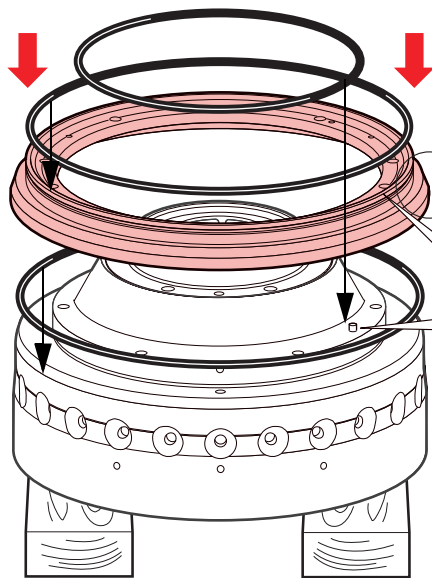
Make sure that the plugs are fitted as described in the illustration.



G0874871

3 Fitting the operating slide.

- a** Apply a thin layer of silicone grease and fit the rectangular ring on the operating slide and the rectangular ring and O-ring on the bowl body.

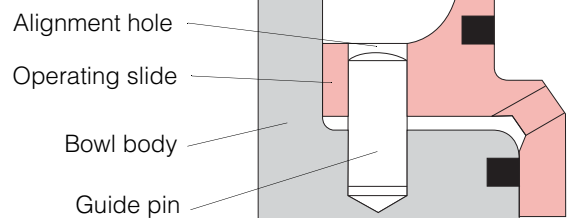


- b** Fit the operating slide.

NOTE

The guide pin in the bowl body should enter the hole in the operating slide (this hole is marked with a drill mark).

Nozzle secured with Loctite 222



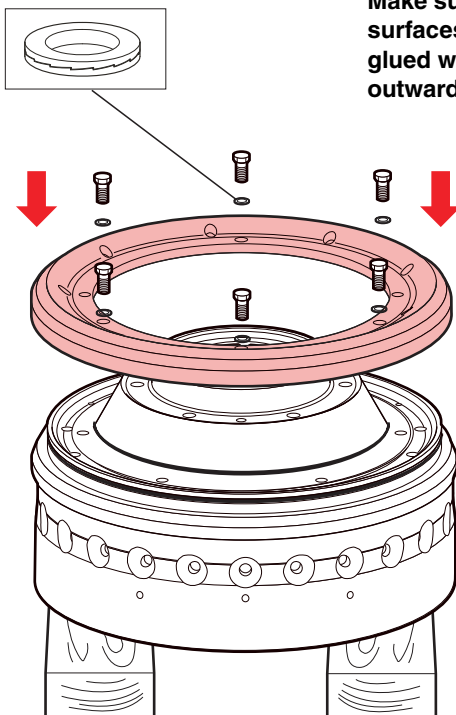
G0861241

4 Fitting the operating slide holder.

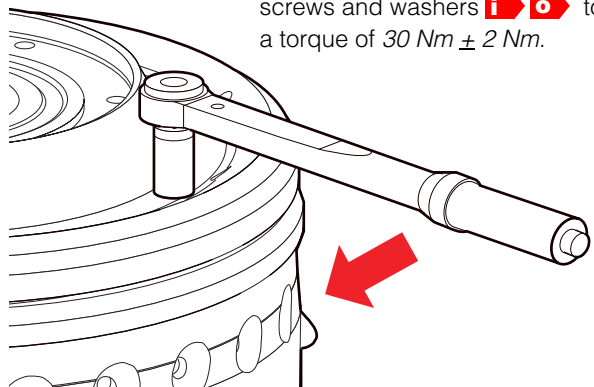
- a** Fit the holder over the operating slide.

NOTE

Make sure that the flat surfaces of the pair-glued washers face outwards!



- b** Apply a thin layer of molykote grease and fit and tighten new screws and washers to a torque of $30 \text{ Nm} \pm 2 \text{ Nm}$.



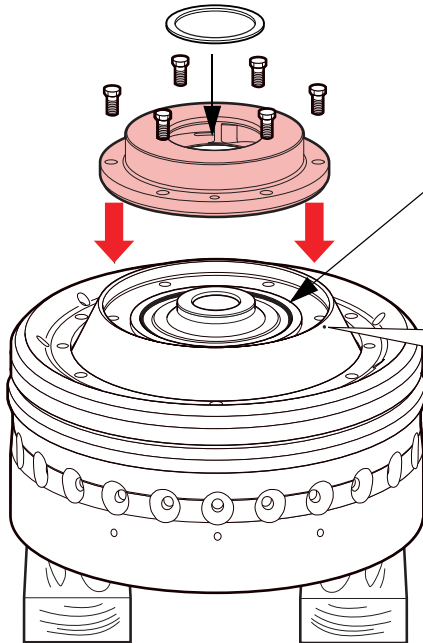
NOTE

It is very important not to refit used screws and washers. Always fit new ones included in the Inspection kit!

G0861342

5 Fitting the operating water ring.

- a** Fit the ring and screws  .

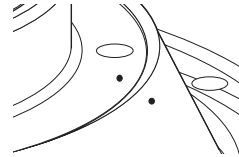


NOTE

It is very important not to refit used screws.
Always fit new ones included in the
Inspection kit!

- b** Apply a thin layer of silicone grease
and fit the O-ring  .

- c** Fit the operating water ring.



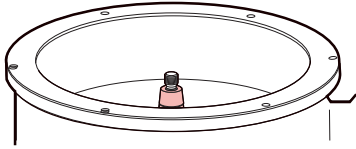
NOTE

The drilled assembly mark on the water ring should
face the corresponding mark on the bowl body.

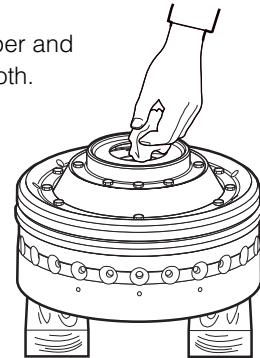
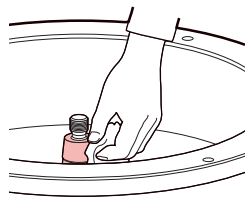
- d** Grease, fit and tighten the screws to a torque of
 $30 \text{ Nm} \pm 2 \text{ Nm}$.

6 Lifting the bowl body onto the spindle taper.

- a** Put a drop of oil on the spindle taper.



- b** Wipe off the spindle taper and nave bore with a dry cloth.

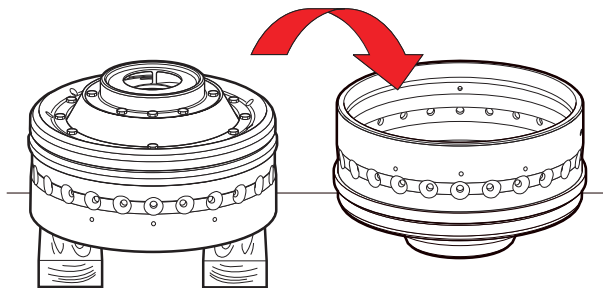


- c** Turn the bowl body over.

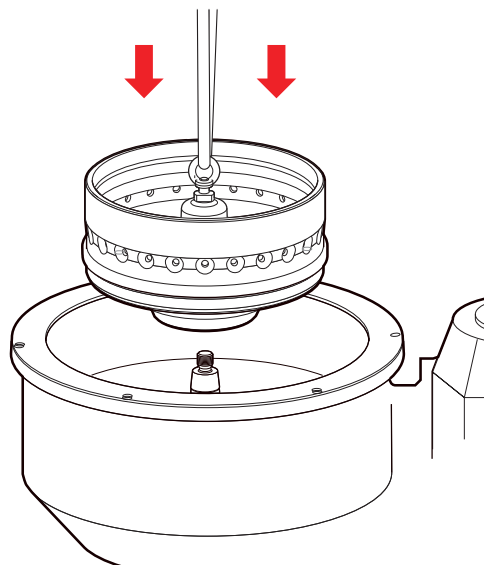


Crush hazard

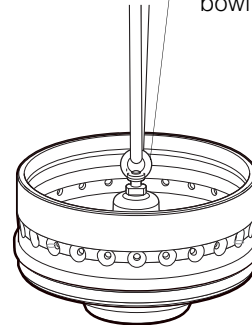
Support the bowl body when turning to prevent it from rolling.



- e** Carefully lower the bowl body onto the spindle taper.



- d** Fit the lifting tool and lift the bowl body.



- f** Remove the lifting tool.

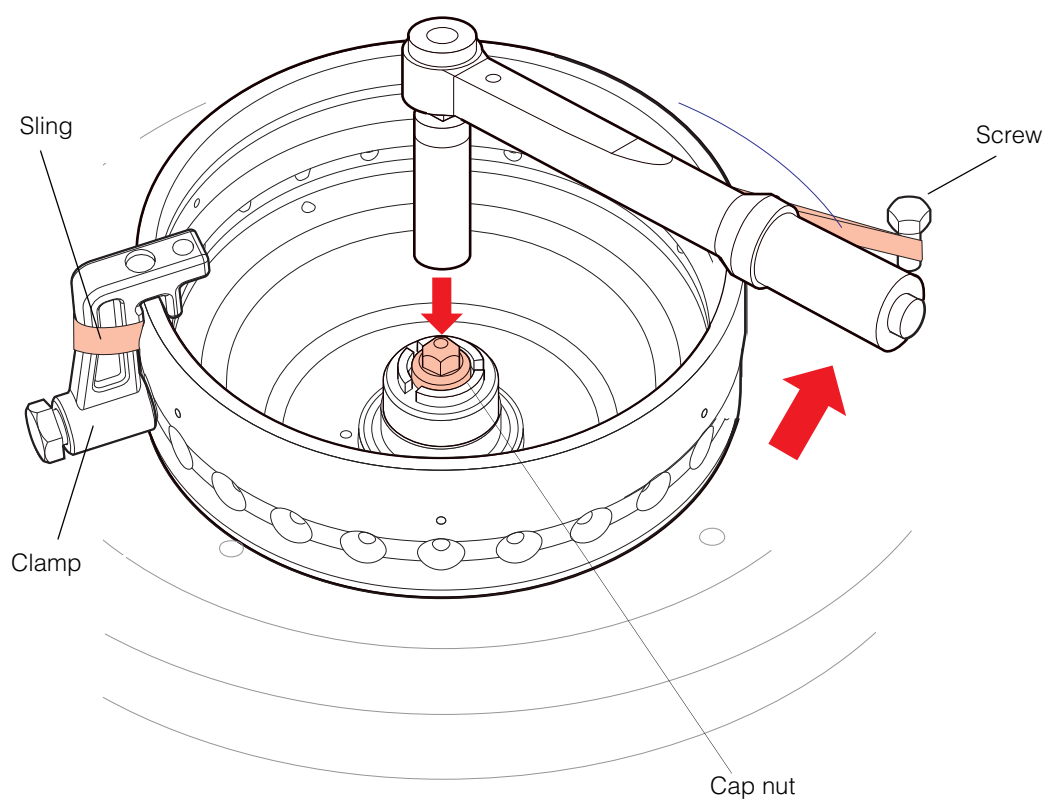
7 Fitting and tightening the cap nut.

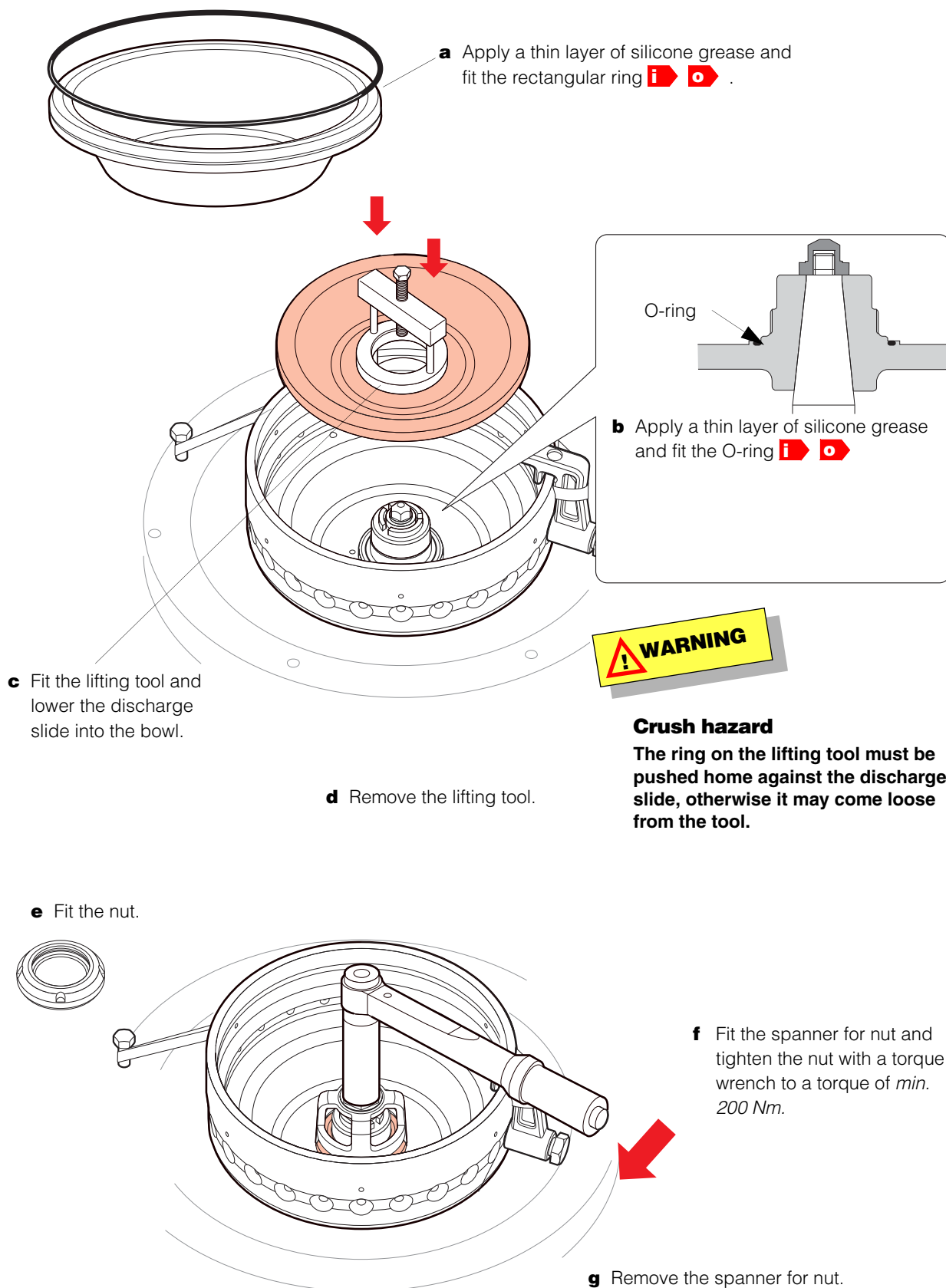
a To prevent the bowl body from rotating when fitting the cap nut; Fit one of the clamps (see page 51) to the bowl body and one of the screws for the frame hood in the frame. Fasten a sling between the clamp and the screw around the bowl body.

b Apply a thin layer of molykote grease. Fit and tighten the cap nut to a torque of 50 Nm.

NOTE

Left-hand thread!



8 Fitting the discharge slide.

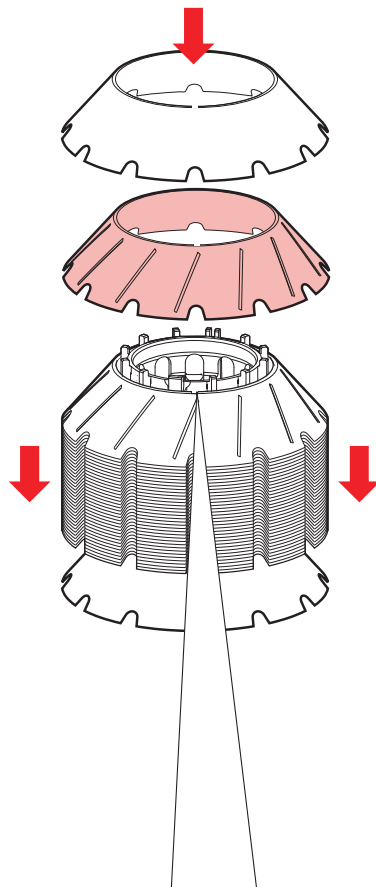
9 Assembly of the disc stack.

- a** Fit the discs one by one onto the distributor.
The distributor has a guide rib for the correct positioning of the bowl discs. Always end with the disc without caulks.



WARNING

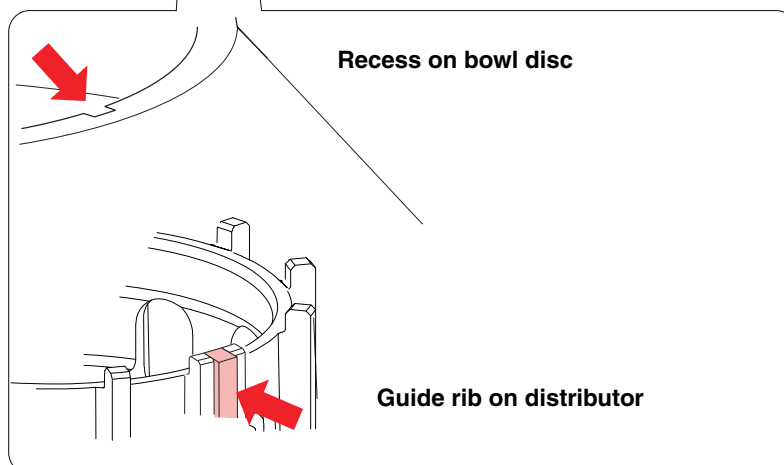
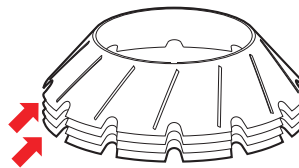
The number of discs may have to be increased to adjust the disc stack pressure. Always check before operating the separator. See *“Checking the disc stack pressure”* on page 121.

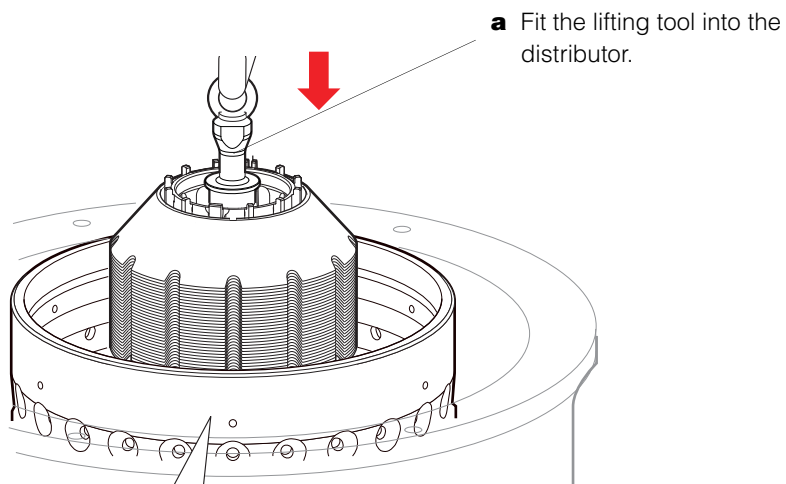


CAUTION

Cut hazard

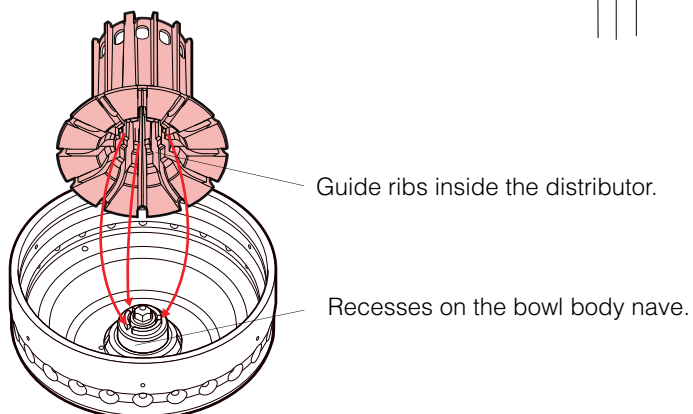
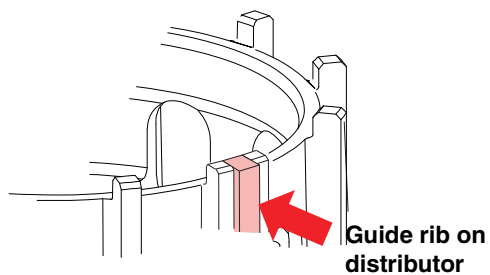
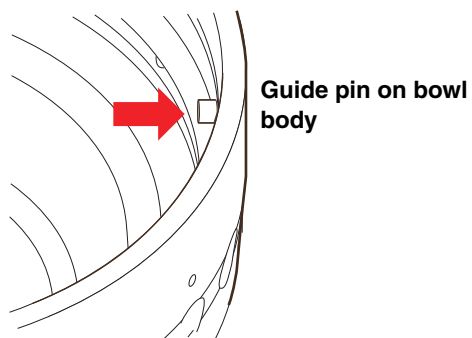
Sharp edges on the bowl discs may cause cuts.



10 Fitting the disc stack assembly to the bowl body.**b** Lower the disc stack into the bowl.**NOTE**

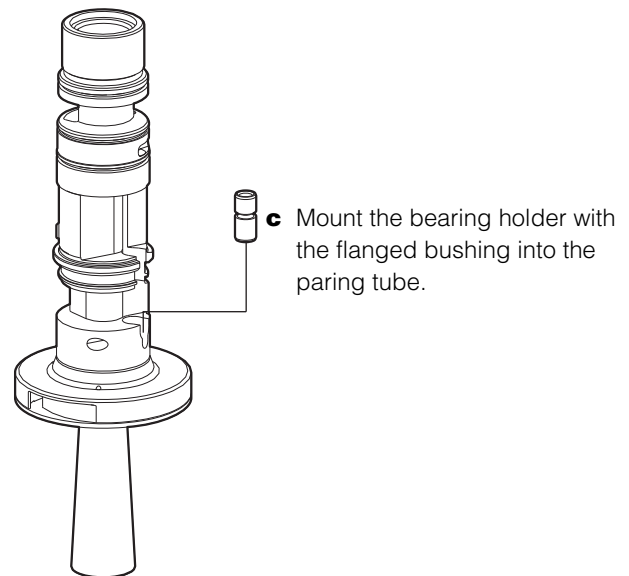
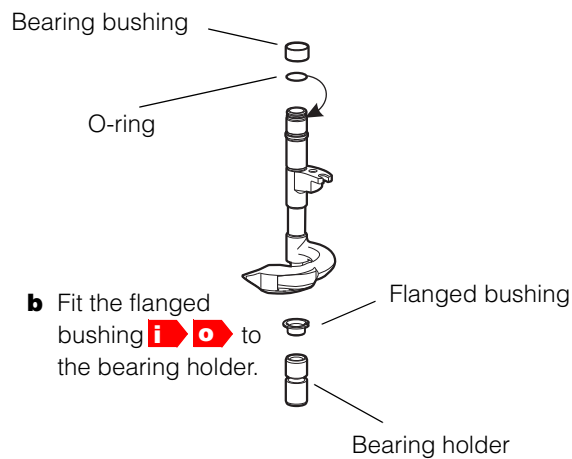
The guide pin on the bowl body should face the guide rib on the distributor.

The guide ribs inside the distributor then enter the recesses on the bowl body nave.



11 Assembling the paring tube and bearing holder .

- a** Apply a thin layer of silicone grease to the O-ring. Fit the O-ring   and bearing bushing   to the paring tube.



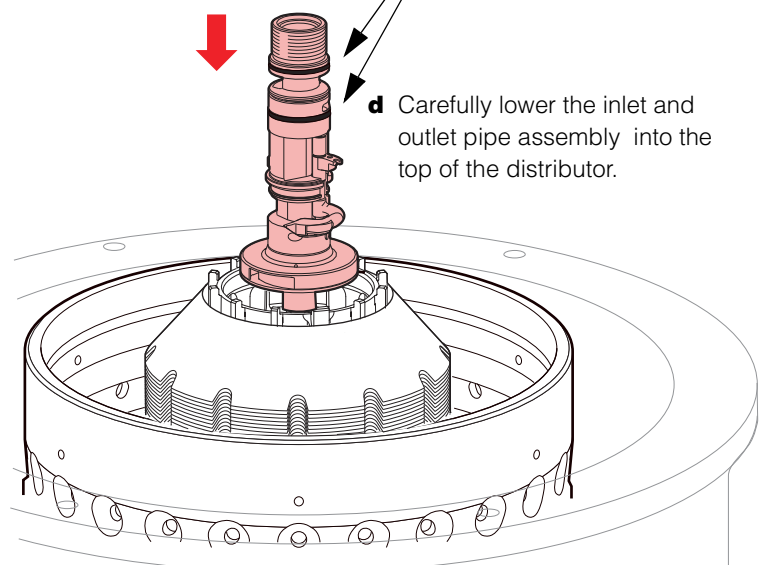
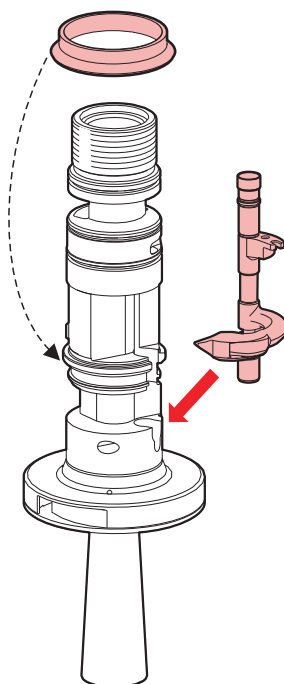
G0964931

12 Mounting the paring tube and fitting the inlet and outlet pipe.

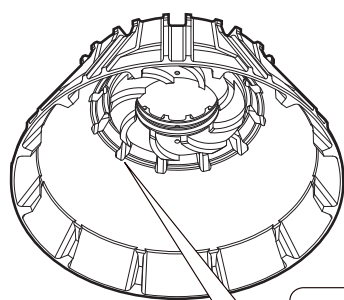
- a** Insert the paring tube to the inlet and outlet pipe.

- b** Apply a thin layer of silicone grease and mount the splash sealing .

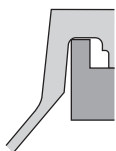
- c** Apply a thin layer of silicone grease and fit the O-rings   to the pipe.



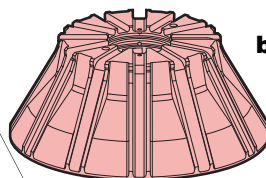
G08622K1

13 Fitting the top disc.

The guide rib on the distributor should enter one of the two larger recesses on the top disc.



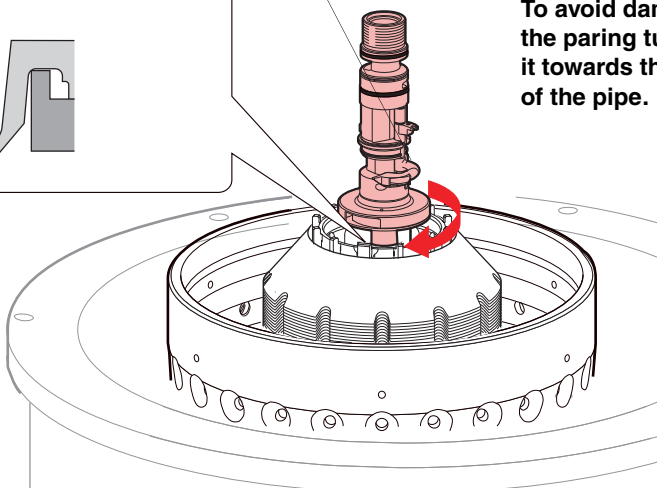
a Move the paring tube to the centre.

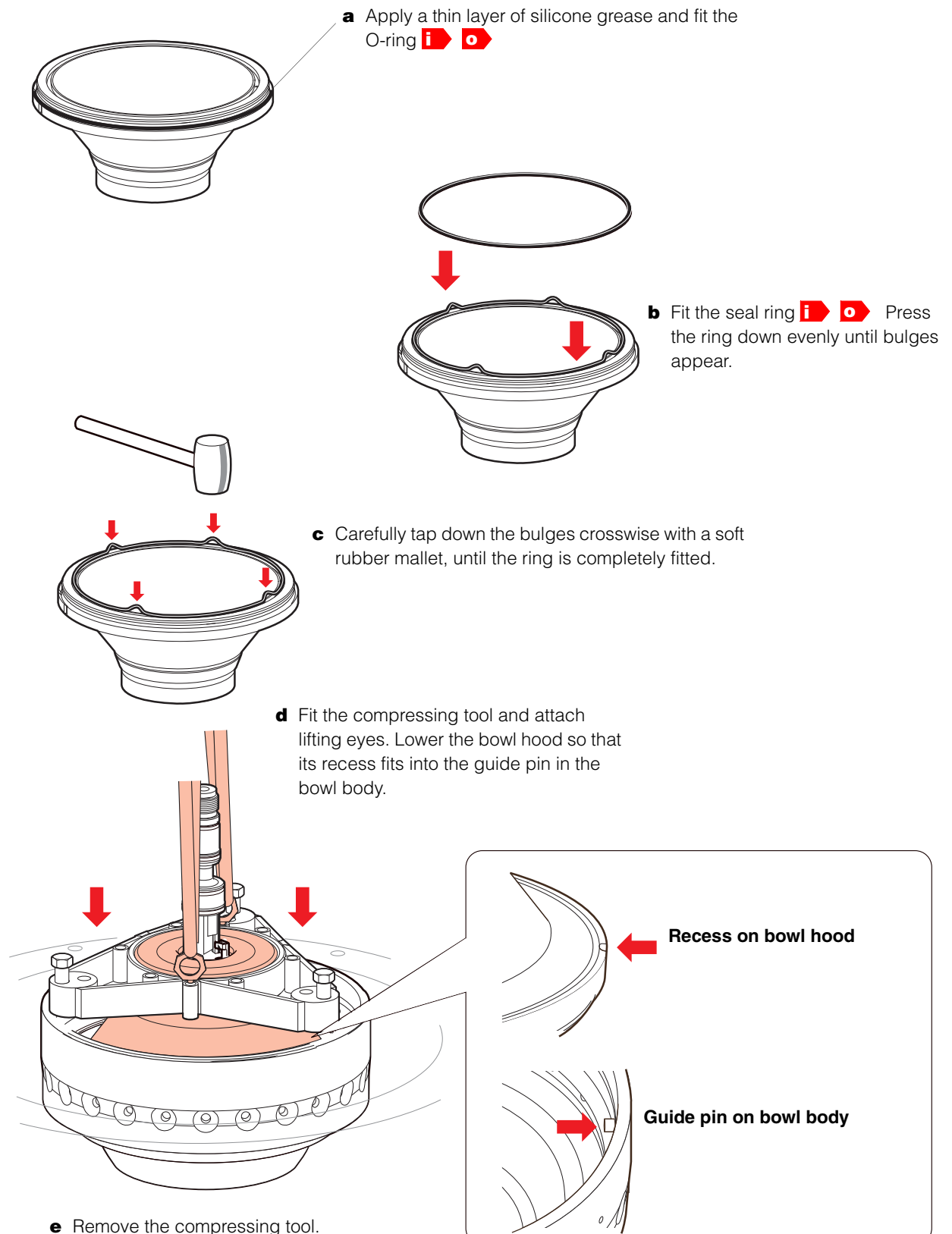


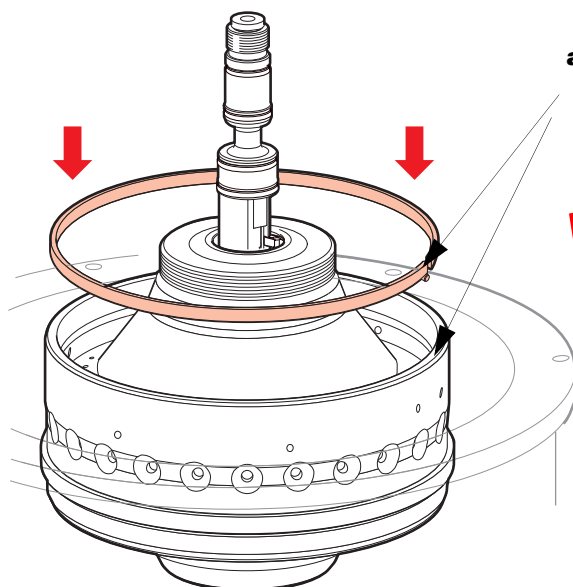
b Lower the top disc.

NOTE

To avoid damaging the paring tube, turn it towards the centre of the pipe.



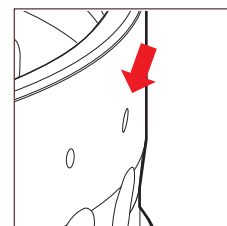
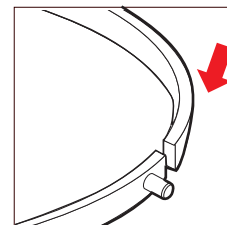
14 Fitting the bowl hood.

15 Fitting the lock ring.

- a** Place the lock ring on the bowl hood with its guide pin close to the corresponding hole in the bowl body.

NOTE

Make sure that the groove in the bowl body which retains the lock ring is clean.

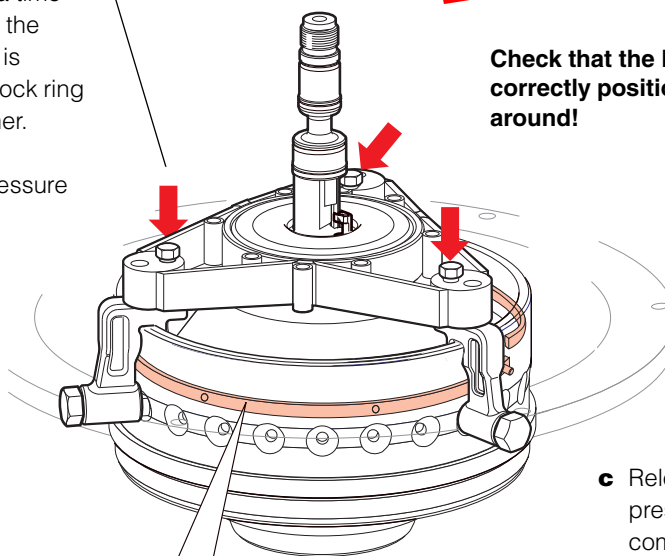


- b** Fit the complete compressing tool and compress the disc stack by alternately turning the screws a maximum of 40 Nm at a time until the lock ring fits into the bowl body. The lock ring is correctly fitted when the lock ring ends are facing each other.

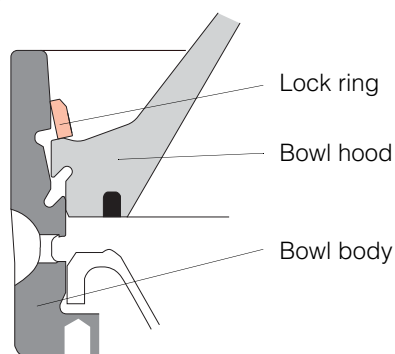
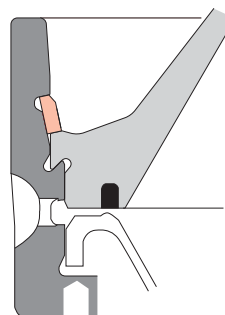
For correct disc stack pressure see [page 121](#)

NOTE

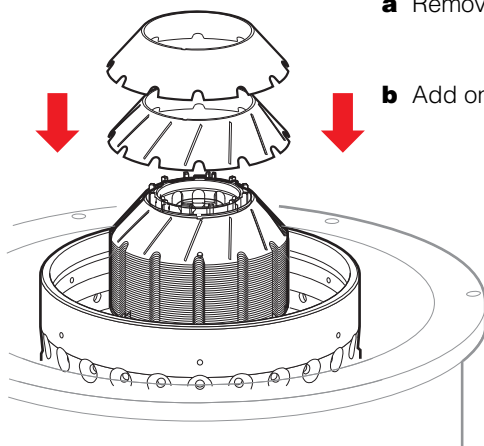
Check that the lock ring is correctly positioned all way around!

**NOTE**

Never remove any material from the lock ring. A hazardous situation could result.

**Before compressing****Lock ring in position**

- c** Release the pressure on the compressing tool and remove it.

16 Checking the disc stack pressure 

a Remove bowl hood, top disc and inlet and outlet pipe.

b Add one disc to the disc stack.

c Refit the disc without caulks, the top disc and bowl hood.

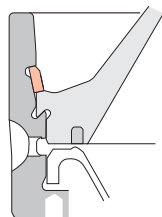
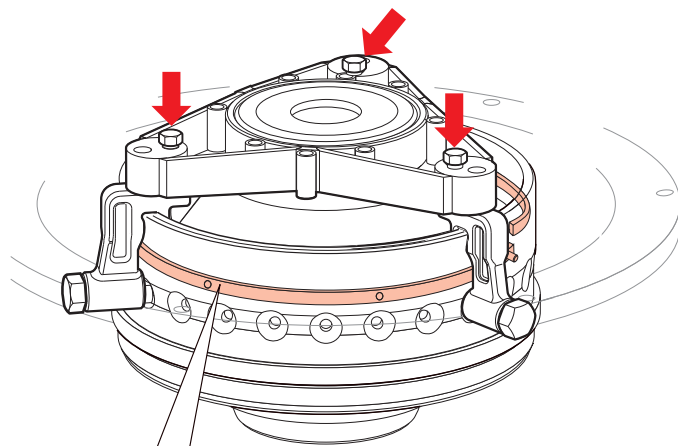
d Fit the lock ring and fully compress the disc stack with the compressing tool.

NOTE

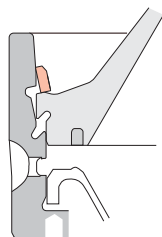
Do not use more power than 50 Nm/screw at a time, alternately.

NOTE

Always refit the disc without caulks on top of the disc stack!



e If the lock ring enters the groove, repeat a-d until the lock ring does not enter the groove.



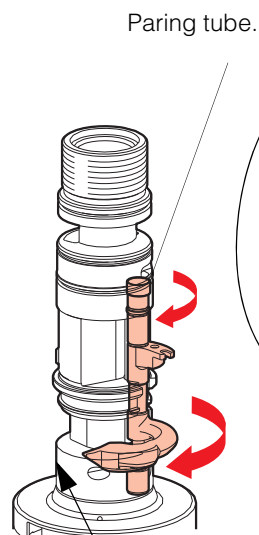
f Dismantle the bowl and remove one disc to get the correct disc stack pressure.

g Assemble the bowl with inlet and outlet pipe.

6.5.4 In and outlet device

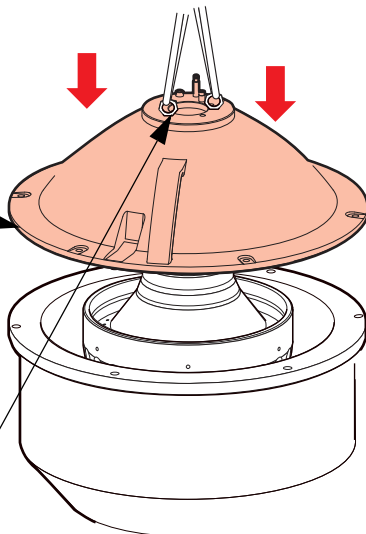
1 Fitting the frame hood .

- a** Turn the paring tube so that the frame hood can pass.



- b** Apply a thin layer of silicone grease and fit the O-ring onto the frame hood  .

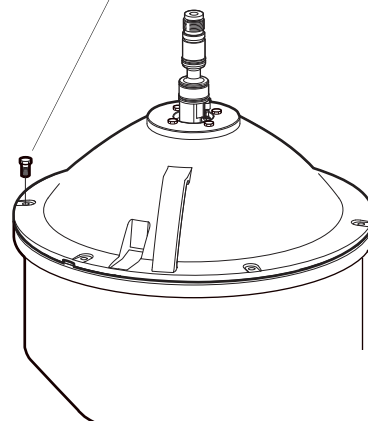
- c** Lower the frame hood.



NOTE

Make sure that the frame hood is mounted in its correct position according to the piping arrangement.

- d** Fit and tighten the screws.



NOTE

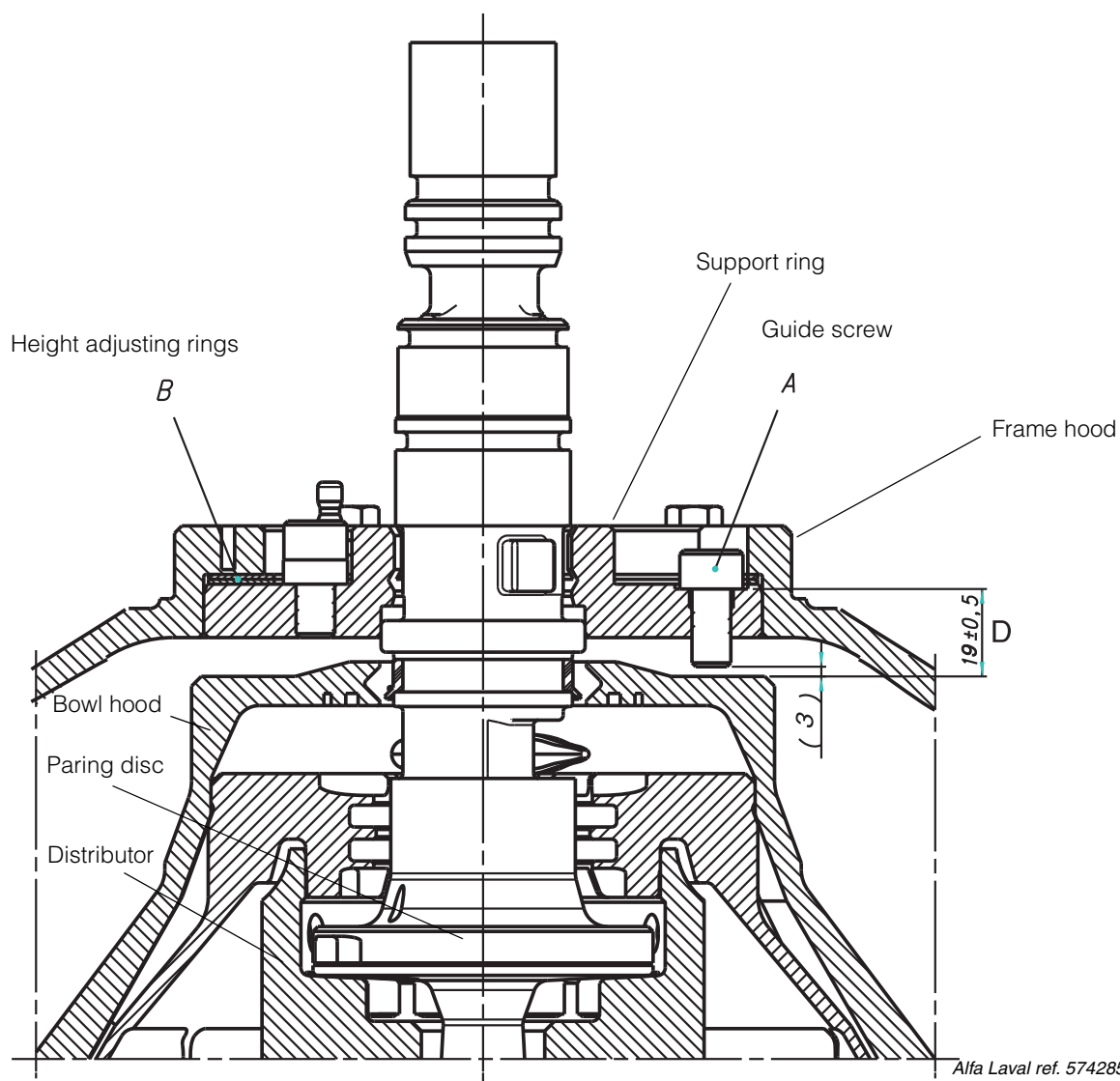
Make sure to fit the frame hood groove and the projection of the pipe.

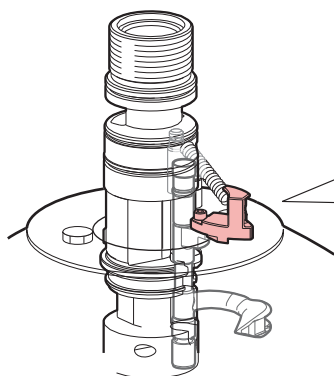
2 Control measurement of paring disc height .

a Remove the guide screw (A).

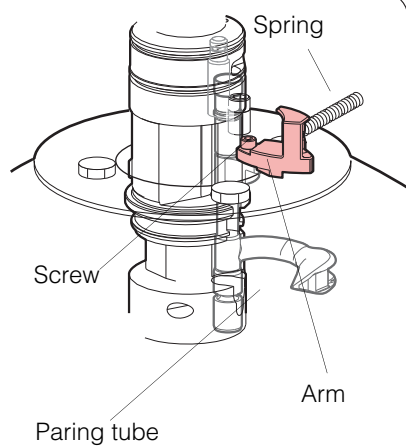
b Measure the distance D .
Assemble the correct
number of height
adjusting rings (B).

c Refit the guide screw (A).

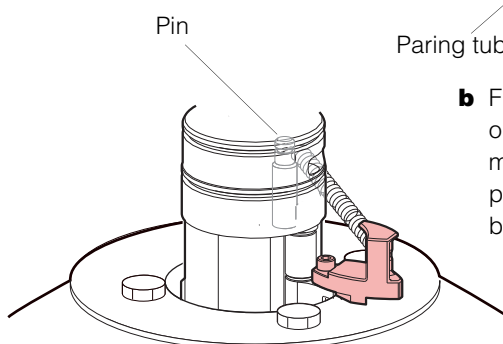


3 Fitting the spring and arm.

- a** Fit the spring on the arm and fit the arm to the top of the paring tube end and fit the screw.



- b** Fit the spring to the pin on the frame hood and make sure that it is properly attached on both ends.



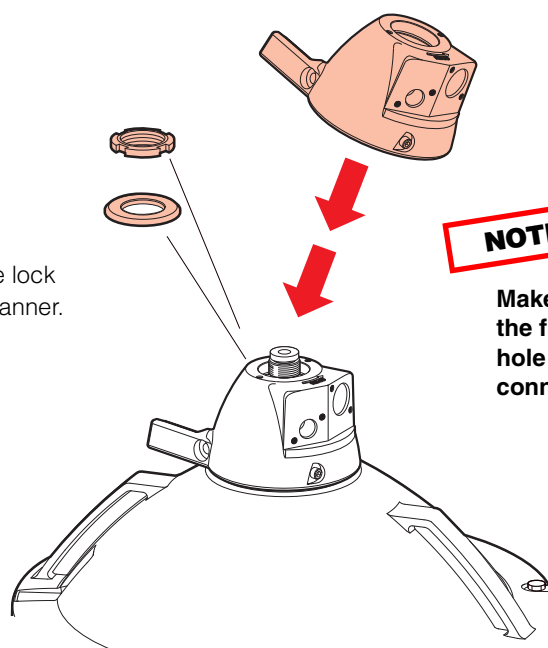
4 Fitting the connection housing.

a Lubricate the inlet pipe thread.

b Fit the connection housing over the inlet/outlet pipe.

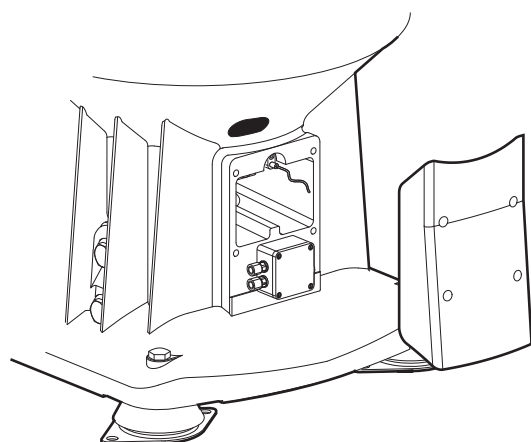
c Lubricate the lock nut threads.

d Fit the washer and the lock nut using the hook spanner.

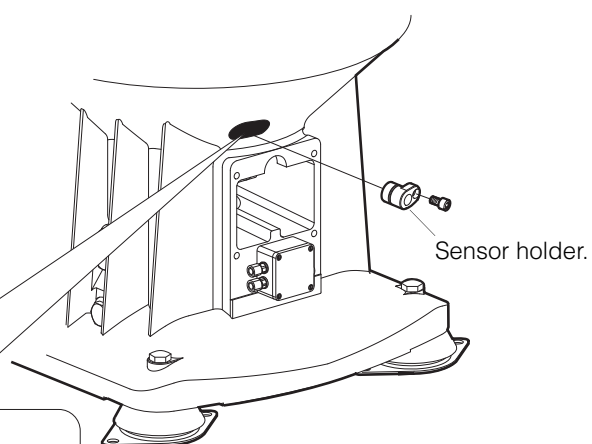


6.5.5 Unbalance sensor (optional)

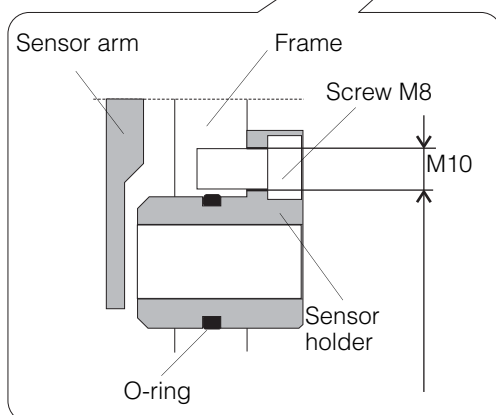
1 Fitting the unbalance sensor holder.



a Remove the cover.



Sensor holder.



b Fit the O-ring on the holder. Fit the screw into the holder and mount the holder into the separator frame.

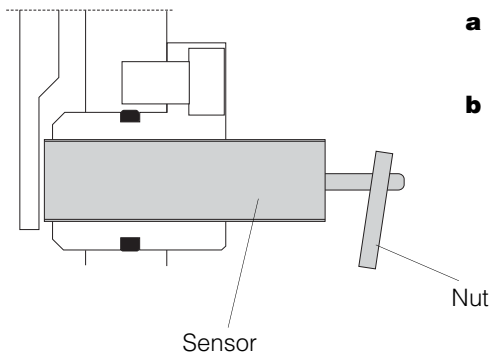
NOTE

If removing the sensor holder; use a M10 screw as a puller.

NOTE

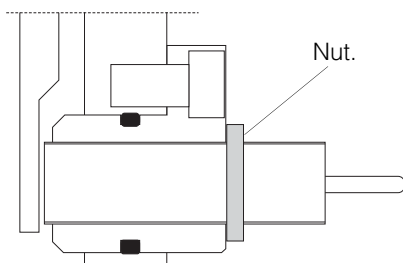
See next page for fitting and correct adjustment of the sensor.

2 Adjusting the unbalance sensor

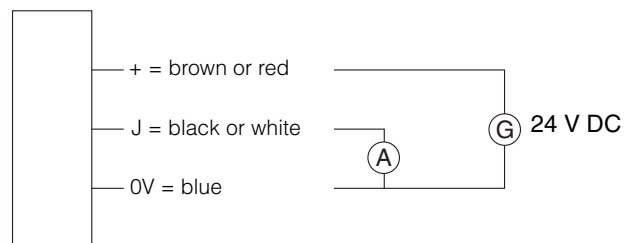


a Fit the sensor into the holder. Do not forget the nut.

b Adjust the sensor so that a value of 1,5 appears on the display.



c When correct distance is achieved tighten the nut against the holder.
Fit the cover (see previous page).

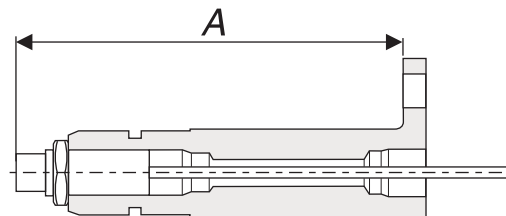


Adjustment value for the sensor is; $12 \text{ mA} \pm 1 \text{ mA}$.
For more details see [8.3 Connection List, page 149](#) and [752 Unbalance sensor \(optional\)., page 156](#).

6.5.6 Speed sensor

1 Adjusting the speed sensor

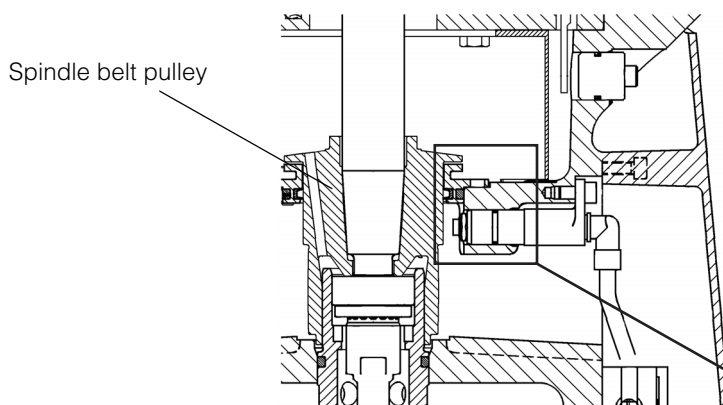
- a** Adjust the speed sensor. Distance $A = 73 \pm 0,1$ mm.
- b** Fit the sensor to the frame, see [4.4 Sensors, page 24](#).



NOTE

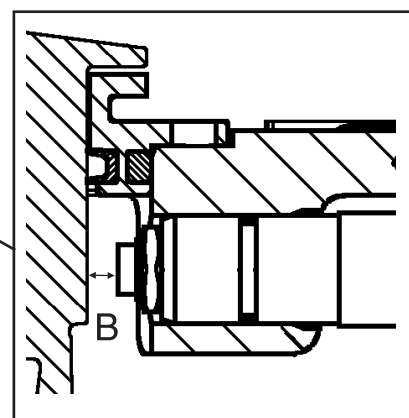
If the sensor does not work properly, check the distance between the sensor and the spindle belt pulley.

Adjust the sensor to achieve measure (B) shown below.



NOTE

The distance (B) between the sensor and the spindle belt pulley must be $2,5 \pm 0,5$ mm



G08734E1

G0858801

6.6 Actions After Assembly

6.6.1 Control of machine plates and safety labels

Alfa Laval ref. 561498 rev. 4

1 Check that the following signs are attached.

Space for additional label for numbering of separator and function

Machine plate

Space for label indicating representative.

Lifting instructions

Safety label.

Indicating direction of rotation of horizontal driving device.

50Hz

60Hz

Oil type plate

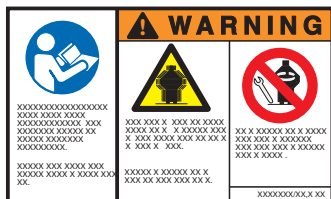
50169011

2 Check legibility. Following texts should be read on the labels.



Separator
 Manufacturing serial No. / Year
 Product No.
 In and outlet device
 Bowl
 Machine bottom part
 Bowl speed synchronous

 Direction of rotation (bowl)
 Speed motor shaft
 El. current frequency
 Recommended motor power
 Max. density of feed
 Max. density of sediment
 Max. density of operating liquid
 Process temperature min./max.



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.



Read instruction manual before lifting.

6.7 Oil Change

The separator should be level and at standstill when oil is filled or the oil level is checked.

6.7.1 Lubricating oil

Do not mix different oil brands.

Always use clean vessels when handling lubricating oil.

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

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

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



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



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

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

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

Applying, handling and storing of lubricants

Always be sure to follow lubricants manufacturer's instructions.

6.7.2 Check oil level

- 1 Remove the oil pin and make sure that the oil level is above the lower end of the pin.

6.7.3 Oil change procedure

- 1 Remove the oil pin, plug and washer.
- 2 Place a vessel under the drain plug.
- 3 Remove the drain plug.



Burn hazard

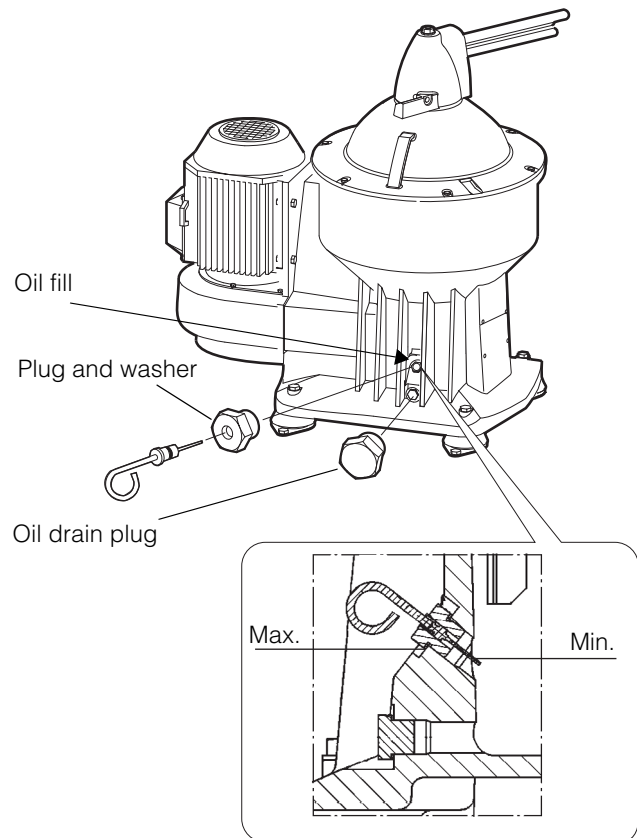
The lubricating oil and various machine surfaces can be sufficiently hot to cause burns.

- 4 Collect the oil in a vessel.
- 5 Fit and tighten the drain plug.
- 6 Fill with new oil until oil flows out of oil filler hole.

NOTE

See 6.7.6 *Lubricating oils*, page 137.

- 7 Fit the washer and the oil filling plug. Tighten the plug.
- 8 Fit the oil pin.



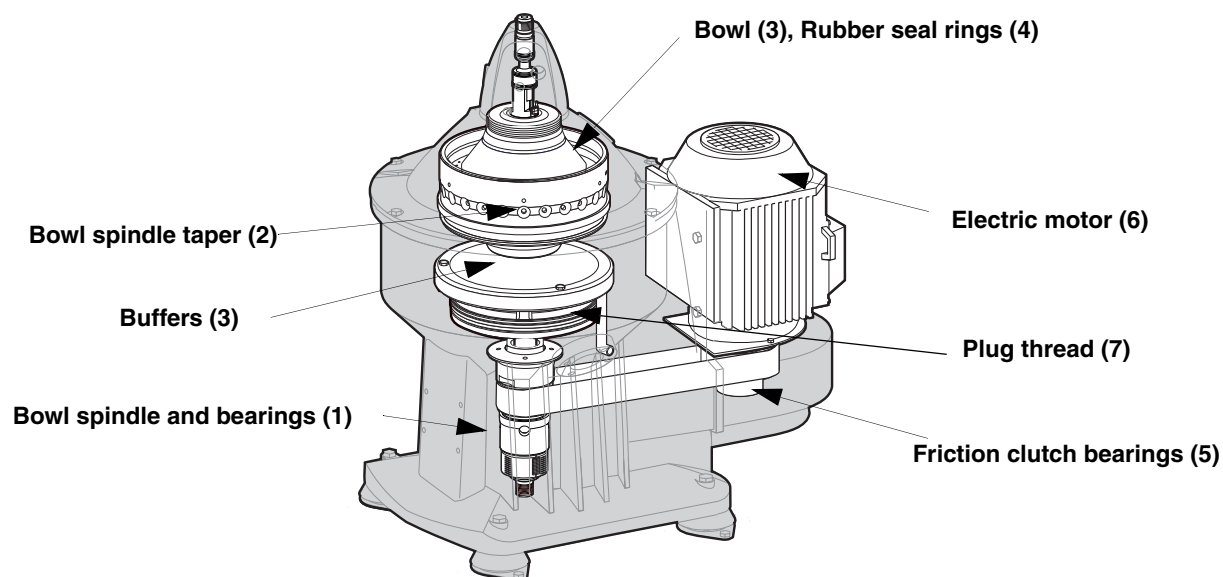
NOTE

For Inspection service procedures; See "Fill oil in the oil sump." on page 108.

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6.7.4 Lubrication chart

Alfa Laval ref. 567329-01, rev. 3



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	Lubricating points	Type of lubricant	Interval
1	The oil bath. Bowl spindle bearings are lubricated by oil mist from the oil bath.	See 6.7.1 Lubricating oil, page 131 Volume: 8.2 Technical Data, page 148 Ambient temperature 0 to +55°C	Oil change: 1. Continuous operation: 4000 hours 2. Seasonal operation: before every operating period 3. Short periods operation: 12 months even if total numbers of operating hours is less than stated above
2	Bowl spindle taper.	Lubricating oil, only a few drops for rust protection.	At assembling
3	Bowl: Sliding contact surfaces, thread of lock nut and cap nut.	Pastes specified in 6.7.5 Lubricants, page 134	At assembling.
4	Rubber seal rings.	Grease as specified in 6.7.5 Lubricants, page 134	At assembling
5	Friction clutch bearings.	The bearings are pre-lubricated with grease.	No need for extra lubrication.
6	Electric motor.	Follow the manufacturer's instructions.	Follow the manufacturer's instructions.
7	Plug thread (neck bearing assembly)	Lubricating oil.	At assembly.

NOTE

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

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

CAUTION

Check the oil level before start.
Top up when necessary.
Do not overfill.
Do not check the oil level when the separator is running.

6.7.5 Lubricants

Alfa Laval ref. 553217-01 rev. 11

NOTE

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

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

Pastes:

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

Bonded coatings:

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

Silicone grease for rubber rings:

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

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

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

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

6.7.6 Lubricating oils

Alfa Laval ref. 567330-01, rev. 4

Paraffinic mineral lubricating oil, category (ISO-L-) HM 68.

Viscosity grade (ISO-3448/3104) VG 68.

The oil shall follow the requirements in one of the standards below.

Standard	Designation
DIN 51524 part 2 or 3* (German standard)	DIN 51524-HLP or HVLP* 68
ISO 11158 (International standard)	ISO-L-HM or HV* 68 Viscosity index (ISO 2909) VI>95

The following is the list of **recommended oil brands**. Trade names and designations might vary from country to country. Other oil brands may be used as long as they follow the above standards and have equivalently high quality as the brands recommended. For use of other brands please contact the oil company for there advises of correct choice of oil.

Manufacturer	Designation
Alfa Laval	567334-01 1 litre
	567334-02 4 litres
BP	Bartran 68 Bartran HV 68* Energol SHF-HV 68 *
Castrol	Hyspin AWS 68 Hyspin AWH(-M) 68*
Chevron	Hydraulic oil AW 68 Rando HD 68 (H2) Rando HDZ 68 (H2)* Rykon Premium 68 (H2)*
ExxonMobil	Nuto H 68 Univis N 68* Mobil DTE 26 (ISO VG 68) Mobil DTE 10 Excel 68*
Q8/Kuwait Petroleum	Haydn 68 Handel 68 *
Shell	Tellus Oil 68 Tellus Oil S 68 Tellus Oil T 68*
Statoil	HydraWay HMA 68 Hydra Way HVXA 68*
Total	Azolla AF 68 Azolla ZS 68 Equivis ZS 68 * Elf Lubmarine Visga 68*

* These oils should be used at cold start, i.e. when the ambient temperature is below 20 °C.

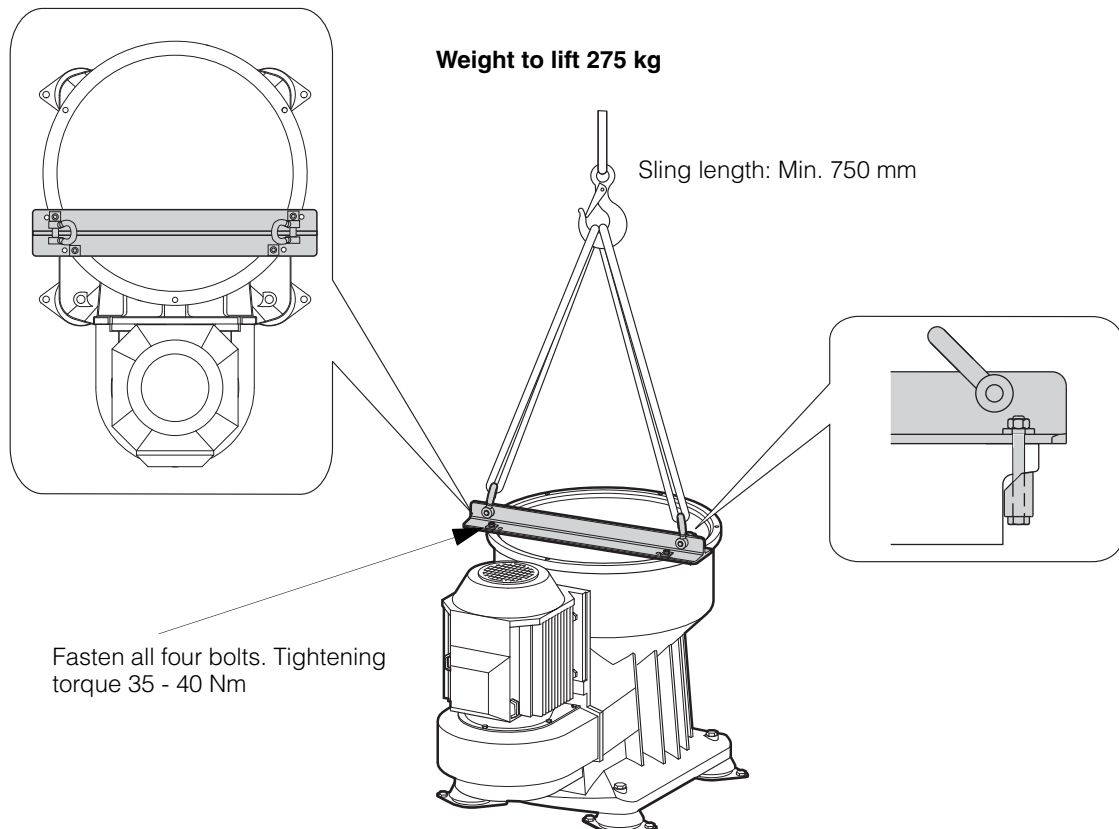
All oils can be used at ambient temperatures above 20 °C.

The list of recommended oil brands is not complete. Other oil brands may be used as long as they follow the above standards and have equivalent high quality as the brands recommended. For use of other brands please contact the oil company for their advice of correct choice of oil.

6.8 Lifting instructions

Alfa Laval ref. 567319, rev. 2

6.8.1 Lifting the separator



- 1 Remove the inlet and outlet device, the frame hood and the bowl according to the instructions in [6.3 Dismantling, page 46](#).

NOTE

Never lift or transport the separator with the bowl still inside.

- 2 Disconnect all connections.
- 3 Fit the lifting tool (not included in set of tools). All four bolts on the lifting tool must be fastened to the frame.

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- 4** Use two lifting slings to lift the separator.
Total length of each loop: minimum 1,5 metres.
- 5** Unscrew the foundation bolts.
- 6** When lifting and moving the separator, follow normal safety precautions for lifting large heavy objects.



Crush hazards

A falling separator can cause accidents resulting in serious injury and damage.

Never lift the separator by any other method than described in this manual.



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

6.8.2 Lifting the bowl

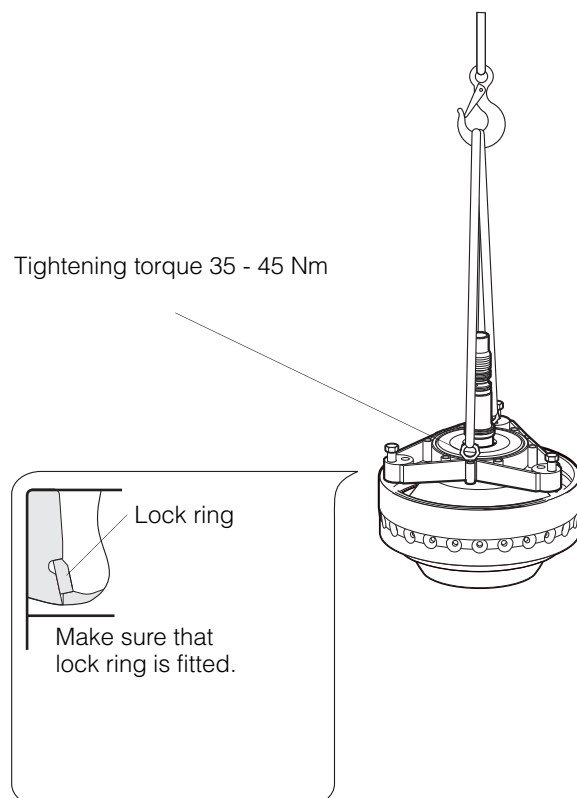
When lifting and moving an assembled bowl, always follow these instructions.

- 1** Fit the lifting tool with lifting eyes to the bowl assembly.
- 2** Check that the lock ring is mounted correctly before lifting the complete bowl.
- 3** Lift the bowl using a sling with the proper rating.



Never try to lift the bowl while it is still in the frame. The bowl body is fastened to the frame with the cap nut.

Weight to lift 37 kg



7 Fault Finding

These fault finding instructions are for the separator only.

If a fault occurs, study the System Documentation fault finding section (if applicable).

7.1 Mechanical Functions

7.1.1 Separator vibration



Disintegration hazards

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

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



Some vibration is normal during the starting and stopping sequences when the separator passes through its critical speed.

Cause	Corrective action
Bowl out of balance due to: - poor cleaning - incorrect assembly - incorrect disc stack compression - bowl assembled with parts from other separators	Dismantle the separator and check the assembly and cleaning.
Uneven sludge deposits in the sludge space.	Dismantle and clean the separator bowl.
Height position of paring disc is incorrect.	Stop the separator, measure, and if necessary, adjust the height.
Bowl spindle bent.	Renew the bowl spindle.
Bearing(s) damaged or worn.	Renew all bearings.
The frame feet are worn out.	Renew the frame feet.
Spindle top bearing spring broken.	Renew all springs.

7.1.2 Smell

Cause	Corrective action
Normal occurrence during start while the friction blocks are slipping.	None. If smell continues when separator is at full speed, stop the separator and replace friction blocks.
Oil level in oil sump too low.	Check oil level and add oil if necessary.

7.1.3 Noise

Cause	Corrective action
Height position of paring disc is incorrect.	Stop the separator, measure and adjust the height.
Bearing(s) damaged or worn.	Renew all bearings.

7.1.4 Speed too low

Cause	Corrective action
Friction blocks are oily or worn.	Clean or renew friction blocks.
Bowl is not closed or leaking.	Dismantle the bowl and check.
Motor failure.	Repair the motor.
Bearing(s) damaged.	Renew all bearings.
Incorrect transmission parts (60 Hz belt pulley for 50 Hz power supply).	 Stop and change the belt transmission to suit the power supply frequency.

7.1.5 Speed too high

Cause	Corrective action
Incorrect transmission parts (50 Hz belt pulley for 60 Hz power supply).	 Stop and change the belt transmission to suit the power supply frequency.

7.1.6 Starting power too high

Cause	Corrective action
Incorrect transmission parts (60 Hz belt pulley for 50 Hz power supply).	 Stop and change the belt transmission to suit the power supply frequency.
Wrong direction of rotation.	Change electrical phase connections to the motor.

7.1.7 Starting power too low

Cause	Corrective action
Incorrect transmission parts (50 Hz belt pulley for 60 Hz power supply).	 Stop and change the belt transmission to suit the power supply frequency.
Friction blocks are oily or worn.	Clean or renew friction blocks.
Motor failure.	Repair the motor.

7.1.8 Starting time too long

Cause	Corrective action
Friction blocks are oily or worn.	Renew or clean friction blocks.
Height position of paring disc is incorrect.	Stop, check and adjust the height.
Motor failure.	Repair the motor.
Bearing(s) damaged or worn.	Renew all bearings.

7.2 Separating Functions

7.2.1 Bowl opens accidentally during operation

Cause	Corrective action
Strainer in the operating water supply is clogged.	Clean the strainer.
No water in the operating water system.	Check the operating water system and make sure the valve(s) are open.
Hoses between the supply valves and separator are incorrectly fitted.	Correct.
Nozzle in operating slide clogged.	Clean the nozzle.
Rectangular ring in discharge slide is defective.	Renew the rectangular ring.
Valve plugs are defective.	Renew all plugs.
Supply valve for opening water is leaking.	Rectify the leak.

7.2.2 Bowl fails to open for sludge discharge

Cause	Corrective action
Strainer in the operating water supply is clogged.	Clean the strainer.
Water flow too low.	Check the water flow
Hoses between the supply valves and separator are incorrectly fitted.	Correct.
Nozzle in operating slide missing.	Fit the nozzle.
Rectangular ring in the operating slide or bowl body is defective.	Renew the rectangular rings.

7.2.3 Unsatisfactory separation result

Cause	Corrective action
Incorrect separation temperature.	Adjust.
Throughput too high.	Adjust.
Disc stack is clogged.	Clean disc stack.
Sludge space in bowl is filled.	Clean and reduce the time between sludge discharges.
Bowl speed too low.	Examine the motor and power transmission including the belt transmission (clutch).
Bowl rotates i wrong direction	Check the electrical connections to the motor.

7.2.4 Bowl fails to close

Cause	Corrective action
Nozzle in operating slide clogged.	Clean nozzle.
Hoses reversed.	Adjust.
Rectangular ring in discharge slide is defective	Renew rectangular ring.
Valve plugs in operating slide missing or defective.	Renew valve plugs.
No water.	Turn on water supply.

8 Technical Reference

8.1 Product description

Alfa Laval ref. 574928, rev. 3 & 574927, rev. 4

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. 881200-02-01/3 & 881200-01-01/4

Separator type. S 811 & S 816

Application. Cleaning of fuel oil and lube oil.

Intended for marine- and land installations.

Total discharge.

Centrilock® lock ring

Designed in accordance with standards:

98/37EC	The Directive of the European Parliament and Council relating to machinery.
89/336EEC	EMC and amendments related to said directive.
EN 12547	Centrifuges - Common safety requirements.

Operational limits:

Feed temperature: 0°C to 100°C

Ambient temperature: 5°C to 55°C

Discharge intervals: min. 2 minutes max. 4 hours.

Maximum allowed density of operating liquid:
1000 kg/m³.

Viscosity max. 700 cSt at 50°C.

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

Risk for corrosion and erosion have to be investigated in each case.

Remote restart allowed under certain conditions, see Interface description.

8.2 Technical Data

Alfa Laval ref. 574297, rev. 3

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.

Subject	Value	Unit
General technical data:		
Motor power: 50 Hz / 60 Hz	5,5/6,4	kW
Gear ratio: 50 Hz	283/70	
Gear ratio: 60 Hz	235/70	
Alarm levels for vibration monitor, connection 752, 1st/2nd:	0,2/0,3	mm
Max. bowl inner diameter:	208,5	mm
Min./Max. discharge interval:	2/240	minutes
Max. density of operating liquid:	1000	kg/m ³
Max. density feed/sediment:	1100/2327	kg/m ³
Min./Max. feed temperature:	0/100	°C
Max. running time without flow, bowl empty/filled:	30/30	minutes
Bowl material:	AL 111 2377-02	
Operating data:		
Bowl speed, synchronous: 50 Hz / 60 Hz	12129/12086	r/min
Motor speed, synchronous: 50 Hz / 60 Hz	3000/3600	r/min
Max. power consumption, start-up:	6,4	kW
Power consumption, idling/max. capacity:	2,6/6,3	kW
Start time min./max.:	60/150	seconds
Stop time min./max.:	10/25	minutes
Sound power:	9	Bel(A)
Sound pressure:	76	dB(A)
Max. vibration level	9,1	mm/s (r.m.s)
Volume and Capacity data:		
Maximum hydraulic capacity, bowl:	5,5	m ³ /h
Bowl liquid volume:	1,8	litres
Fixed discharge volume:	1,6	litres
Sludge volume, efficient/total:	0,23/0,74	litres
Lubricating oil volume:	1,7	litres
Weight information:		
Motor drive:	58	kg
Bowl:	35	kg
Separator total:	315	kg

8.3 Connection List

Alfa Laval ref. 567321 rev. 2

No.	Description	Requirements/limits
201	Inlet for process liquid - Allowed temperature - Max allowed density - Allowed flow	Min. 0 °C, max. 100 °C See <i>“Technical Data” on page 148</i> Max 4,5 m ³ /h
206	Inlet for conditioning and displacement liquid Instantaneous flow	Fresh water 0,9 litres/minute
220	Outlet for light phase, clarified liquid Counter pressure	0 - 250 kPa
221	Outlet for heavy phase	No counter pressure.
222	Outlet for solid phase - Small discharge - Large discharge - Discharge frequency	Total discharge Max 24 discharge/h. The outlet from the cyclone must always be arranged to prevent the cyclone from being filled up with sludge. Solids are discharged by gravity.
375	Inlet for discharge and make-up liquid - Quality requirements - Max density - Pressure Make-up liquid - Flow (momentary) - Consumption - Interval - Time Discharge liquid - Flow - Consumption - Time Closing liquid - Flow - Consumption - Time Start up closing liquid - Flow - Time	See page <i>160</i> . Max. 1000 kg/m ³ Min. 150 kPa 2,8 litres/minute 1,7 litres/hour 5 minutes 3 seconds 11 litres/minute 0,55 litres/discharge 3 seconds 2,8 litres/minute 0,7 litres/discharge 15 seconds 11 litres/minute 5 seconds
462	Drain of frame top section, lower	

701	Motor for separator Allowed frequency variation: (momentarily during 5 seconds)	$\pm 5\%$ $\pm 10\%$
740	Speed sensor for bowl spindle - Type - Supply voltage, nominal - With sensor activated (near metal) - With sensor not activated (far from metal) - Number of pulses per revolution	See page 155. Inductive proximity switch 8 V Less or equal to 1,2 mA. More or equal to 2,1 mA. 1
752	Position transducer for bearing holder - Type - Supply voltage - Operation range (mild steel) - Output voltage within sensing range - Load resistance, R_L	See page 156. Inductive analogue sensor 15 to 30 V DC 3,5 mm 4 to 20 mA 1 kOhm
760	Cover interlocking switch - Type - Switch rating, resistive load max.	Mechanical limit switch 3 A (at 48 V DC) 1 A (at 220 V AC)

8.4 Interface Description

Alfa Laval ref. 564834 rev. 3

8.4.1 Scope

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

8.4.2 References

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

- *Interconnection diagram*
- *Connection List*
- *Technical Data*

Standards referred to are:

- EN 418 Safety of machinery - Emergency stop equipment, functional aspects - Principles of design
- EN 1037 Safety of machinery - Prevention of unexpected start-up
- EN 954-1 Safety of machinery - Safety related parts of control systems - Part 1 General principles for design.

8.4.3 Definitions

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

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

8.4.4 Goal

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

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

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

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

8.4.5 Description of separator modes

For control purposes the operation of the separator should be divided into different modes.

The normally used modes are described below but other modes might exist.

It is assumed that:

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

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

Stand still means:

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

Starting means:

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

Running means:

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

Stopping means:

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

8.4.6 Remote start

This machine may be started from a remote location under the following conditions;

- First start after any kind of service or manual cleaning must be supervised locally in order to ensure that no mistakes has been made during assembly.
- The unbalance sensor is mandatory for remote start.
- The installation must include equipment to prevent unintentional start-up from remote location when the machine is disassembled.
- The installation must include equipment to prevent unintentional start of process flow from remote location when the machine is not properly connected to the piping.

8.4.7 Handling of connection interfaces**Electrical connections***701 Separator motor.*

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

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

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

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

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

740 Speed sensor

A proximity sensor of inductive type according to Namur standard is giving a number of pulses per revolution of the bowl (see *Connection List*).

Signal processing in *STARTING*:

- The separator should be stopped automatically according to *NORMAL STOP* procedure and an alarm should be given when the accumulated time for acceleration is longer than the maximum time specified in *Technical Data*. An abnormal start time indicates some malfunction of the separator equipment and should be investigated.
- If the speed exceeds "Bowl speed, synchronous" in Technical Data with more than 5% the separator shall be stopped automatically by *NORMAL STOP* and a high speed alarm shall be given.
- The speed monitoring system shall be checked continuously (e.g by checking that pulses are coming). In case of failure indication the separator shall be stopped automatically by *NORMAL STOP* with a timer controlled stop sequence and an alarm for speed monitoring system failure shall be given.
- The acceleration should be supervised to ensure that a certain speed (e.g 250r/min.) has been reached within a certain time (e.g 30 seconds).

Signal processing in *RUNNING*:

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

Signal processing in *STOPPING*:

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

752 Unbalance sensor (optional).

For indication of any abnormal unbalance and to be able to perform appropriate countermeasures, the separator has been equipped with a vibration velocity transducer on the separator frame. The signal from the transducer 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 of *STARTING*.

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

Signal processing in *STARTING*:

If vibrations exceed the second alarm level the separator shall be stopped automatically by *SAFETY STOP*.

If the self check system triggers, an alarm shall be given and an automatic stop by *NORMAL STOP* shall be initiated.

Signal processing in *RUNNING*:

- If vibrations exceed the first alarm level an alarm should be given. Vibrations of this magnitude will reduce the expected life time of the bearings and should therefore be eliminated.
- If vibrations exceed the second alarm level the separator shall be stopped automatically by *SAFETY STOP*.
- If the self check system triggers, an alarm shall be given.

Signal processing in *STOPPING*:

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

Signal processing in *NORMAL STOP*:

- If vibrations exceed the second level the system shall turn over automatically to *SAFETY STOP*.

760 Cover interlocking switch (optional)

The separator is equipped with a interlocking switch to detect if the cover is mounted.

Signal processing in *STAND STILL*:

- The circuit is closed when the cover of the separator is mounted.
- The interlocking switch should be connected in such a way that starting of the motor is prevented when the separator cover is not mounted.

Signal processing in *STARTING*, *RUNNING* and *CLEANING*:

- If the circuit is broken the separator should be stopped automatically by *NORMAL STOP*. This is to minimise the risk of having access to moving parts.

Fluid connections

Complementary information is given in the document Connection List.

201 Inlet

Processing in *STAND STILL*:

- Shall be closed.

Processing in *STARTING*:

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

Processing in *RUNNING*:

- Could be closed or open.

Processing in *CLEANING*:

- A sequence of cleaning liquids should be fed to the separator. The flow rate should be as high as possible and preferably not less than the production flow rate.

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

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

Processing in *SAFETY STOP*:

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

206 Inlet for conditioning and displacement liquid

- According to process

220, 221 and 222 Outlets

Processing in *STAND STILL*:

- Could be closed or open.

Processing in other modes:

- Shall be open.

375 Inlet for discharge and make-up liquid

Processing in all modes:

- It is recommendable to supervise the supply pressure. If pressure is too low (see Connection List), start should be interlocked and if it happens in *PRODUCTION* or *CLEANING* turn over to *STAND BY* should take place.

Signal processing in *STARTING*:

- Below 85% of synchronous bowl speed no water supply may be made.
- When coming from *PRODUCTION* a discharge shall be initiated to remove sediments from bowl to avoid problems due to solidification, see Connection List.

Signal processing in *PRODUCTION*:

- Automatic discharges shall be initiated by timer or ALCAP system.

Signal processing in *CLEANING*:

- Automatic discharges shall be initiated by timer or CIP-control system.

Signal processing in *NORMAL STOP*:

- Discharges should not be made.

Signal processing in *SAFETY STOP* and *EMERGENCY STOP*:

- Discharges should not be made.

8.5 Demand Specification Water

Alfa Laval ref. 574487 rev. 1

Poor quality of the operating water may with time cause erosion, corrosion and/or operating problems. The water shall be treated to meet certain demands.

- 1** Turbidity-free water, solids content <0,001% by volume.
Max. particle size 50 µm.
Deposits shall not be allowed to form in certain areas in the system.
- 2** Total hardness less than 180 mg CaCO₃ per litre, which corresponds to 10 °dH or 12,5 °E. Hard water may with time form deposits in the operating mechanism. The precipitation rate is accelerated with increased operating temperature and low discharge frequency. These effects become more severe the harder the water is.
- 3** Chloride content max. 100 ppm NaCl (equivalent to 60 mg Cl/l).
Chloride ions contribute to corrosion on surfaces in contact with the operating water. Corrosion is a process that is accelerated by increased separating temperature, low pH, and high chloride ion concentration.
- 4** 6,5 < pH < 9
Bicarbonate content (HCO₃) min. 70mg HCO₃ per litre, which corresponds to 3,2 °dKH.

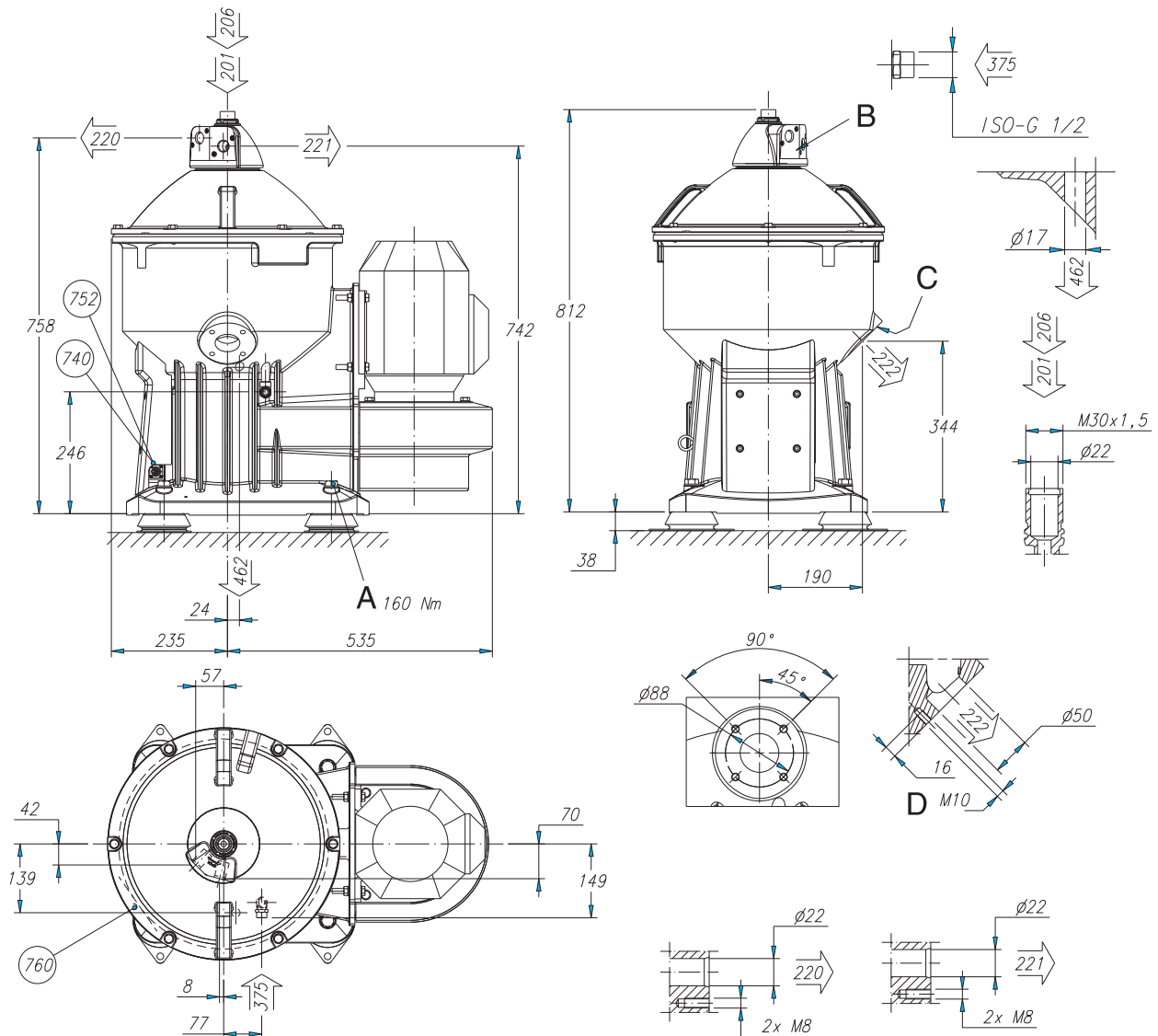
NOTE

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

8.6 Drawings

8.6.1 Basic size drawing

Alfa Laval ref. 574283 rev. 0

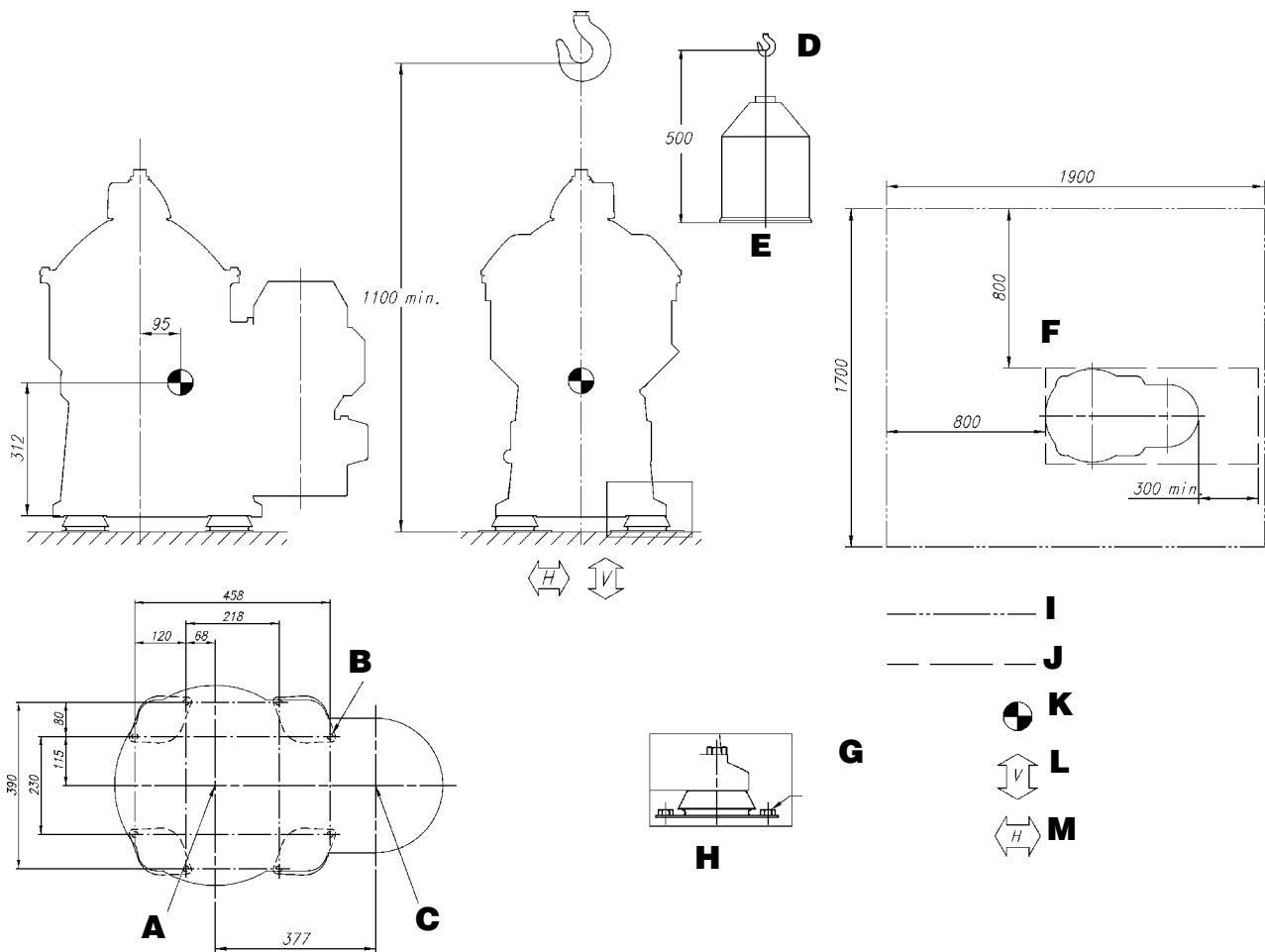


Connection house, with connections 201, 220 and 221, turnable in 60° steps all around.
 All connections to be installed non-loaded and flexible
 All dimensions are nominal. Reservation for individual deviations due to tolerances.
 Data for connection, see [8.3 Connection List, page 149](#).

- A** Tightening torque 160 Nm.
- B** Maximum horizontal displacement at the inlet and outlet connections during operation ± 5 mm.
- C** Maximum vertical displacement at the sludge connection during operation ± 2 mm.
- D** 4 holes M10, depth 30

8.6.2 Foundation drawing

Alfa Laval ref. 574284 rev. 1

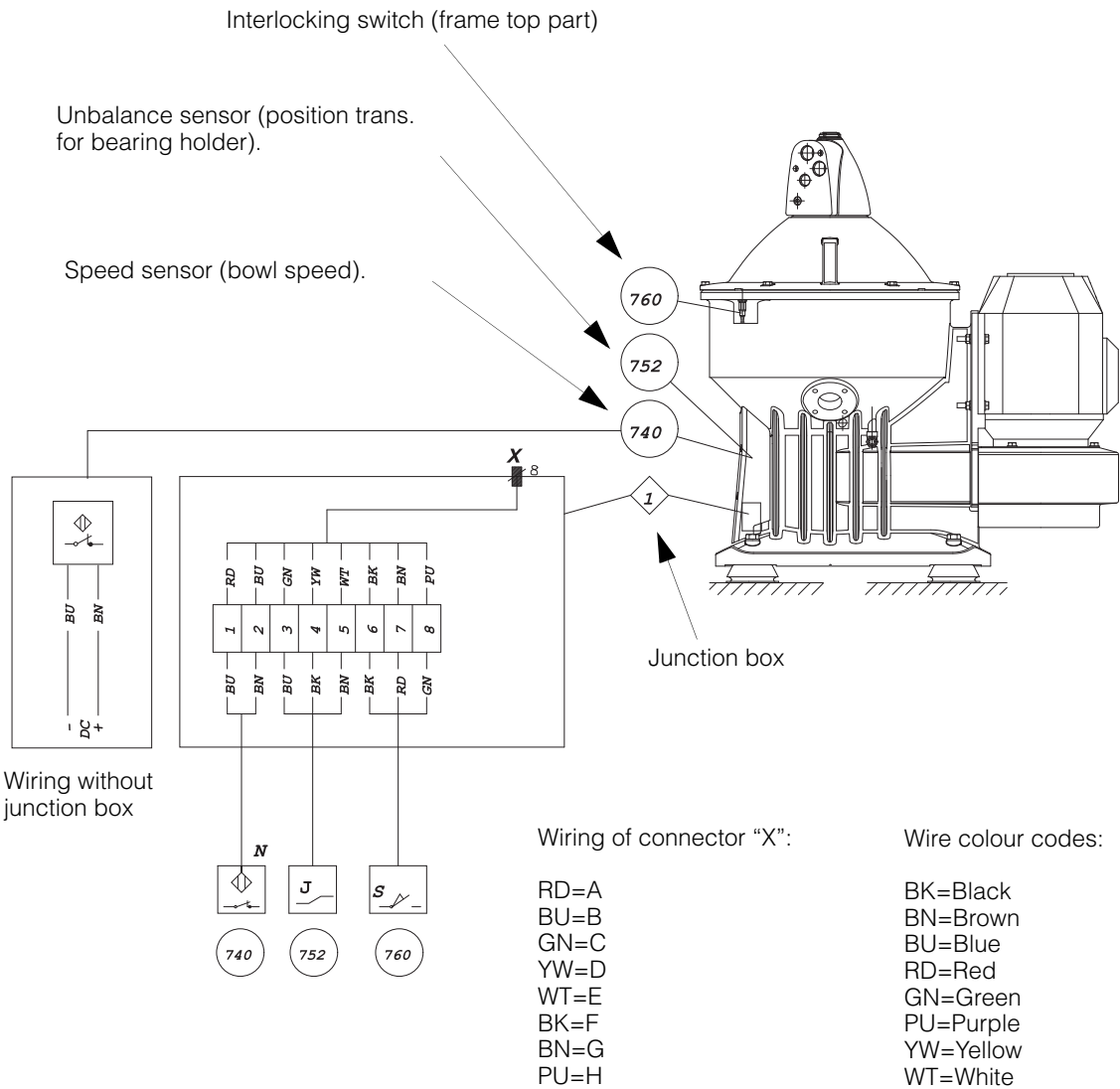


- A** Centre of separator bowl.
- B** Holes for foundation bolts (8x).
- C** Centre of motor.
- D** Min. lifting capacity required during service: 300 kg.
- E** Max. height of largest component incl. lifting tool.
- F** Service side.
- G** Foundation bolts.
- H** Installation according to stated foundation force.
Foundation turnable 360°
- I** Recommended free floor space for unloading when doing service.
- J** No fixed installation within this area.
- K** Centre of gravity (complete machine).
- L** Dynamic forces (static force excluded)
From separator do not exceed;
Force in any separator foot;
Vertical ± 8 kN
Horizontal ± 8 kN
- M** Total foundation force (sum of all feet)
Vertical ± 8 kN
Horizontal ± 8 kN

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8.6.3 Interconnection diagram

Alfa Laval ref. 561786 rev. 5



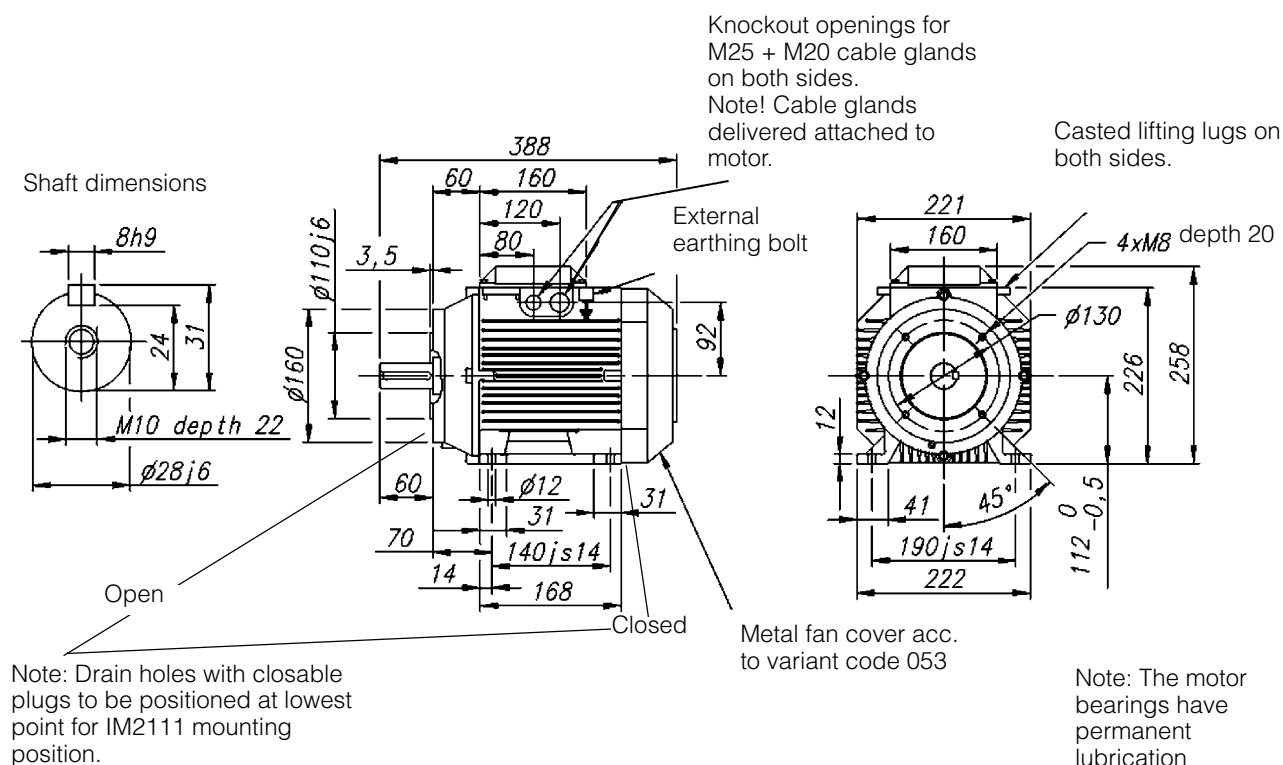
Demand specification wire
Approval: UL 1007/1569
CSA TR-64
Area acc. to AWG 18

Items showed in this document are not included in all separators. See product specification.

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8.6.4 Electric motor

Alfa Laval ref. 565595 rev. 9



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Manufacturer	ABB Motors
Manuf. drawing	Cat. BA/Marine mot./GB 08-2001
Standards	IEC 34-series, 72, 79 and 85
Size	IEC 112MB
Type	M3AA 112 MB
Weight	33 kg
Poles	2
Insulation class	F
Bearings	D-end 6206-2Z/C3 N-end 6206-2Z/C3
Method of cooling	IC 411 (IEC 34-6)
Spec.	Totally enclosed three-phase motor for marine service ²⁾ Motor with feet and small flange.

Type of mounting		Degree of protection
IEC 34-7		IEC 34-5
	IM 2111	IP 55

Rated output (kW) valid for temp. rise max. 90°.

Cast iron bearing shield at N-end.

The motors can be provided with space heaters for 110V or 220V, 25W as optional.

NOTE

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

9 Installation

9.1 Introduction

These installation specifications are valid for the S 811 & S 816 separator.

The installation instructions are specifications, which are compulsory requirements.

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

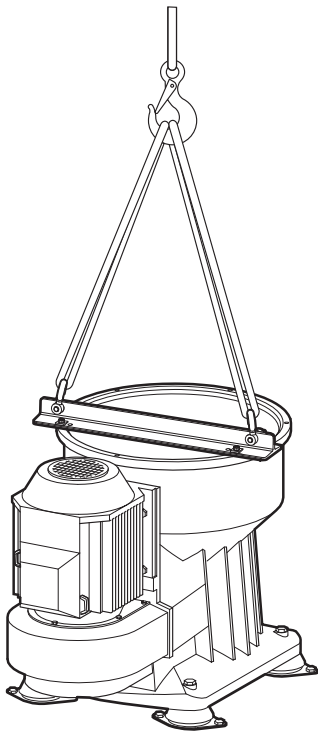
NOTE

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

9.2 Upon Arrival At The Storage Area

Ensure that the separator delivered is suitable for the application.

9.2.1 Transport



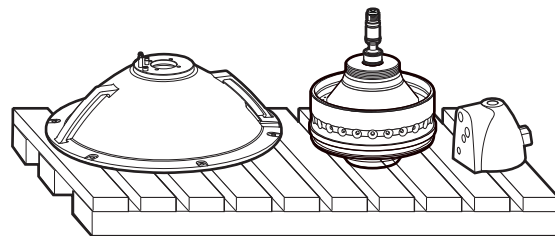
- a** When lifting the separator, make sure that tools and lifting devices are fastened securely. See chapter [6.8.1 Lifting the separator, page 139](#).



Crush hazards

Use correct lifting tools and follow lifting instructions.

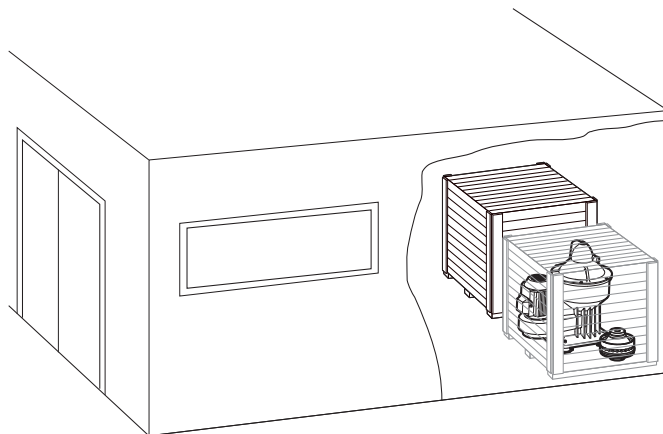
- b** When lifting the bowl see [6.8.2 Lifting the bowl, page 140](#).



- c** During transport of the separator, the in- and outlet device, frame hood and bowl must always be removed.

9.2.2 Protection and storage of goods

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



The following protection products are recommended:

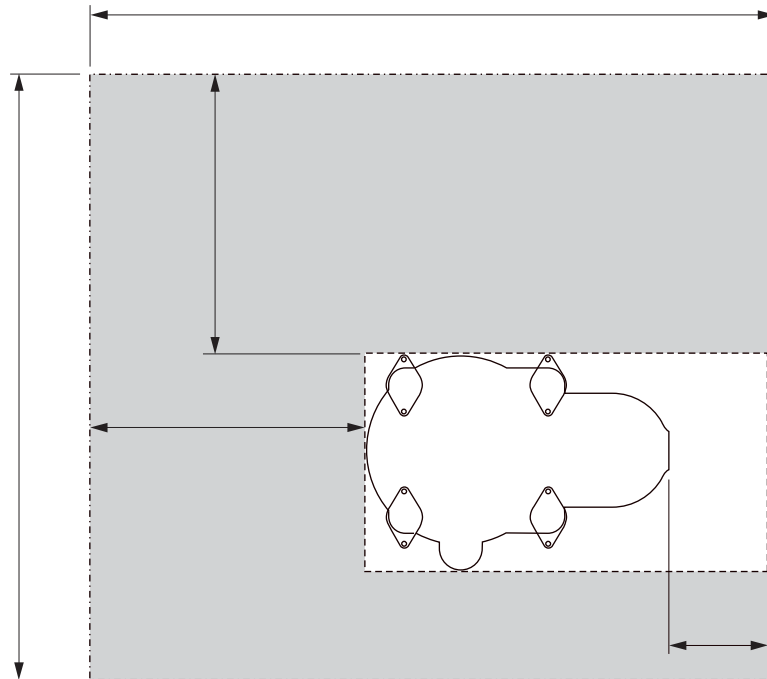
- 1** Anti-rust oil (Dinitrol 112 or equivalent) with long lasting effective treatment for external surfaces. The oil should prevent corrosion attacks and leaves a waxy surface.
- 2** Anti-rust oil (Dinitrol 40 or equivalent) is a thin lubricant for inside protection. It gives a lubricating transparent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

- b** If there is a risk for water condensation, the equipment must stand well ventilated and at a temperature above dew point.

- c** If the storage time exceeds 12 months, the equipment must be inspected every 6 months and, if necessary, the protection be renewed.

9.3 Planning of Installation

9.3.1 Important measurements

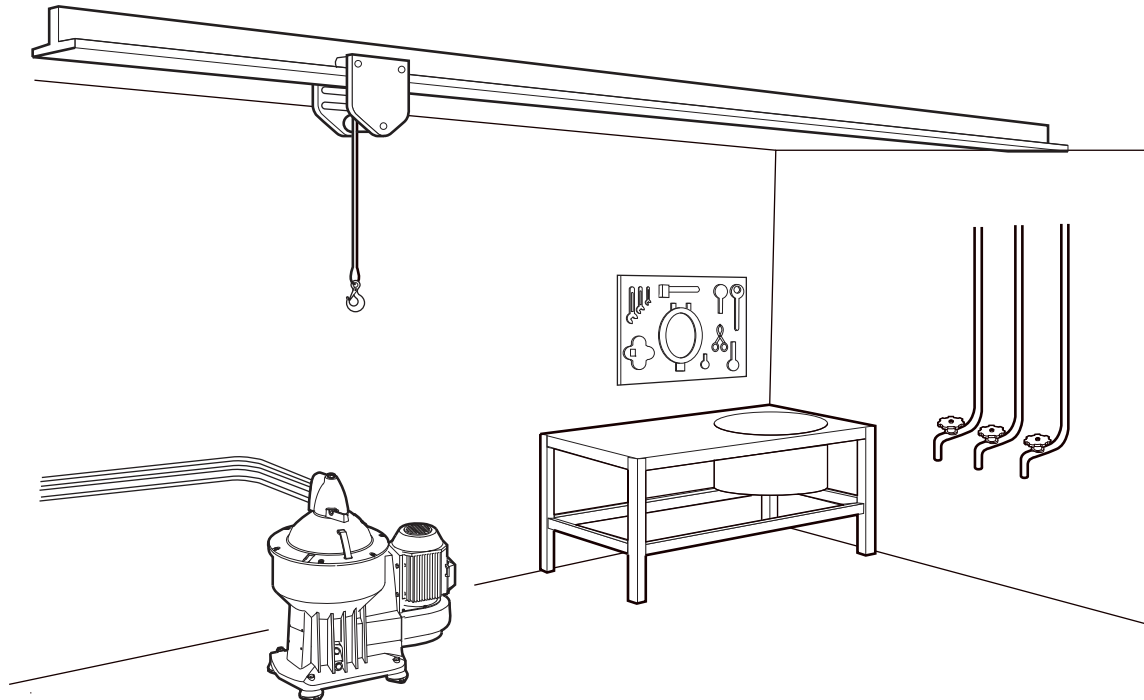


Important measurements are:

- minimum lifting height for lifting bowl parts
- shortest distance between driving motor and wall
- space for control and operation
- free passage for dismantling and assembly
- space for maintenance work
- space on floor for machine parts during maintenance work

For more detailed information, see *8.6.1 Basic size drawing, page 161* and *8.6.2 Foundation drawing, page 162*.

9.3.2 Maintenance service



A work bench should be installed in the separator room.

Hot water, compressed air and diesel oil should be available near the work bench to make maintenance work easier.

An overhead hoist with capacity of 300 kg is required for transport of bowl parts to the working bench. Lifting point should be above the centre of the separator.

NOTE

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

See 8.6.2 Foundation drawing, page 162

9.3.3 Connections to surrounding equipment

Local safety regulations

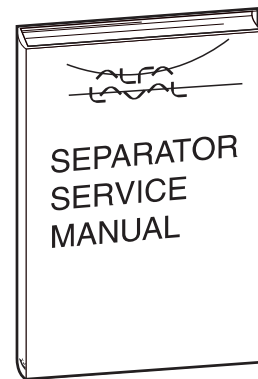
If the local safety regulations prescribe that the installation has to be inspected and approved by responsible authorities before the plant is put into service, consult with such authorities before installing the equipment and have the projected plant design approved by them.



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Service media

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

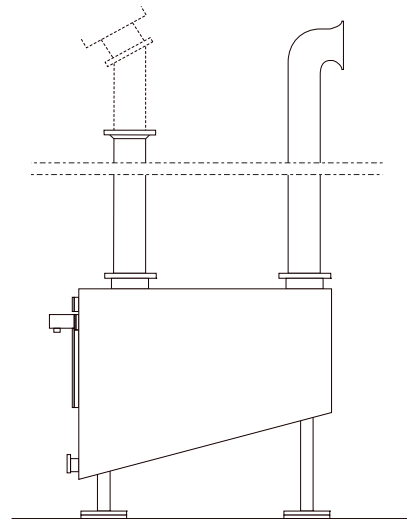


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Sludge discharge tank

If the sediment from the separator is discharged into a tank, this tank must be sufficiently ventilated. The connection between the separator and the tank must be of the size and configuration specified.

If the solids are discharged from the separator bowl casing into a closed system, ensure that this system cannot be overfilled or closed in such a way that the solids cannot leave the bowl casing. This could cause a hazardous situation.



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9.4 Storage at out of operation

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

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

For details see *9.2.2 Protection and storage of gods, page 167*

9.5 Before start-up

If the separator has been out of operation for:

1 months or longer

- Pre-lubricate the spindle bearings.

6 months or longer

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

18 months or longer

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

