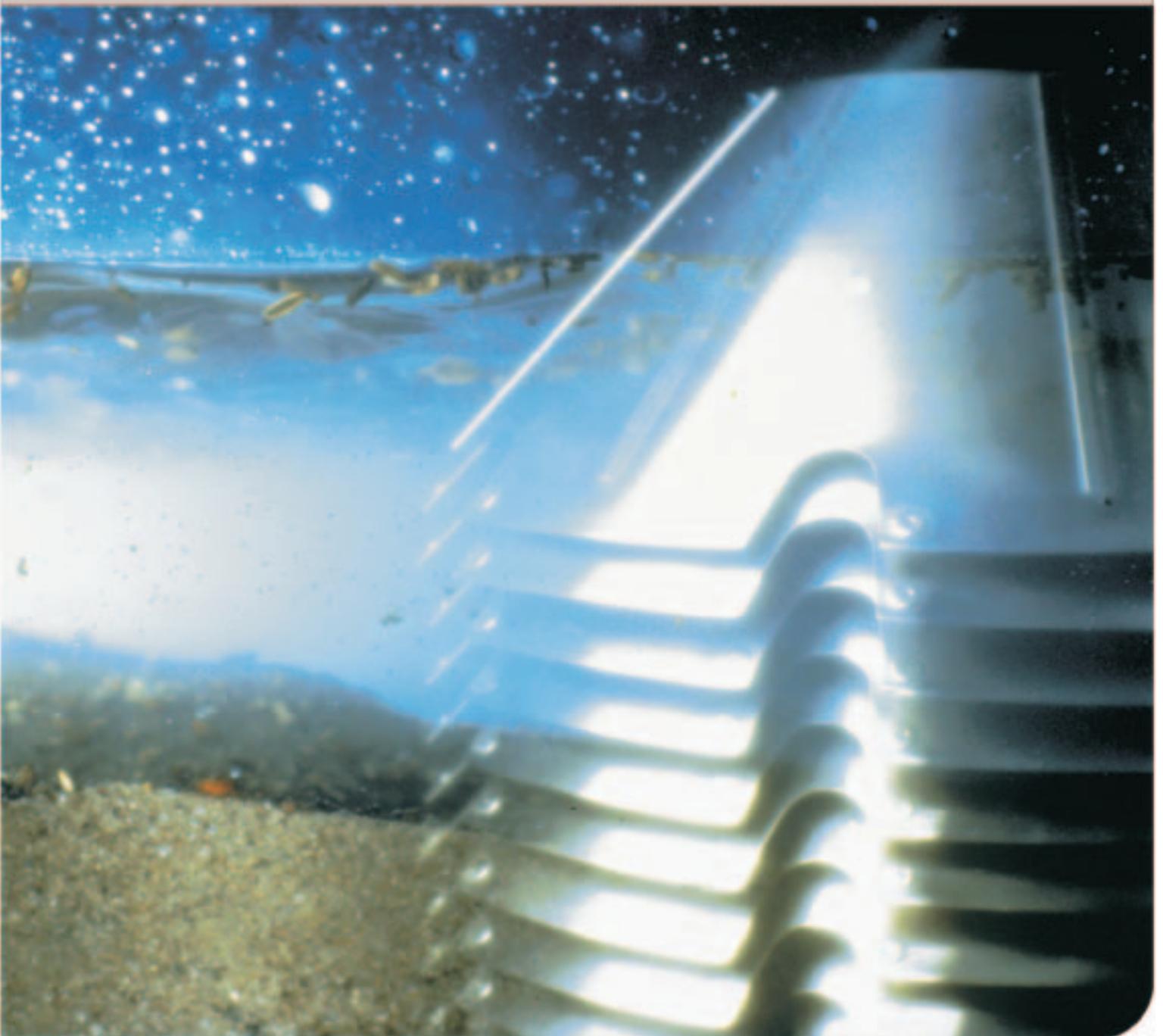




Separator Manual
High Speed Separator

MIB 303S-13/33



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

Not following the instructions can result in serious accidents.

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



1 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

- If excessive vibration occurs, **stop** separator.
- Use the separator only for the purpose and parameter range specified by Alfa Laval.
- 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.



S0151241

S01512H1



Entrapment hazards

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

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



S0151261



Electrical hazard

- Follow local regulations for electrical installation and earthing (grounding).
- To avoid accidental start, switch off and lock power supply before starting **any** dismantling work.



S0151271



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.



S0151201



Flying objects

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



S01512C1



1.1 Warning signs in text

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



DANGER

Type of hazard

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



WARNING

Type of hazard

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



CAUTION

Type of hazard

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

NOTE

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



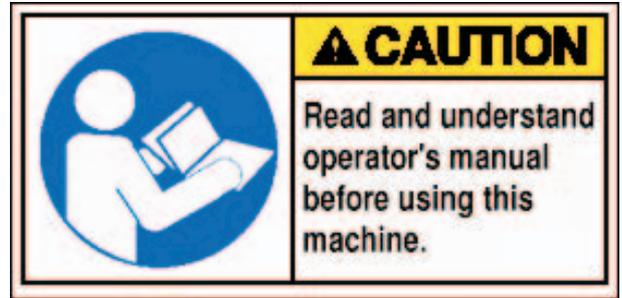
Warning label

Warning label placed on the separator hood.

Interpretation:

Stop! Read the instruction manuals before installation, operation and maintenance.

Failure to strictly follow instructions can lead to fatal injury.



Label for English-speaking markets



Label for other markets

Machine plate

Plate placed on the separator base.

Text on label:

Separator type MIB 303S-13/33

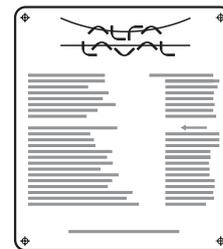
Product number 881176-10-01

Speed max. 7 500 r/min

Rotation ----->

Supply voltage 230V ~50/60 Hz 110V ~50/60 Hz

Current max. 4 A 8A





1.2 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 wear parts in the machine are replaced.

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.

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



1.3 Requirements of personnel

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

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

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



2 Separator Basics

2.1 Application

The use of the separator is restricted to removal of water and solids from gas oil, marine diesel oil and lube oil.

The table below shows examples of oils to be treated:

Oil type	Density at +15 °C	Viscosity at +40 °C	Recommended separation temperature (°C)
Gas oil	810 - 860 kg/m ³	1,5 - 6 cSt	40
Marine diesel oil	850 - 920 kg/m ³	Up to 14 cSt	40
Lube oil	Max. 920 kg/m ³	Up to 150 cSt	70

NOTE

Maximum permissible separation temperature is +70 °C.



WARNING

Disintegration hazard

Do not use the separator for separating any oils or liquids other than those specified above.

2.2 Conversion kit

If the liquid to clean only contains smaller amounts of water and solids, the purifier bowl can be converted to a clarifier, using the optional conversion kit to replace the purifier parts in bowl, see “2.5 Changing operation mode” on page 22.

A brief explanation of the different modes is given in “2.4 Working principle” on page 21.

2.3 Description of main parts

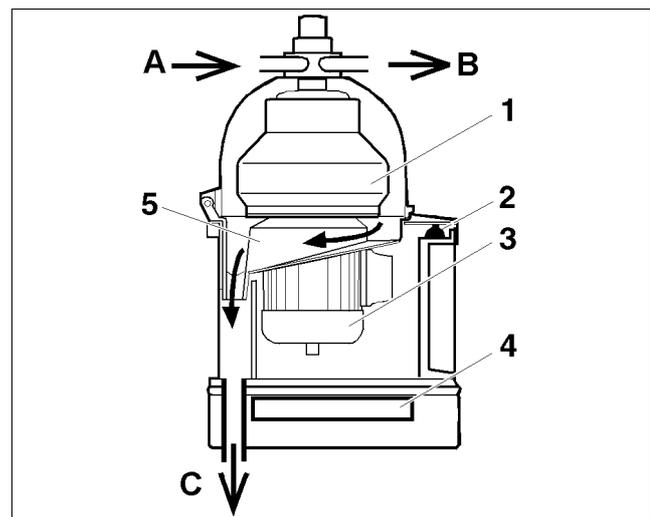
2.3.1 Overview

A general view of the separator is shown in the illustration beside.

The oil is fed to the oil inlet (A) and down to the rotating bowl (1) where separation takes place. The cleaned oil leaves the separator at (B). If the separator is working as purifier, the separated water runs down the water collecting channel (5) to the water outlet (C).

The bowl (1) and motor (3) are suspended on three vibration dampers (2).

The frequency converter (4) for the motor is mounted at the bottom of the separator.



Separator

- A. Dirty oil inlet
- B. Clean oil outlet
- C. Water outlet.

When the separator is stopped the bowl is drained via this outlet.

- 1. Bowl
- 2. Vibration dampers
- 3. Electric motor
- 4. Frequency converter
- 5. Water collecting channel

More details are shown in the illustration on next page.

2.3.2 Detailed description

Separation takes place in the bowl (6) which is mounted directly on the motor shaft. The bowl contains a set of conical discs (7) between which the separation process takes place.

The bowl wall (6) and the paring chamber cover (2) are held in place by the lock nut (5).

NOTE

The lock nut has a conventional right-hand thread contrary to most Alfa Laval separators that have left-hand threaded lock rings.

The paring disc (3) is stationary, held by the paring disc knob (1). Below the paring disc a level ring (4) is fitted. Two level rings are delivered with the separator. Which level ring to be used is dependent of which type of oil to be separated. See further description in “3.3.2 Before start” on page 27.

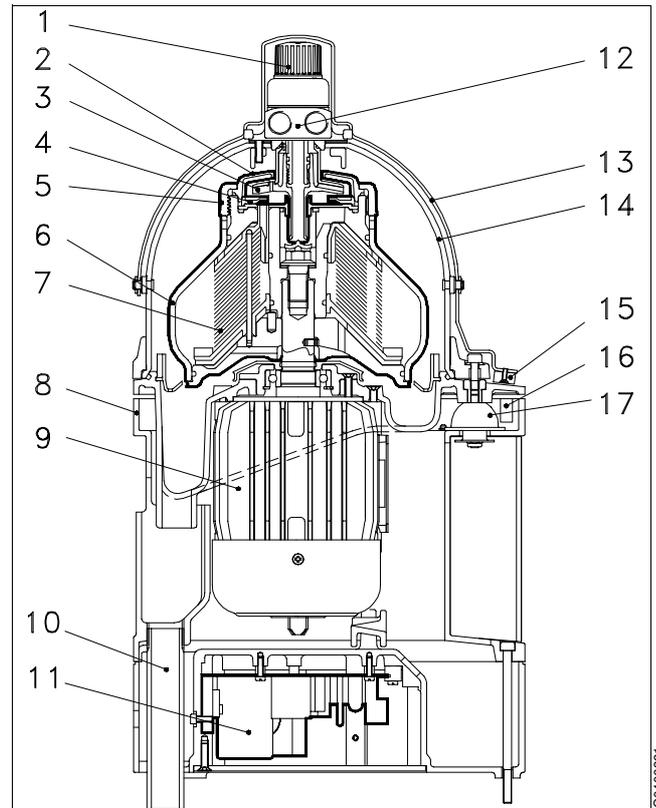
The motor flange rests on three rubber cushions (17) in the frame (8). When operating the separator as purifier, an inclined channel in the motor flange directs water that has been separated from the oil down to the water outlet (10).

The motor (9) is powered via an electronic frequency converter (11), which converts the incoming mains to an output frequency of 125 Hz. This gives the motor and bowl an operating speed of 7500 r/min. When the current is switched off the converter acts as a brake quickly reducing the speed to below 1000 r/min. within 25 seconds.

The separator is equipped with the following safety devices:

A safety yoke (13) over the hood (14) and the oil connection housing (12) has a magnet (15) which operates a magnetic safety switch (16), so that power can only be supplied to the motor when the yoke is in its upright position. The yoke can be raised to this position only when both the mounting screws of the hood and the paring disc knob (1) have been tightened.

The separator also has built-in overload protection.

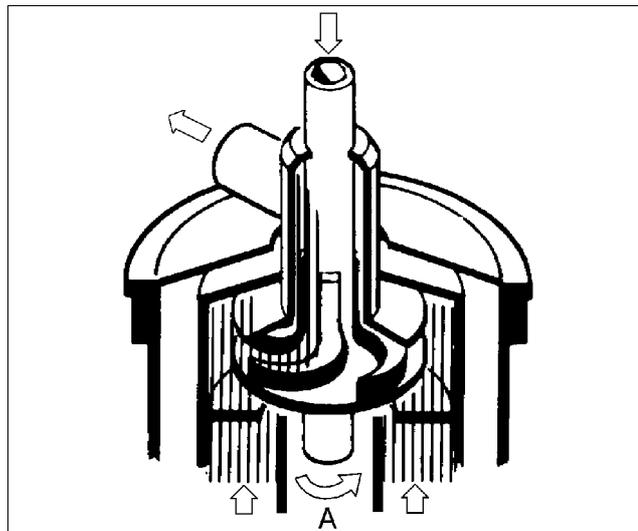


Separator main parts

1. Paring disc knob
2. Paring chamber cover
3. Paring disc (see separate description on page 20)
4. Level ring
5. Lock nut
6. Bowl
7. Disc stack
8. Frame
9. Motor
10. Water outlet
11. Frequency converter
12. Oil connection housing
13. Safety yoke
14. Hood
15. Magnet
16. Magnetic safety switch
17. Rubber cushions

2.3.3 Paring disc

The paring disc serves as a stationary pump wheel mounted in a chamber in the rotating bowl neck. The paring disc dips radial into the rotating liquid ring and pares out the liquid (oil). The paring disc is used as a discharge pump.



The liquid and all bowl parts (except the stationary paring disc) rotate in direction illustrated by arrow (A)

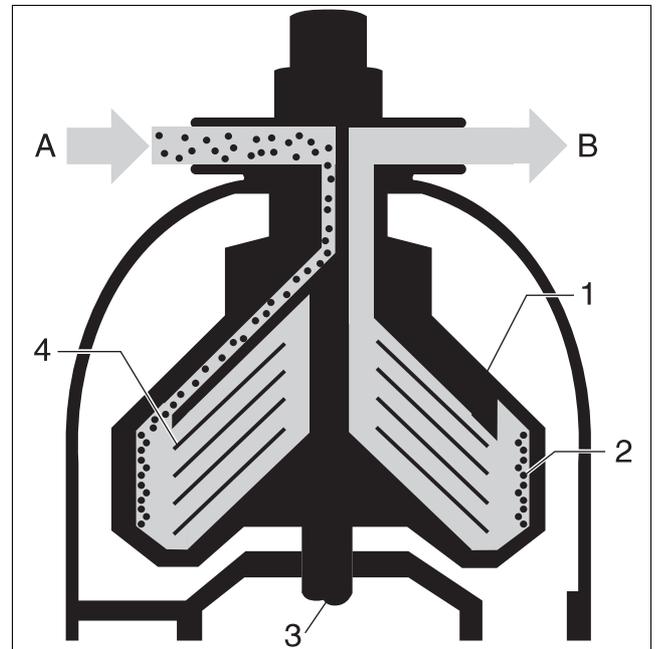
2.4 Working principle

2.4.1 Clarifier mode

The unseparated oil continuously enters at (A) and flows into the bowl (1). The particles (2) are separated and deposited on the bowl wall.

The cleaned oil is forced inwards to the centre of the bowl and up to a paring disc (not illustrated). Since the oil is rotating, the stationary paring disc acts as a pump which forces the oil out through outlet (B) under a constant pressure.

The particles accumulated on the bowl wall are removed periodically by hand.

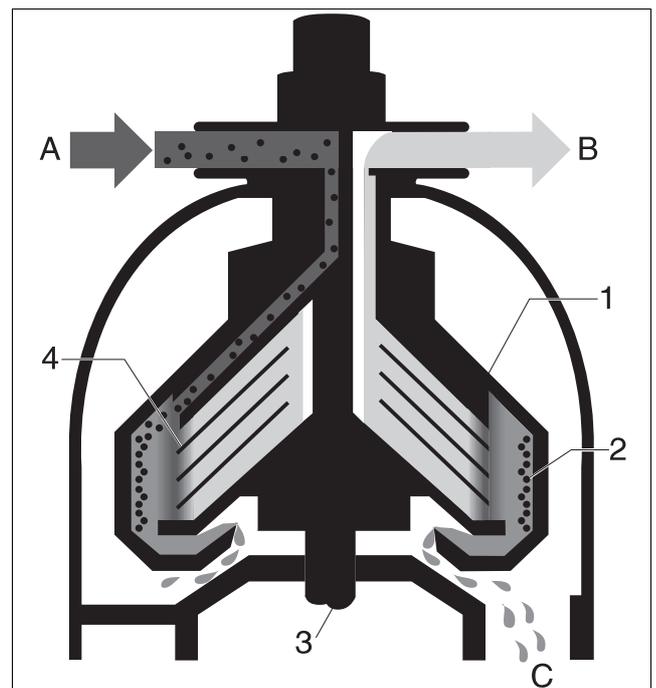


Clarifier bowl

2.4.2 Purifier mode

When operating the separator as a purifier a water seal must be established before the oil feed is started. If not, oil will flow out through the water outlet (C). How to proceed is described in [“3.3.3 Start” on page 28](#).

Otherwise the separation principle is similar to clarification except that the separated water, which is heavier than the oil, leaves through the underside of the bowl at (C).

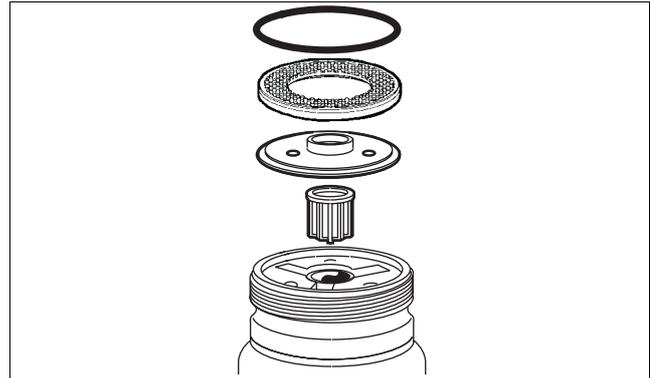


Purifier bowl

2.5 Changing operation mode

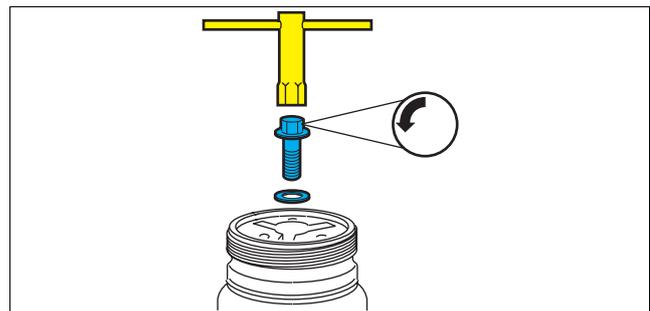
When changing operating mode from clarifier to purifier, or vice versa, proceed as follows:

1. Dismantle the separator in the same way as when cleaning the bowl, see 5.4.2 on page 40.
2. Remove the level ring, O-ring, lower part of paring chamber and the sleeve with wings.



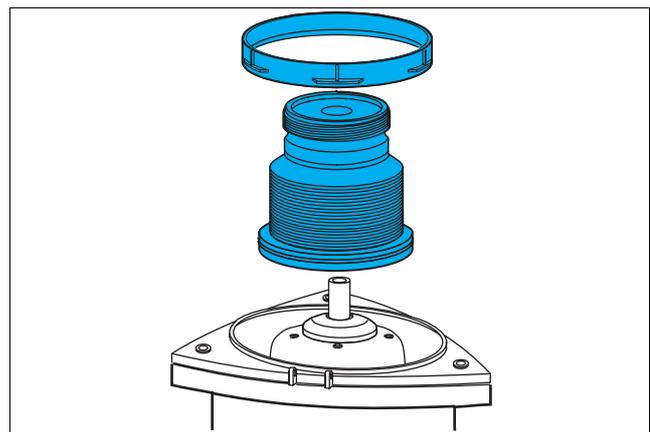
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3. Unscrew the centre screw.



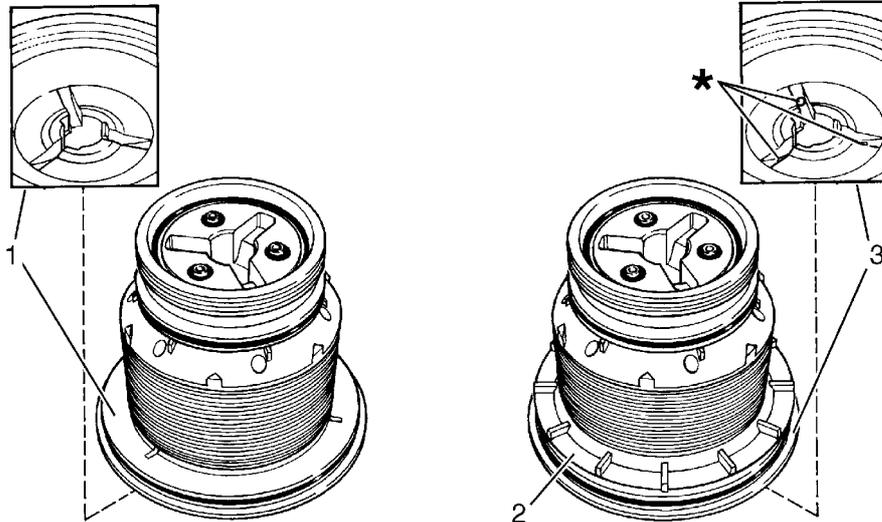
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4. Lift out the bowl insert. If it is difficult to get the insert loose from the bowl spindle, then first remove the splash guard (the white plastic ring) to get a better grip on the bowl bottom.



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A number of parts have to be replaced in the bowl when changing operation mode. The illustration below shows the differences between a clarifier and purifier bowl insert. The number of bowl discs is also different between the modes.



Clarifier bowl insert (fitted as delivered)

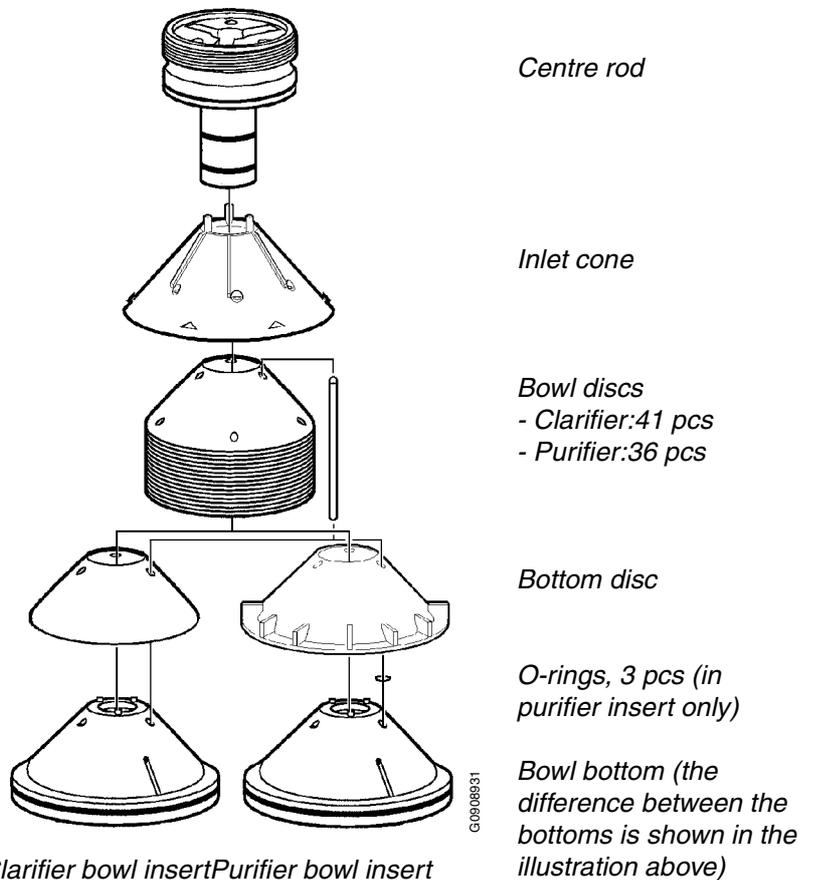
Purifier bowl insert

- 1. Bowl bottom (clarifier), no holes
- 2. Bottom disc (purifier)

- 3. Bowl bottom (purifier) with three holes (*)

5. Rebuild the bowl insert as described below.

- a. Separate the bowl insert parts as illustrated.
- b. Add (as clarifier) or remove (as purifier) 5 pcs of the bowl discs.
- c. Replace the bottom disc.
- d. Remove (as clarifier) or add (as purifier) the three O-rings fitted on the pins between the bottom disc and bowl bottom.
- e. Replace the bowl bottom.
- f. Assemble the bowl insert parts as illustrated.



Clarifier bowl insert Purifier bowl insert

Centre rod

Inlet cone

Bowl discs
- Clarifier: 41 pcs
- Purifier: 36 pcs

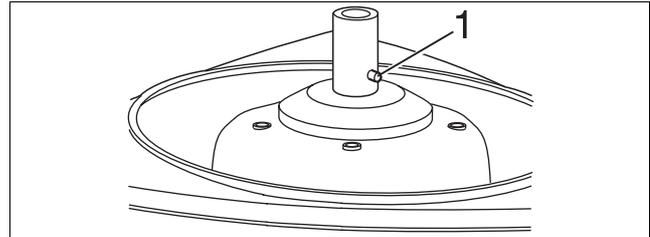
Bottom disc

O-rings, 3 pcs (in purifier insert only)

Bowl bottom (the difference between the bottoms is shown in the illustration above)

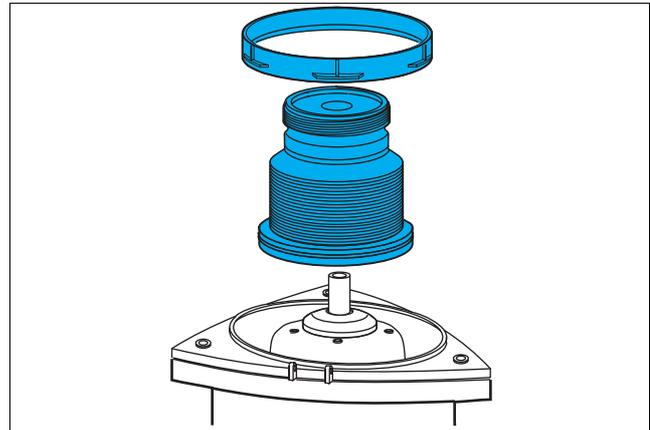
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6. When fitting the insert, check that the cylindrical pin (1) is not missing in the shaft. Check that the pin enters the guide in the bottom of the insert.



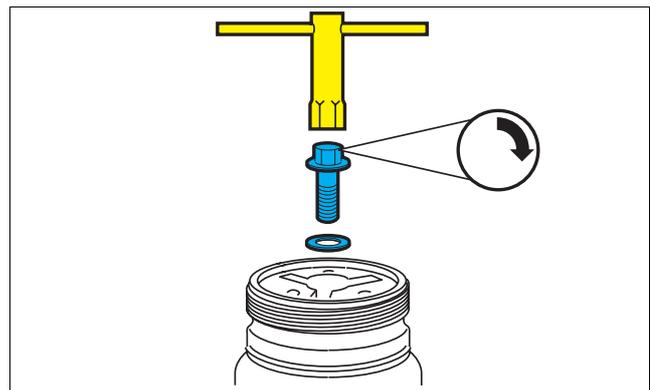
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7. Tighten the centre screw. Check that **one** washer is fitted under the screw.

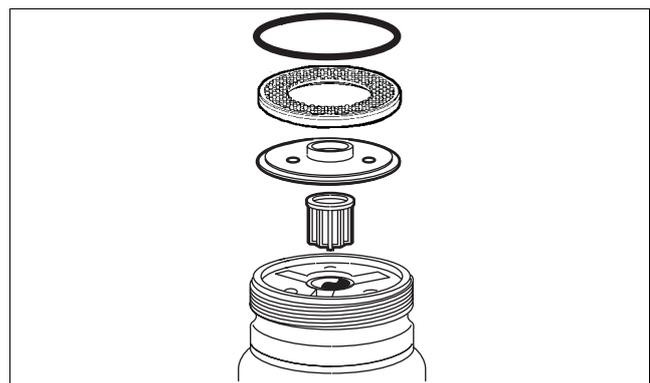


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8. Fit the sleeve with wings, lower part of paring chamber, level ring and O-ring. Use correct level ring, see “3.3.2 Before start” on page 27.



G05191C1



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NOTE

See the instructions in “5.4.2 Cleaning of bowl” on page 40 how to fit the level ring and O-ring correctly.

These pages also describe the rest of the assembly of the separator.

3 Operating Instructions

3.1 Separation mode

To learn the correct running strategy, first read the information below carefully before starting the separation process.

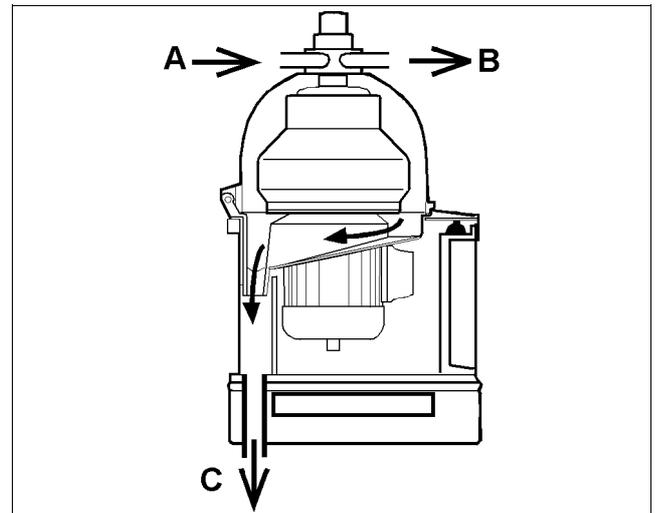
1. Decide if the separator will be operated as clarifier or purifier. The difference between them is described in [“2.4 Working principle” on page 21](#).

At delivery the separator is assembled as a clarifier.

2. If the amount of water and sludge in the oil is unknown, start the separation in clarifier mode (how to change operation mode is described in chapter [2.5 on page 22](#)).
3. Run the separator for 1 - 2 hours.

Then stop the separator and drain content (about 1 litre) from the outlet (C) into a glass bottle or similar to check the water content. If water is found, operate the separator as a purifier.

- A. *Inlet of uncleaned oil*
 - B. *Outlet of cleaned oil*
 - C. *Water outlet.*
- When the separator is stopped the bowl is drained via this outlet.*



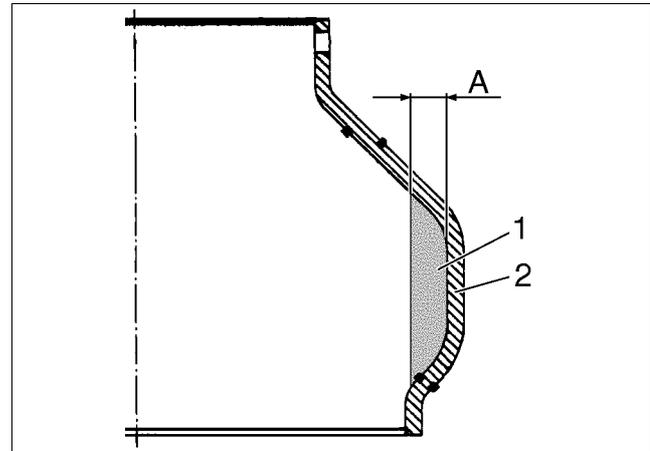
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3.2 Separation time

Dismantle the separator and measure the thickness (A) of the sludge collected on the bowl shell, see “5.1 Cleaning” on page 37. The thickness should never exceed 10 mm.

Max. recommended cleaning interval is 3 days. A longer interval can result in a sludge cake that is hard and difficult to remove. Too long interval can also result in that sludge enters the disc stack and hinders separation. Oil overflow and vibration can also occur.

When cleaning very contaminated oil, bowl cleaning every 20 - 30 minutes could be necessary.



A. Max. thickness = 10 mm
(corresponds to 0,6 litre)

1. Sludge
2. Bowl shell

NOTE

The separator can be operated either as a clarifier or as a purifier. Choose **clarifier operation** when **no** or only traces of **water** in the oil. At delivery the separator is assembled for clarifier operation.

Choose **purifier operation** when the oil contains **much water**.

The differences between the two modes are further described on page 21.

3.3 Operating routine

3.3.1 Introduction

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

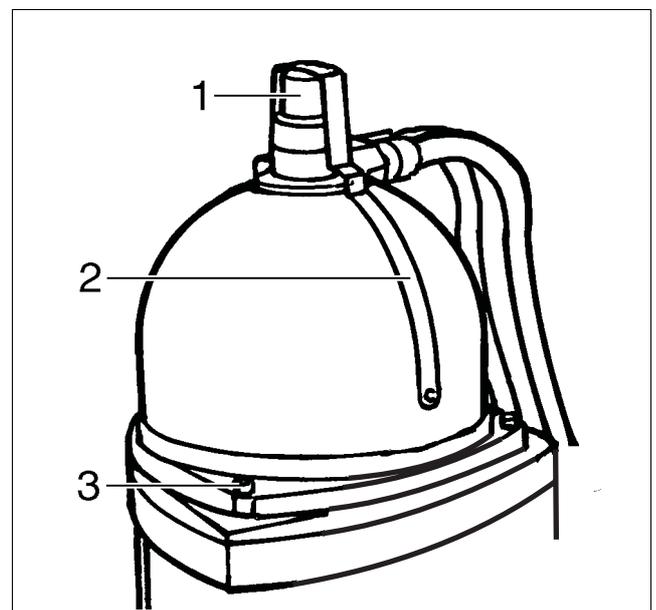
NOTE

If there is a System Manual, always follow the operating instructions given therein. If there is no System Manual the instructions below are to be followed.

3.3.2 Before start

- The separator is set up as clarifier when delivered. In case that purifier mode is needed, please convert the bowl as described in chapter “2.5 Changing operation mode” on page 22.
- Make sure that the separator is correct assembled according to the instructions given in chapter “5 Maintenance” on page 37.
- If running the separator in purifier mode, make sure that the correct level ring is fitted:
 - For cleaning **gas oil** only, fit the **white level ring** which has a 43 mm diameter hole.
 - For cleaning marine diesel oil and lube oil, fit the **black level ring** which has a 50 mm diameter hole.
 - For alternating between marine diesel oil and gas oil, fit the black level ring which has a 50 mm diameter hole.
- Make sure that the three hood screws (3) and the paring disc knob (1) are firmly tightened and that the safety yoke (2) is in its closed (vertical) position.
- Make sure the bowl is free from sludge before restarting.

	<p>WARNING</p> <p>Disintegration hazard</p>
<p>Unevenly spaced sludge cake will result in heavy vibration and damage can be caused.</p>	



1. Paring disc knob
2. Safety yoke
3. Hood screw (3 pcs)

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3.3.3 Start

1. Make sure that the outlet valve for cleaned oil is open.
2. Start the separator (keep the button pressed 3 - 4 seconds).



WARNING

Disintegration hazard

Some vibrations can occur for short periods during the start phase when the separator passes through the critical speed. This is normal and passes over without danger. If the vibrations become very severe or continue at full speed, **stop the separator immediately**. See chapter [“4.3 The separator vibrates”](#) on page 32 for possible causes.

3. When operating in purifier mode only!

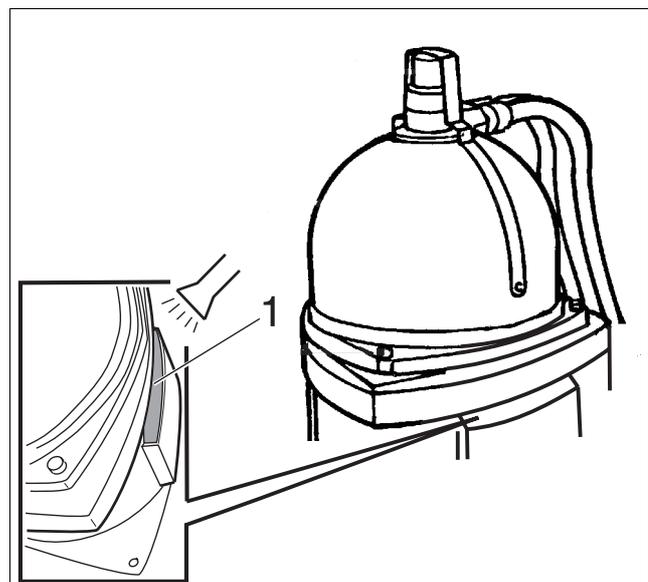
After 20 seconds, when the separator has gained full speed, feed at least one litre of water into the oil inlet line. This will create the water seal.

4. Turn on the oil feed to the separator.
Max. recommended flow is 1 000 litres/hour.
Check that the oil has reached correct separating temperature, see [“2.1 Application”](#) on page 17.
5. Regulate the counter pressure in the oil outlet line to 40 - 60 kPa.

6. When operating in purifier mode only!

After 1 minute, check that oil is not discharging from the separator. Check as illustrated (1) using a torch or check through the water outlet at the bottom of the separator.

If oil escapes through the water outlet, stop the oil feed and follow the instructions given in [“4.7 Some oil is escaping through water outlet”](#) on page 34 or [“4.8 Oil flows through water outlet only”](#) on page 34.



Check if oil escapes through the water outlet (1)

3.3.4 Operation

NOTE

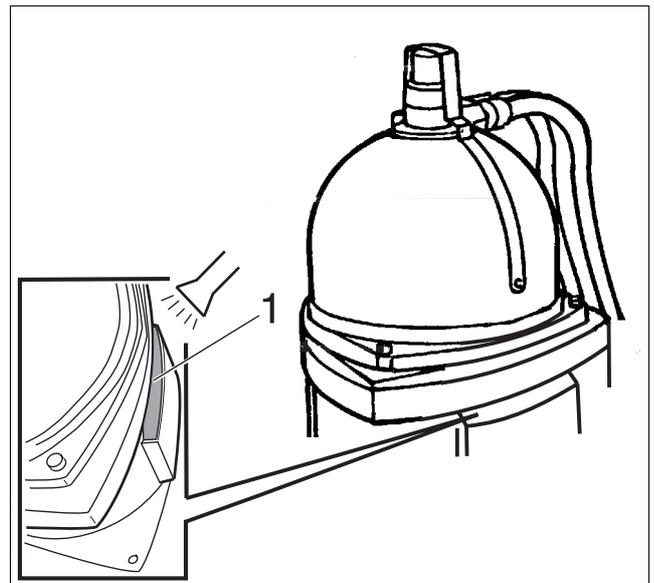
Never run the unit longer than 3 days between bowl cleaning. It is important to follow the instructions in [“3.2 Separation time”](#) on page 26.

Check the separator for correct operation (temperature, counter pressure and vibration). This is especially important the first few times the separator is run after installation or after any dismantling and assembly has been carried out.

When operating in purifier mode only!

Check that oil is **not** discharging from the separator. Check as illustrated (1) using a torch or check through the water outlet at the bottom of the separator.

If oil escapes through the water outlet, stop the oil feed and follow the instructions given in [“4.7 Some oil is escaping through water outlet”](#) on page 34 or [“4.8 Oil flows through water outlet only”](#) on page 34.



Check if oil escapes through the water outlet (1)

3.3.5 Manual stop

NOTE

After each stop the separator bowl must be well cleaned. Otherwise an unevenly spaced sludge cake will at next start result in heavy vibration and damage can be caused.

1. Turn off the oil feed.

2. Stop the separator.

When the separator has nearly stopped rotating, the contents of the bowl (approx. 1 litre) will be drained out by gravity at the bottom of the separator. This is the normal draining of the bowl as it stops, both in purifier and clarifier mode.

3. Make sure that the valves are closed on both the feed and outlet sides of the separator. If this is not done and the position of the tank level is higher than the inlet/outlet of the separator, there is a risk that oil may be siphoned through the separator.

3.3.6 Automatic stop

The separator is automatically stopped by the built-in electronic safety devices if one of the following situations should occur:

- too high current due to overload of the separator motor
- too high temperature in the frequency converter
- wrong frequency from the converter.

Auxiliary safety devices that also stop the separator: See [“6.7 Connection diagrams” on page 62](#).

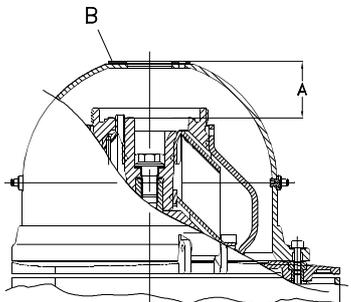
NOTE

If the separator stops, the oil feed must be stopped immediately or there will be serious oil overflow.

If the separator does not start or if it stops during operation, follow the instructions given in [“4.1 The separator does not start” on page 31](#) and [“4.2 The separator stops” on page 32](#).

4 *Trouble shooting*

4.1 The separator does not start

Possible cause	Action
Safety yoke is not in the correct position.	Position the yoke correctly.
No power supplied to the separator.	Check the mains switch, fuses and supply line.
Defective magnetic safety switch indicating the position of the safety yoke.	Make sure that the switch opens and closes when the safety yoke is moved up and down. Measure across terminal points Nos 5 and 6 on the frequency converter board. Replace the switch if faulty.
Incorrect assembly after cleaning. The bowl and motor shaft can not rotate freely.	Make sure that the bowl and motor shaft can rotate freely by turning the bottom end of the motor shaft with a suitable tool.
Incorrect height adjustment of paring disc after major overhaul.	<p>The height adjustment of the paring disc is measured as shown in figure. The height A should be $48,5 \pm 0,5$ mm and can be adjusted by the number of washers B (1-3 pcs) under the oil connection housing.</p> 
Defective motor or frequency converter.	See “5.4.7 Replacement of frequency converter” on page 53.
Voltage protection on frequency card trips because of too low/high voltage or voltage spikes.	Check the voltage. If unstable voltage, connect a transformer.

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4.2 The separator stops

Possible cause	Action
The safety yoke has been moved out of its position.	Reposition the yoke. Running position = vertical.
Overload due to incorrect assembly.	Check the bowl assembly.
Too high counter pressure.	Reduce the counter pressure (40 - 60 kPa is recommended).
Tripped frequency converter due to too low or too high supplied voltage (>±10% of nominal voltage).	Check the voltage. If unstable voltage, connect a transformer.
Defective motor or frequency converter.	See “5.4.7 Replacement of frequency converter” on page 53.

4.3 The separator vibrates



WARNING

Disintegration hazard

If excessive vibrations occur, **stop** the separator.

Possible cause	Action
Bowl out of balance due to: <ul style="list-style-type: none"> • Insufficient or incorrect cleaning (sediment in disc stack). • Unevenly spaced sediment cake (bowl not cleaned prior to start). • Incorrect assembly. 	Dismantle and clean the separator bowl. Be sure that the separator is assembled correctly.
Vibration dampers are worn.	Fit three new dampers.
Motor bearings are damaged.	Fit new bearings.

4.4 Noise

Possible cause	Action
Incorrect assembly.	Dismantle and assemble correctly.
Motor bearings are damaged.	Fit new bearings.
Vibration dampers are worn.	Fit new dampers.

4.5 Low outlet flow

Possible cause	Action
Too low flow rate of feed.	Check the feed line - increase the flow rate.
Too high counter pressure at outlet.	Reduce the counter pressure (40 - 60 kPa is recommended).
Leakage caused by incorrect assembly.	<ul style="list-style-type: none"> The three screws fastening the frame hood or the paring disc knob (the upper part of the separator) are not completely tightened. Dismantle and check the separator bowl parts. Especially check that no O-rings are missing, are defective or incorrectly fitted. Ensure that the separator is assembled correctly.
Separator rotates in wrong direction.	Connect the electrical connections properly.

4.6 Insufficient separation result

Possible cause	Action
The black level ring is too large for present oil (purifier only).	Replace the black level ring with the smaller (white) level ring.
The oil feed rate is too high.	Reduction of the feed rate improves the separation result.
The separation temperature is too low.	Adjust the setting of the heating.
The counter pressure is too low.	Increase the counter pressure until water is observed to be discharged from the water outlet. Recommended counter pressure is 40 - 60 kPa.
The separator disc stack is clogged.	Clean the separator bowl and disc stack. Shorten the cleaning interval.

4.7 Some oil is escaping through water outlet

Possible cause	Action
Too high counter pressure at outlet.	Reduce the counter pressure (40 - 60 kPa is recommended).
The separator disc stack is clogged.	Clean the separator bowl and disc stack. Shorten the cleaning interval.
The three screws fastening the bowl hood or the paring disc knob (the upper part of the separator) are not completely tightened, causing leakage.	Tighten the screws and /or the knob.
If operating in purifier mode: Insufficient sealing between bottom disc and bowl bottom in separator (O-rings may be missing).	Dismantle and check the separator bowl. Be sure that the separator will be assembled correctly.

4.8 Oil flows through water outlet only

Possible cause	Action
Obstruction in cleaned oil feed line.	Check the feed line.
If operating in purifier mode: Insufficient water seal in the bowl.	<p>Either no water was added at start-up or the water seal has broken during operation. Add 1 litre of water to create a new water seal.</p> <p>If this fault repeats itself so that oil again discharges through the water outlet the density of the oil is too high. Stop the separator and fit the black level ring instead of the white one. If the black level ring is already installed, this oil cannot be cleaned in the separator because the density of the oil is too high.</p>

4.9 No outlet flow either through clean oil outlet or water drain

Possible cause	Action
No feed.	Check the feed line (valves, feed pump, filter etc.).
The separator has stopped.	See “4.2 The separator stops” on page 32.

4.10 Oil leakage through water outlet when separator is not running

Possible cause	Action
Oil is siphoned from oil tank due to siphon effect.	Close valves on both feed and outlet sides of the separator.

5 Maintenance



WARNING

Entrapment hazard

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

5.1 Cleaning

The separated sludge collected inside the separator bowl must be removed manually. The length of the cleaning interval depends on the oil flow rate and on the amount of sludge, but the interval must never exceed 72 operating hours (3 days). For further information on max. permitted amount of sludge and other limitations, see [“3.1 Separation mode” on page 25](#).

[“5.4.2 Cleaning of bowl” on page 40](#) explains how to proceed.

NOTE

Never use cleaning agents with a pH below 6 or above 9 as they can damage the metal surfaces.

5.2 Once per year

Replace the O-rings with new ones included in the O-ring service kit. Their positions are shown in the *Spare Parts Catalogue*. Before fitting, lubricate the O-rings with the Silicone grease supplied in the service kit.

See [“5.4.3 Replacement of O-rings in purifier bowl” on page 45](#) and [“5.4.4 Replacement of O-rings in clarifier bowl” on page 47](#) how to proceed.

Check the condition of discs in the bowl, replace if necessary. See comments in [“5.3.1 Disc stack replacement” on page 38](#).

5.3 Every second year

5.3.1 Disc stack replacement

Check/replace the disc stack to maintain the separation efficiency. At separation temperature 60 °C and below, it is recommended to fit a new stack every two years to ensure that the separation efficiency is maintained.

At separation temperature above 60 °C, it is recommended that the disc stack is replaced every year or at any sign of brittleness.

See [“5.4.3 Replacement of O-rings in purifier bowl” on page 45](#) and [“5.4.4 Replacement of O-rings in clarifier bowl” on page 47](#) how to proceed.

The disc stack is available as a set.

5.3.2 Vibration damper replacement

Fit new vibration dampers every two years. Inspect the stop flanges of the dampers for possible damage and replace the stop flanges with new ones if necessary.

The position of the vibration dampers is shown in illustration No. 11 at page 49.

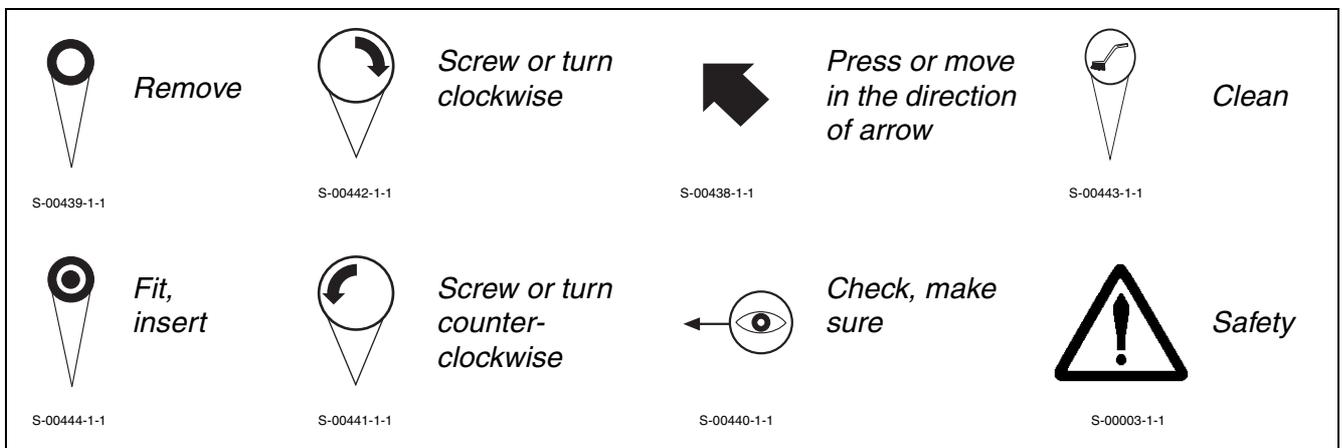
The vibration dampers are available as a set (see *Spare Parts Catalogue*).

5.4 Dismantling - assembly instructions

5.4.1 Introduction

The illustrations on the following pages describe step by step how to dismantle, clean, replace and assemble the various parts of the separator.

The illustrations have symbols only to indicate the actions required. The key to the symbols is given below.



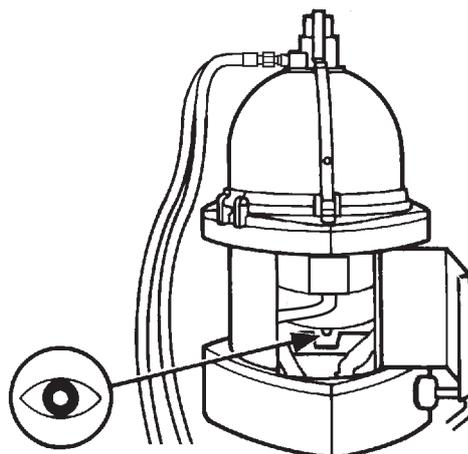
5.4.2 Cleaning of bowl

Comments to illustrations on opposite page.

Illustration 4:

Before dismantling the separator, wait until the rotating parts have come to a complete standstill, which will take up to two minutes.

To be sure, open the front cover and check that the rotation of the electric motor shaft has stopped.



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NOTE

If the separator is opened too soon, the following could happen:

- The pin on the inside of the connecting housing breaks.
- The pin inside the top of the paring disc breaks.
- Excessive wear of top of level ring.

Illustration 8:

A few drops of oil will normally leak from the connecting housing when the bowl hood is opened.

If oil continues to leak, the cause could be a non-sealing check valve (if any) while the separator is connected to an oil tank with an oil level higher than the separator (siphon effect).

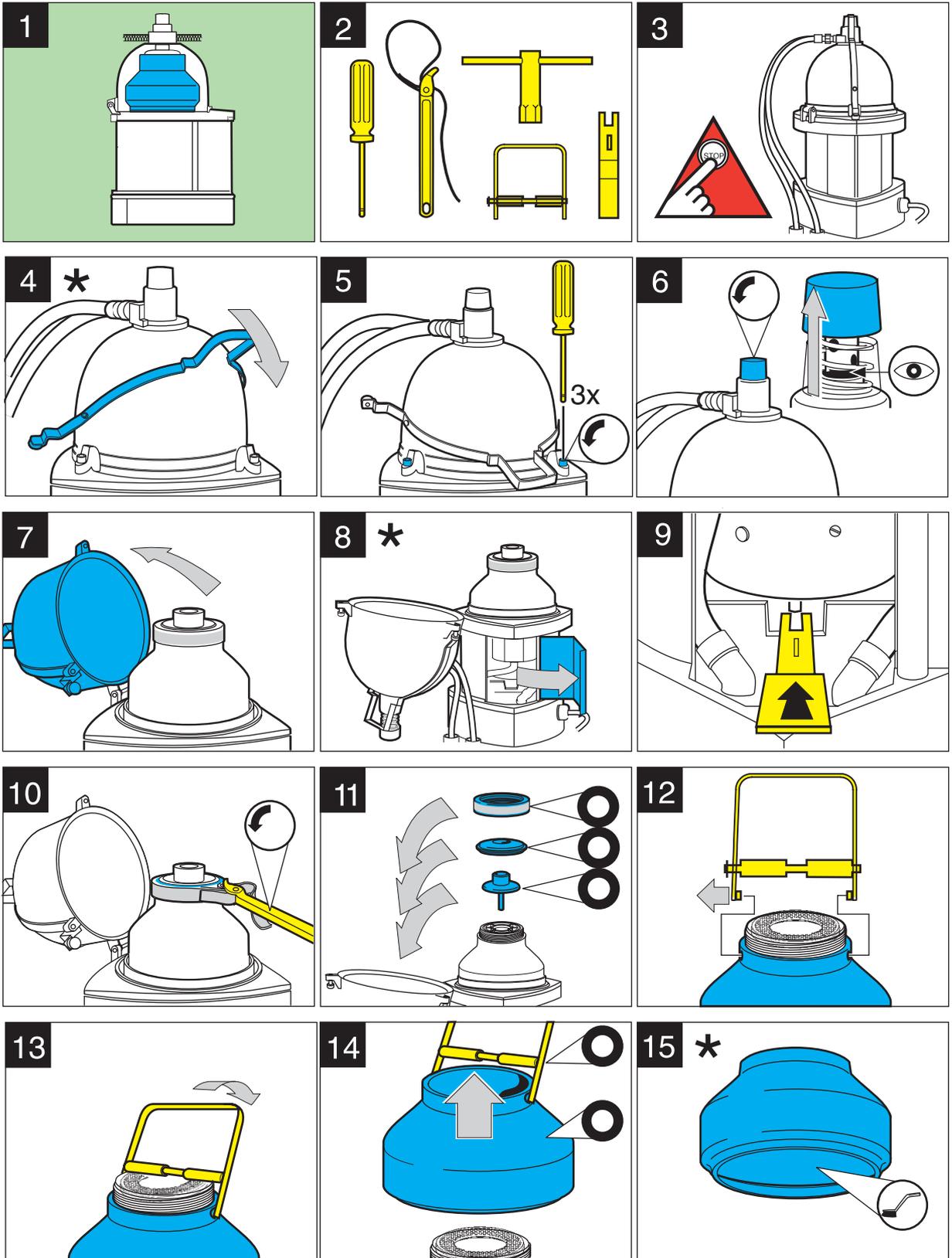
Illustration 15:

NOTE

Never use sharp or metallic tools when cleaning the bowl wall. This can damage the coating. Always use soft rags.

Cleaning of the disc stack is not normally necessary unless sludge has accumulated and entered the stack (cleaning interval too long).

Dismantling



* See comments on opposite page

Comments to illustrations on opposite page.

Illustration 16:

When fitting the bowl wall, press firmly downwards with both hands to overcome the resistance from the O-ring fitted on the bowl bottom. A “clicking” sound will be heard.

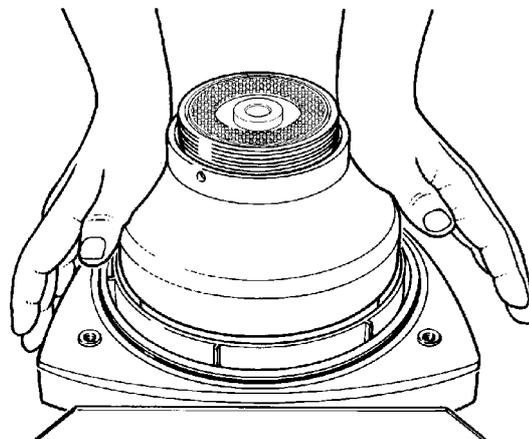
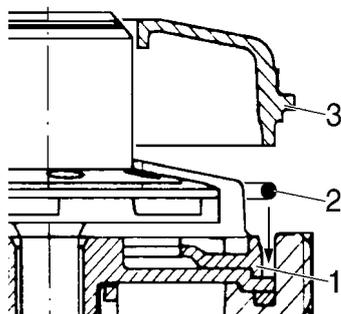
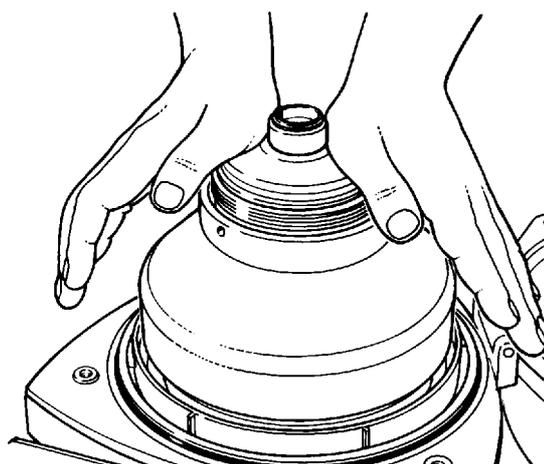


Illustration 17:

If the level ring (1) and O-ring (2) have been removed, first fit the level ring and then the O-ring outside the level ring. Finally press down the cover (3) firmly with both hands.



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Illustration 18:

Check that the distance illustrated is max. 0,5 mm. If not, the reason could be:

1. The O-ring outside the level ring is not in the downwards position or the O-ring is located under the level ring.
2. Two washers are fitted under the centre screw fixing the bowl to spindle.

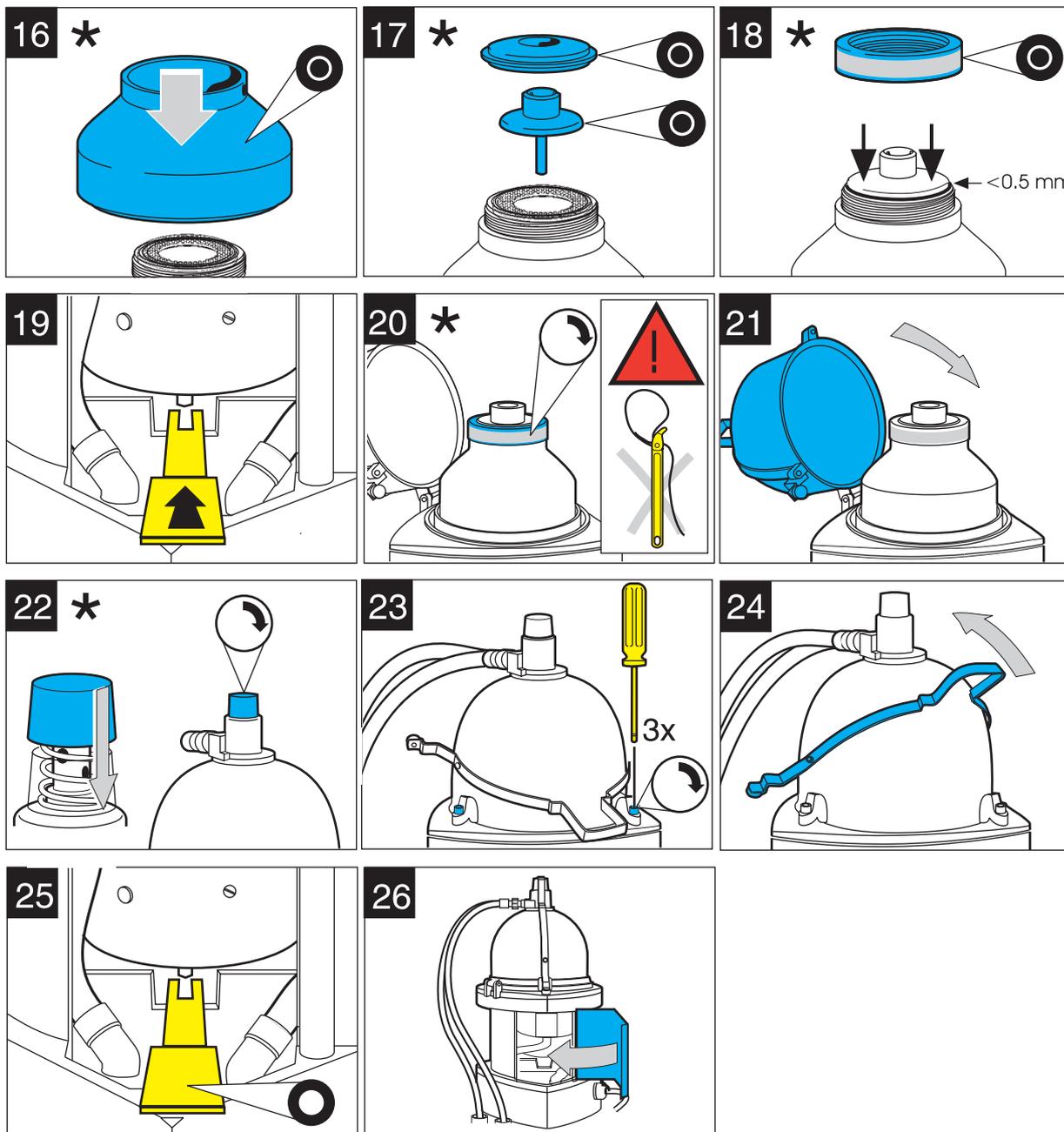
Illustration 20:

Only tighten by hand. Never over tighten when assembling parts.

Illustration 22:**NOTE**

Always screw home the knob fitted on the connecting housing **before** tightening the screws shown in illustration 23. Otherwise there is a risk that the pin inside the connecting housing could break.

Assembly



* See comments on opposite page and at top of this page

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5.4.3 Replacement of O-rings in purifier bowl

How to convert from purifier to clarifier bowl or vice versa is described in point [“2.5 Changing operation mode”](#) on page 22.

Comments to illustrations on opposite page.

Illustration 4:

Take care of the washer.

Illustration 13:

Check that the washer is fitted. Otherwise there is a risk that the bowl will not make firm contact with the spindle.

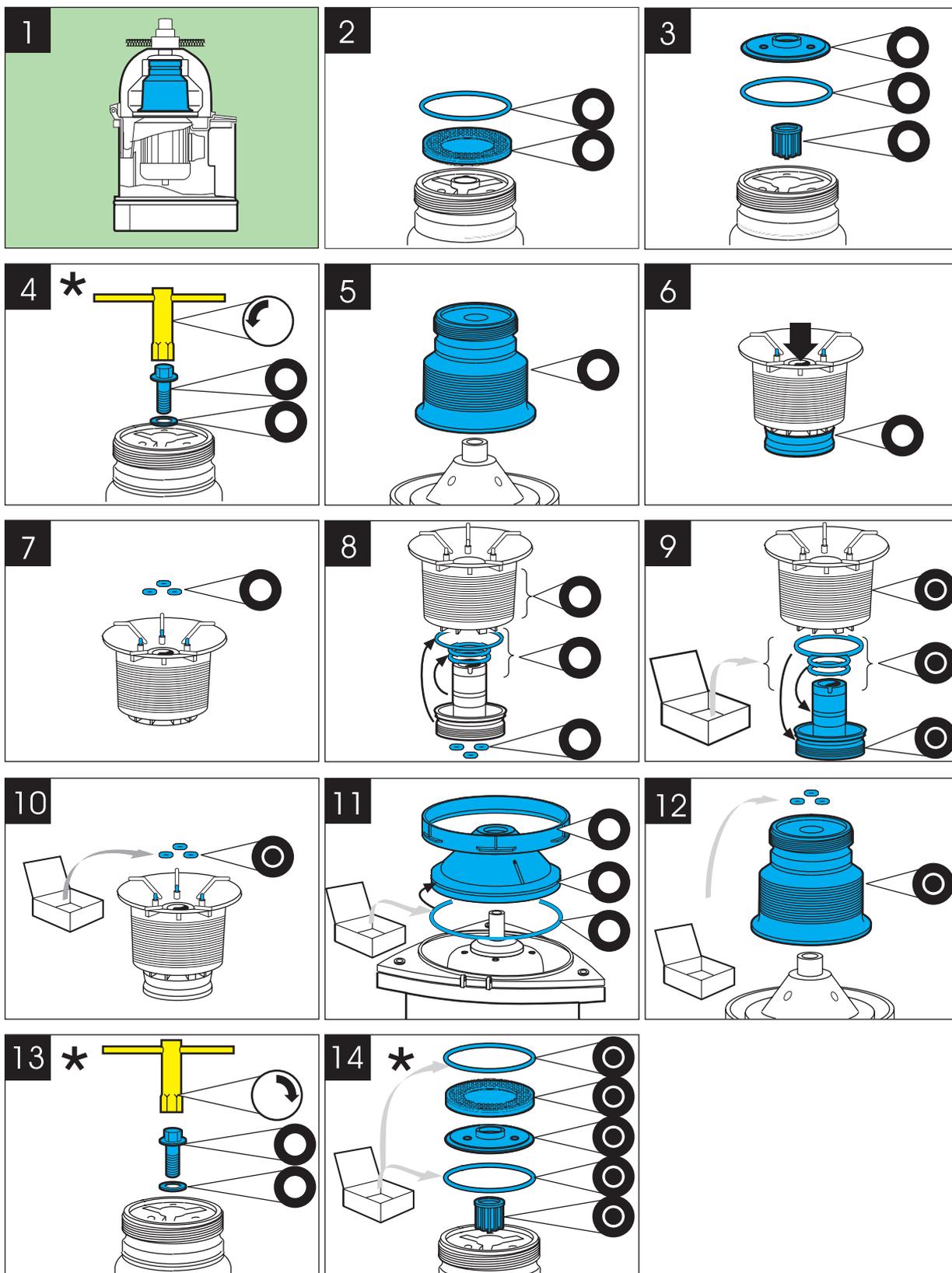
If two or more washers are fitted accidentally this will prevent the top parts of the bowl from being positioned correctly.

Illustration 14:

NOTE

Fit the upper O-ring outside the level ring, see comments to illustration 17 on page [42](#).

First dismantle the separator bowl as described in "5.4.2 Cleaning of bowl" on page 40.



* See comments on opposite page.

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5.4.4 Replacement of O-rings in clarifier bowl

How to convert from purifier to clarifier bowl or vice versa is described in point [“2.5 Changing operation mode”](#) on page 22.

Comments to illustrations on opposite page.

Illustration 4:

Take care of the washer.

Illustration 13:

Check that the washer is fitted. Otherwise there is a risk that the bowl will not make firm contact with the spindle.

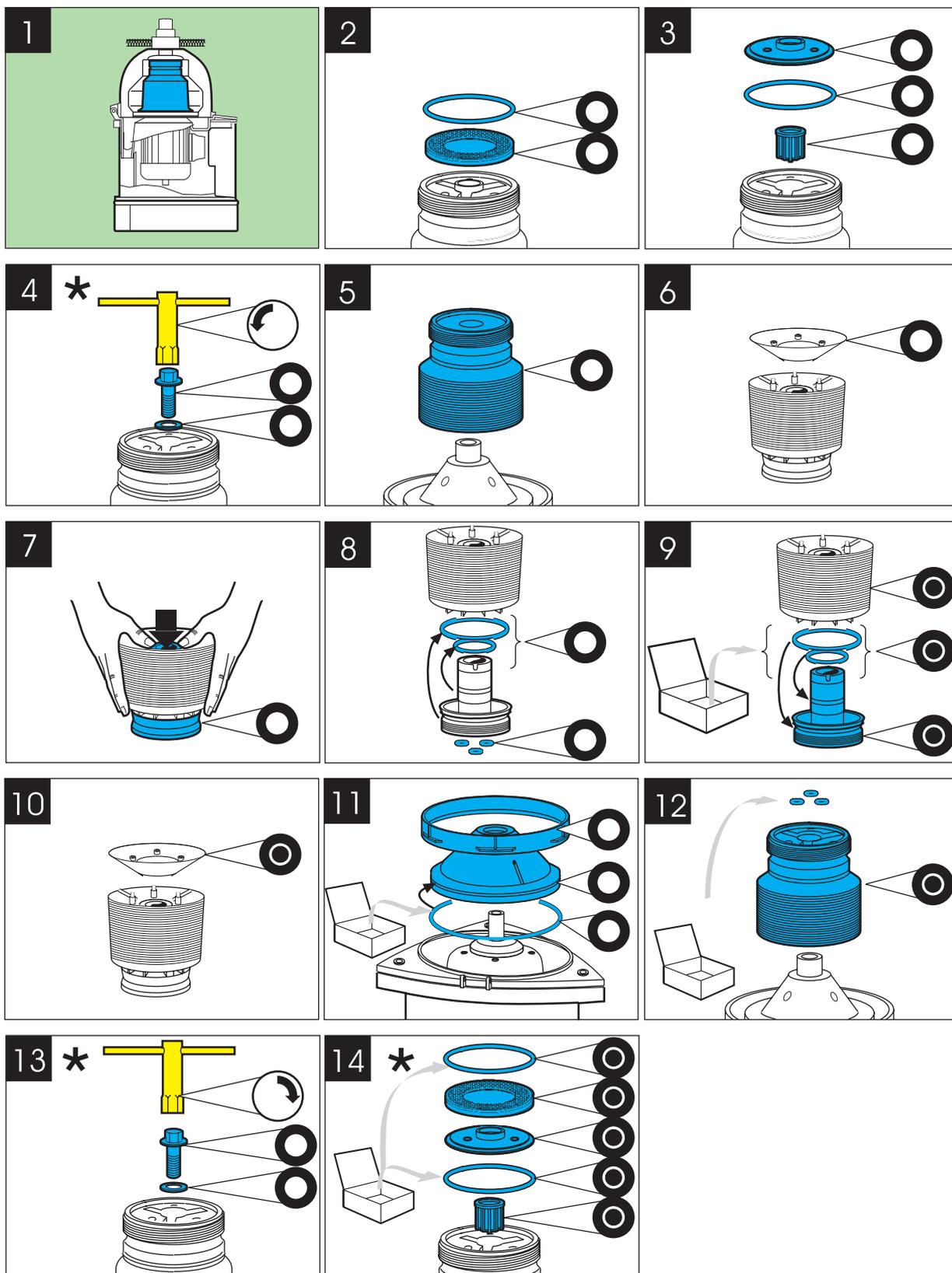
If two or more washers are fitted accidentally this will prevent the top parts of the bowl from being positioned correctly.

Illustration 14:

NOTE

Fit the upper O-ring outside the level ring, see comments to illustration 17 on page [42](#).

First dismantle the separator bowl as described in "5.4.2 Cleaning of bowl" on page 40.

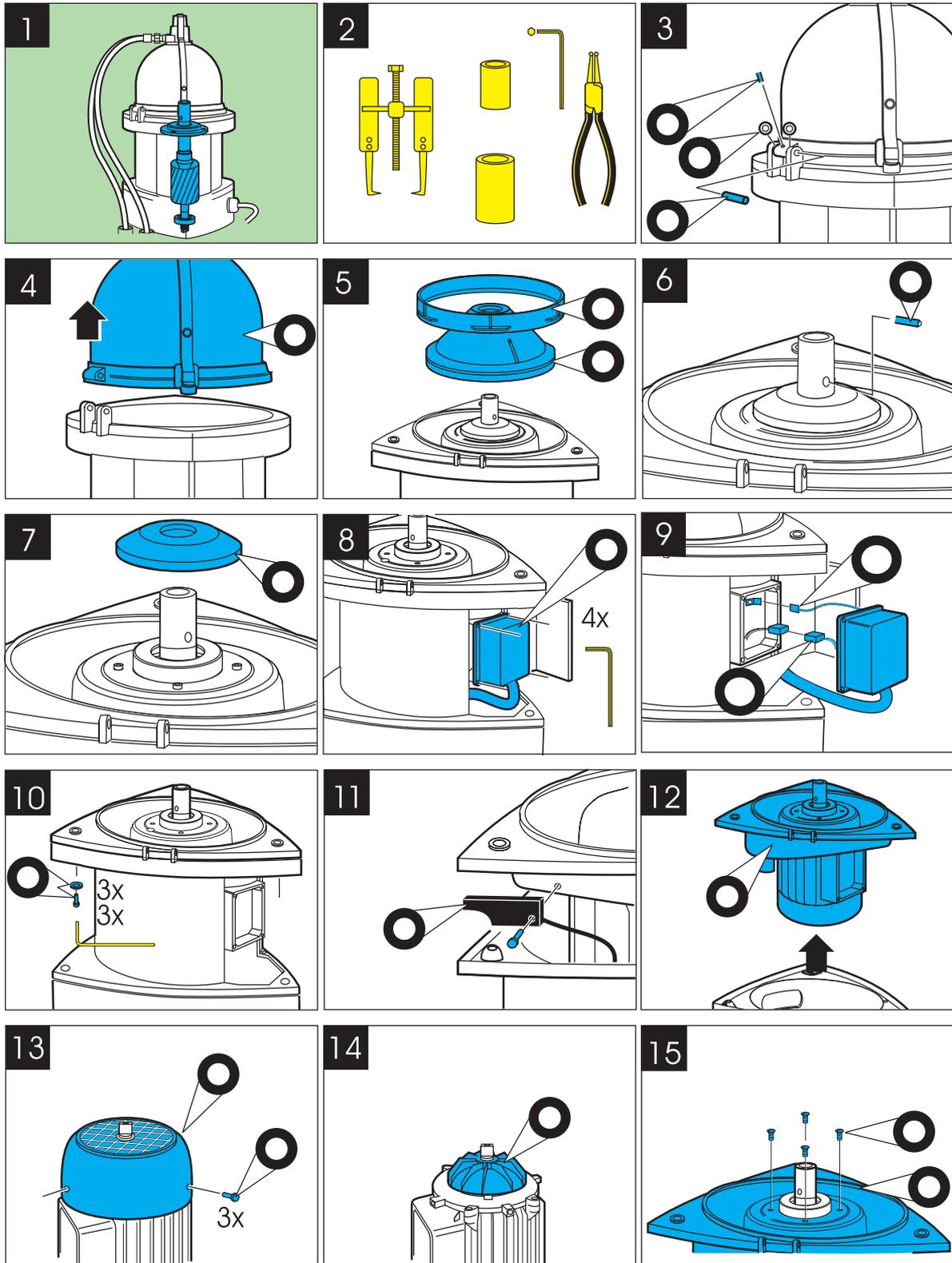


* See comments on opposite page.

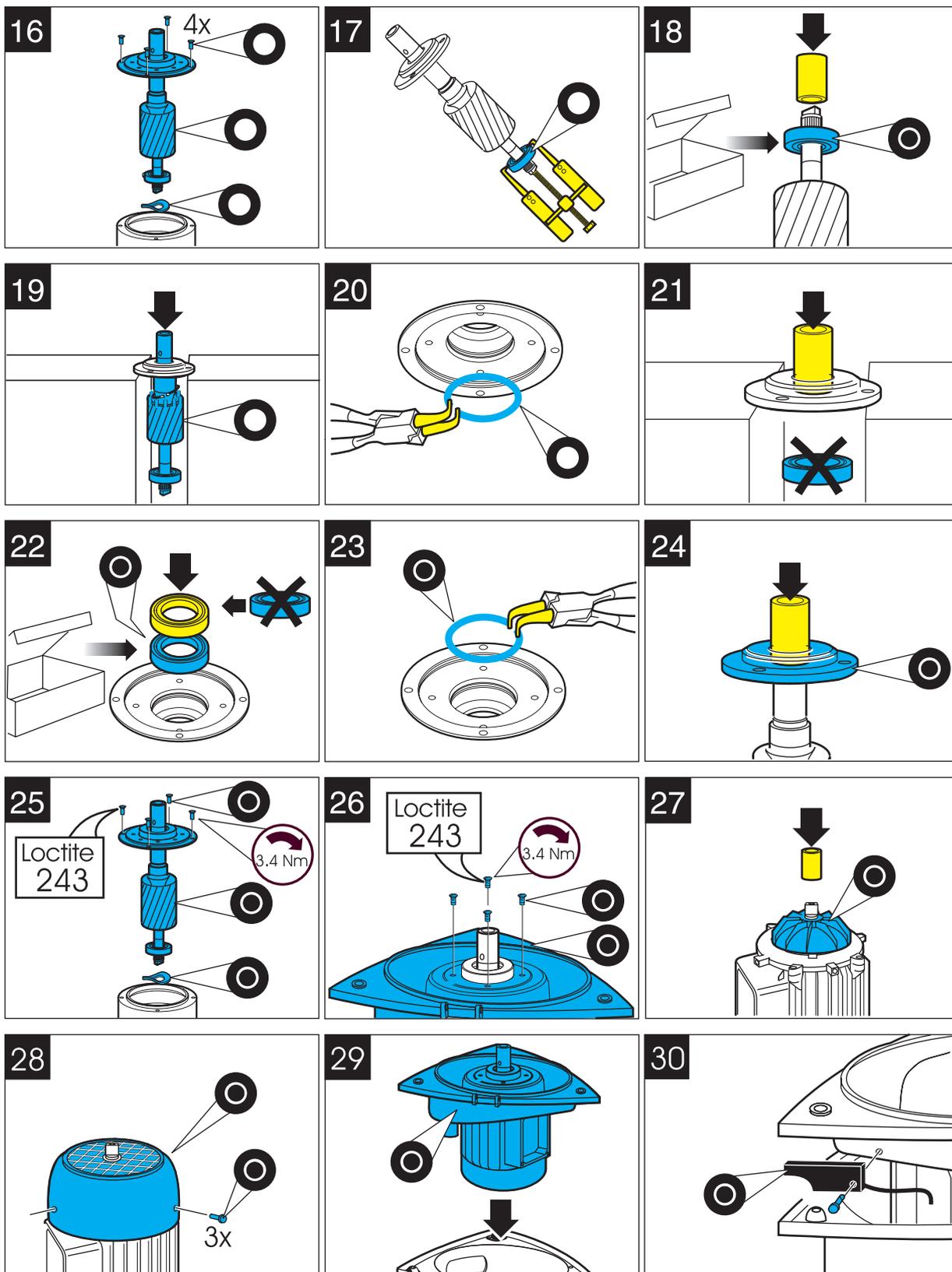
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5.4.5 Replacement of motor bearings

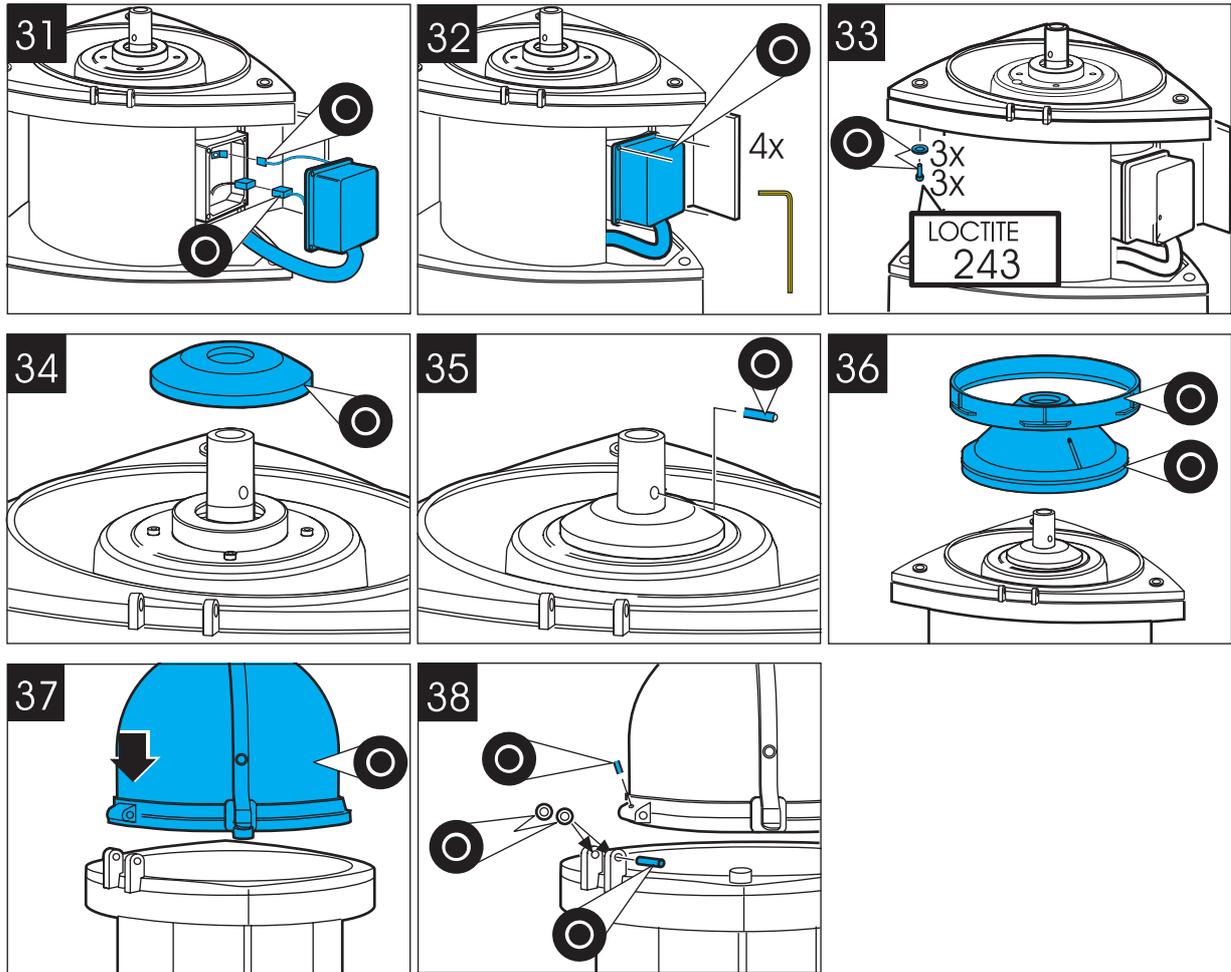
First dismantle the separator bowl as described in "5.4.2 Cleaning of bowl" on page 40.



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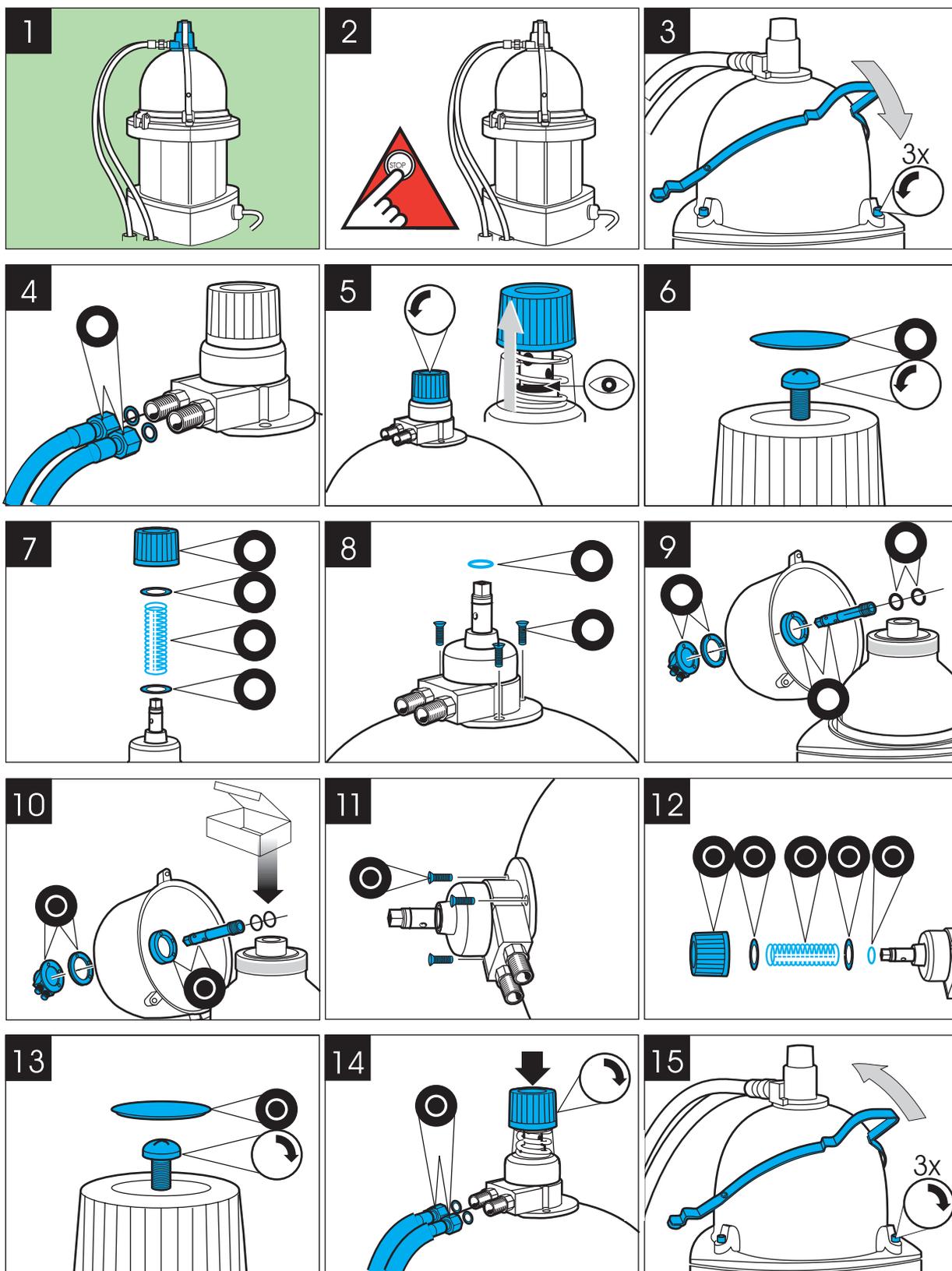


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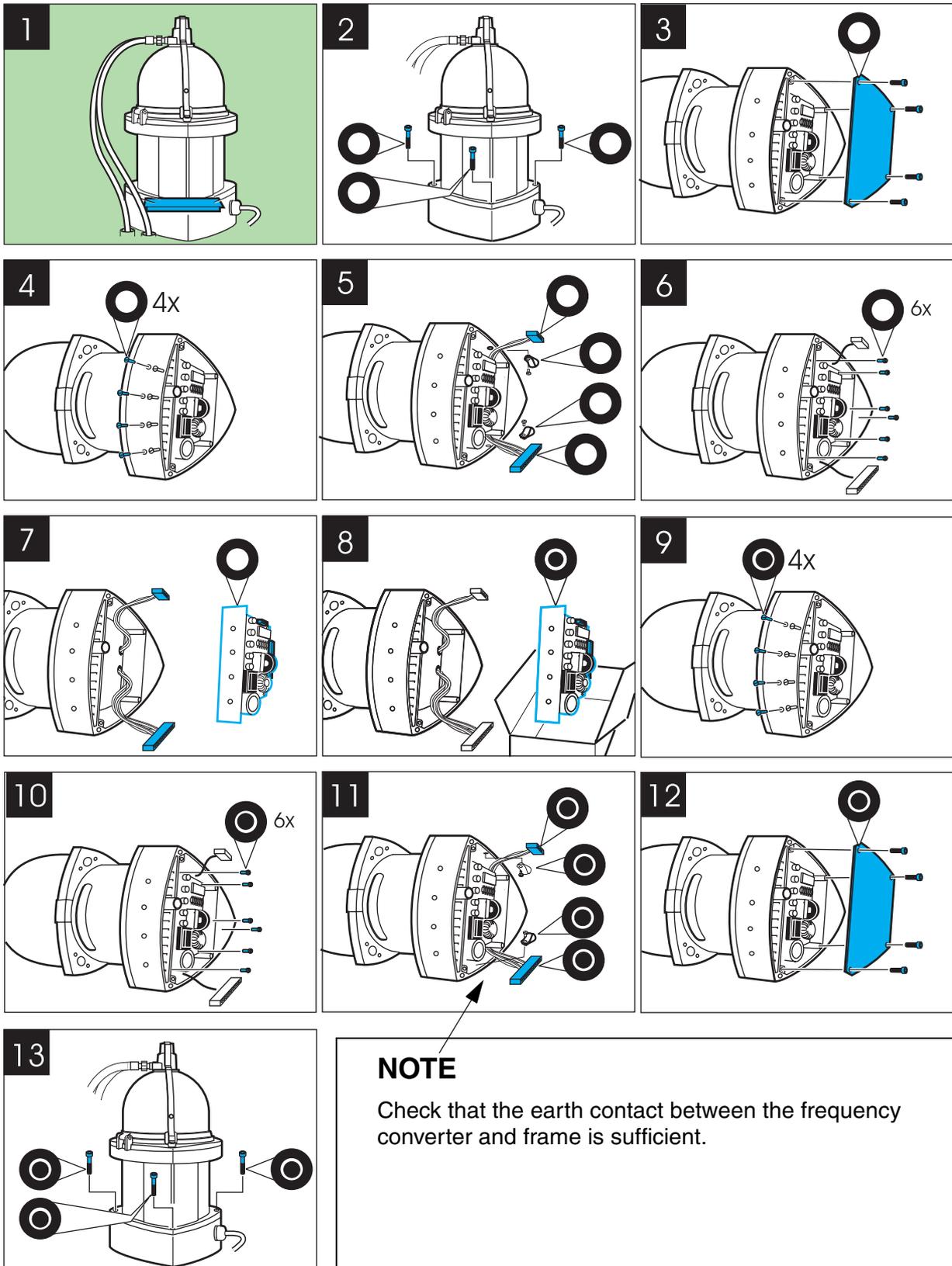
See “ Assembly” on page 44 for how to assemble the rest of the separator.

5.4.6 Replacement of connection housing



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5.4.7 Replacement of frequency converter



6 *Technical references*

6.1 Product description

Alfa Laval ref. 557925, rev. 3

Product number	881176-10-01
Separator type	MIB 303S-13/33
Application	Removal of water and solids from gas oil, marine diesel oil and lube oil.
Technical design	Solid bowl made of aluminium and plastics. AC motor rotor mounted on the bowl spindle. Rigidly mounted top bearing. Exterior rubber buffers. Integrated frequency converter. Purifier/Clarifier function.

Design in accordance with directives and standards:	98/37/EC	Machinery directive
	EN 12547	Centrifuges-Common safety requirements
	89/336 EEC	EMC directive.
	73/23 EEC	Low voltage directive

Restrictions	Max. recommended flow: 1 m ³ /hour Feed temperature: +15 °C to +70 °C Ambient temperature: 0 °C to +55 °C Use is restricted to above mentioned diesel fuels and mineral oils.
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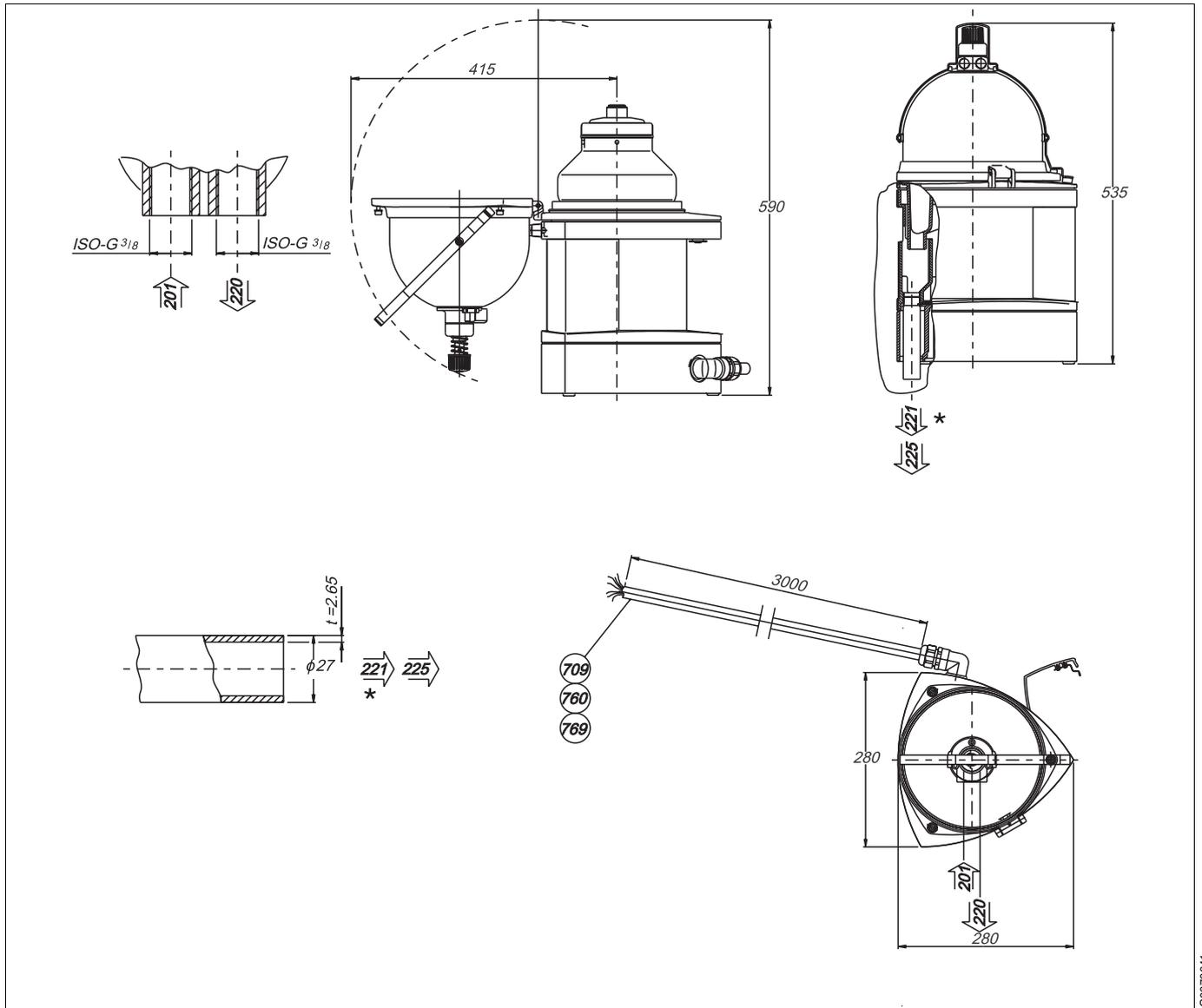
6.2 Technical data

Bowl speed, max.	7500	r/min
Speed motor shaft, max.	7500	r/min
Gear ratio	1:1	direct drive
Density of sediment / feed, max.	1600 / 1100	kg/m ³
Motor power	0,45	kW
Stopping time with brake	1,7 / 3,0	minutes (min. / max.)
Starting time	0,5	minute (max.)
Power consumption	0,2 / 0,4	kW (idling / at max. capacity)
Rated current at 110 V AC	8	A
Rated current at 230 V AC	4	A
Sound power / sound pressure level	7,9 / 65	Bel (A) / dB (A)
Direction of rotation	Counter-clockwise seen from the motor shaft end	
Enclosure class, motor and frequency converter	IP 54	
Vibration level, max.	30 / 30	mm/sec (new separator / separator in use)
Weight of separator	18	kg (with motor)
Weight of bowl	4	kg
Bowl volume	1,1	litres
Bowl body material	AL 111 4212-06	

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

6.3 Basic size drawing

Alfa Laval ref. 554367, rev. 2 / 557885, rev. 1



All connections to be installed non-loaded and flexible

* Connection 221 only for purifier (-13)

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6.4 Connection list

Alfa Laval ref. 554542 rev. 3, 557884 rev.1, 562417 rev.1, 562418 rev.1

No.	Description	Requirements/limits			
		MIB 303S-			
		-13 230 VAC	-13 110 VAC	-33 230 VAC	-33 110 VAC
201	Inlet for process liquid (dirty oil)	Min. 15 °C, Max. +70 °C Max. 14 cSt Max. 150 cSt Max. 1000 litres/h 0 - 60 kPa			
	– Allowed temperature				
	– Viscosity				
	– Flowrate				
220	Outlet for light phase (cleaned oil)	70-200 kPa			
	– Pressure				
221	Outlet for heavy phase (water)	0 kPa (Open) No outlet			
	– Counter pressure				
225	Bowl drain outlet	No counter pressure			
709	Electrical connection	See “6.5 Interface description”. The connection must be protected against voltage peaks (transients) of high amplitude.			
	– Power supply	230 V 1-phase 50/60 Hz	110 V 1 phase 50/60 Hz	230 V 1 phase 50/60 Hz	110 V 1 phase 50/60 Hz
	– Fuse max.	10 A	16 A	10 A	16 A
760	Cover interlocking switch	See “6.5 Interface description”			
	– Type	Magnetic proximity switch			
	– Switch rating, voltage load max.	230 V AC 20 VA			
769	Frequency converter protection	See “6.5 Interface description”			
	– Motor overcurrent trip max.	2,5 A in 15 sec		2,5 A in 15 sec	
	– Out frequency trip max.	140 Hz			
	– Over temperature trip (heat sink)	70-75 °C		70-75 °C	

6.5 Interface description

Alfa Laval ref. 557647 rev. 0

General

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

Definitions

Ready for start means:

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

Start means:

- The power to separator is on.
- The acceleration is supervised to ensure that a certain speed has been reached within a certain time, See [“6.1 Product description” on page 55](#).

The start procedure continues until the full speed has been reached and a stabilizing period has passed (about 1 minute).

Normal stop means:

- Stopping of the machine at any time with brake applied.

Safety stop means:

The machine must be stopped in the quickest way due to the interlocking switch function (769).

- The machine must not be restarted before the reason for the safety stop has been investigated and action has been taken.

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

Component description and signal processing**Electrical connections 709**

- The three phase separator motor is fed from a built in frequency converter which in turn is fed from a single phase power supply.

Cover interlocking switch 760

- The separator is equipped with a safety yoke and an interlocking switch. When the cover is closed and the yoke is in the upright position the interlocking circuit in the starter control is closed and the separator could be started.

Signal processing:

- The cover interlocking switch should be connected so that starting and running of the motor is prevented when interlocking circuit is not closed.

Interlocking switch function 769

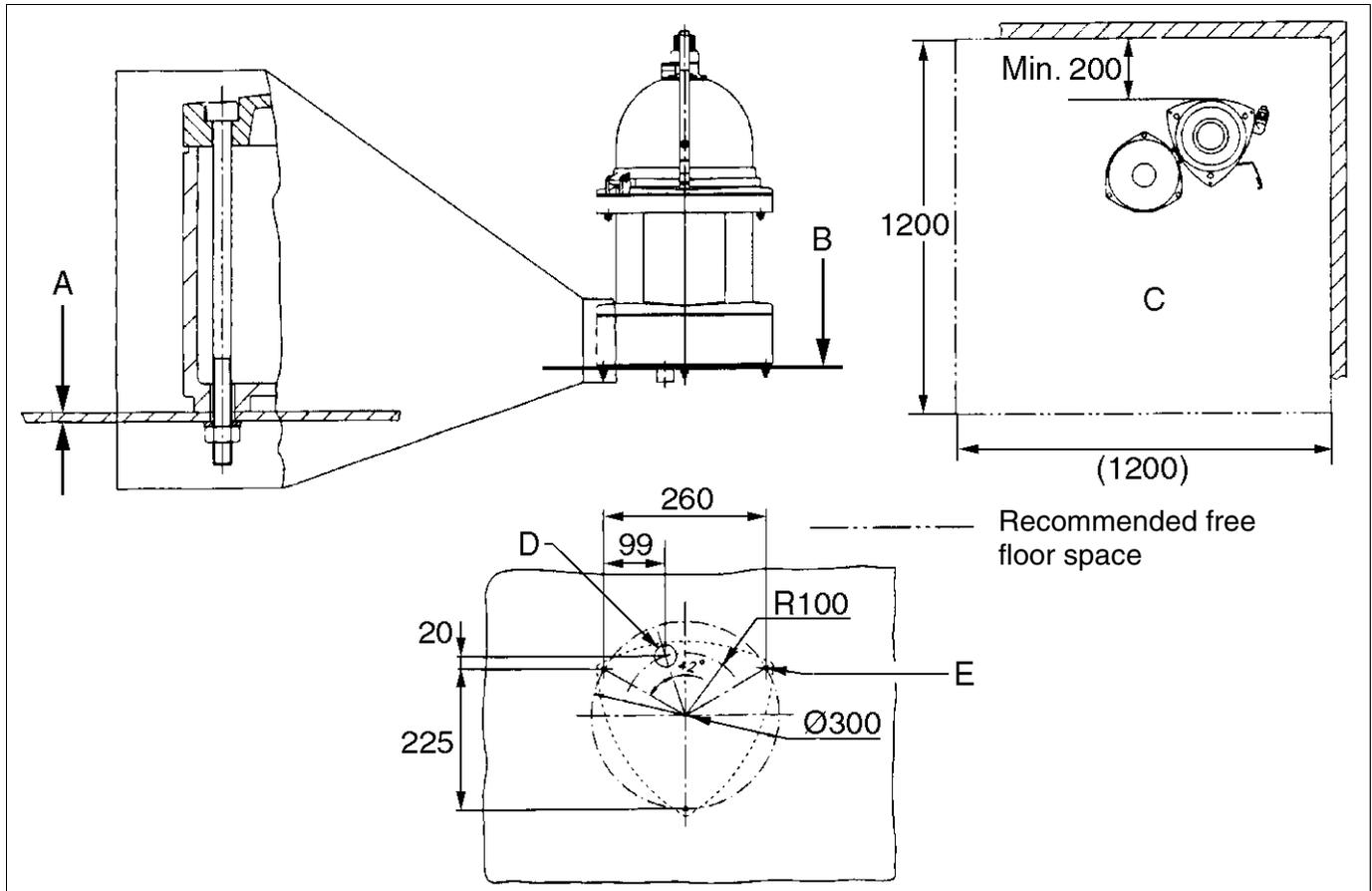
- The built in frequency converter interlocking switch function contains three sensors, connected in series for over temperature, over frequency trip and overcurrent.

Signal processing:

- If the interlocking switch function opens the machine must be stopped with automatic safety stop.

6.6 Foundation drawing

Alfa Laval ref. 554365, rev. 0

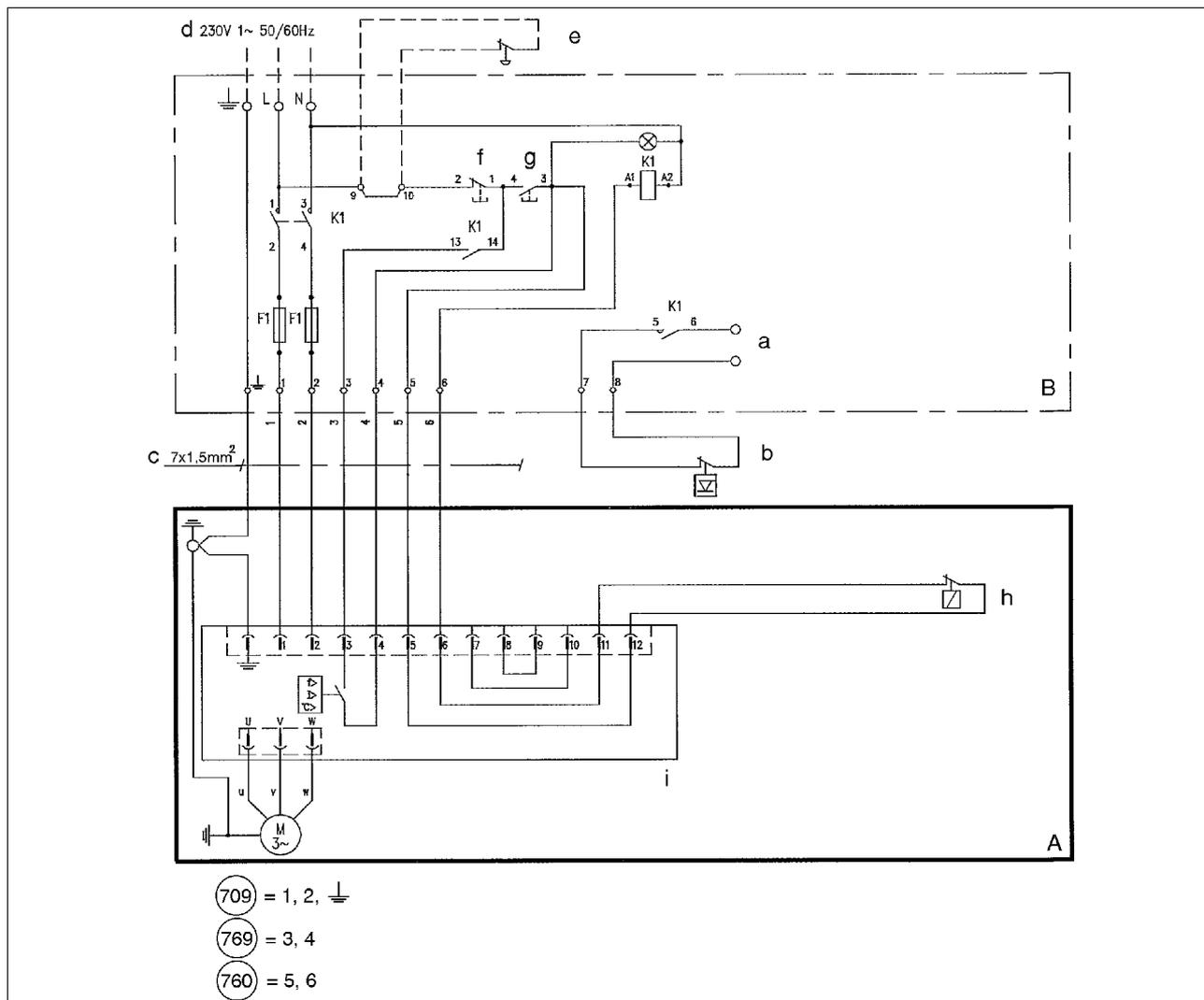


- A. Recommended thickness of sheet metal is 3 mm
- B. Horizontal deviation, max. 3°
- C. Service side
- D. 1 hole, Ø35 mm
- E. 3 holes, Ø7 ±0,2 mm, spaced 120°

6.7 Connection diagrams

6.7.1 230 V AC

Alfa Laval ref. 554581 rev. 2



A. Separator, frequency converter included

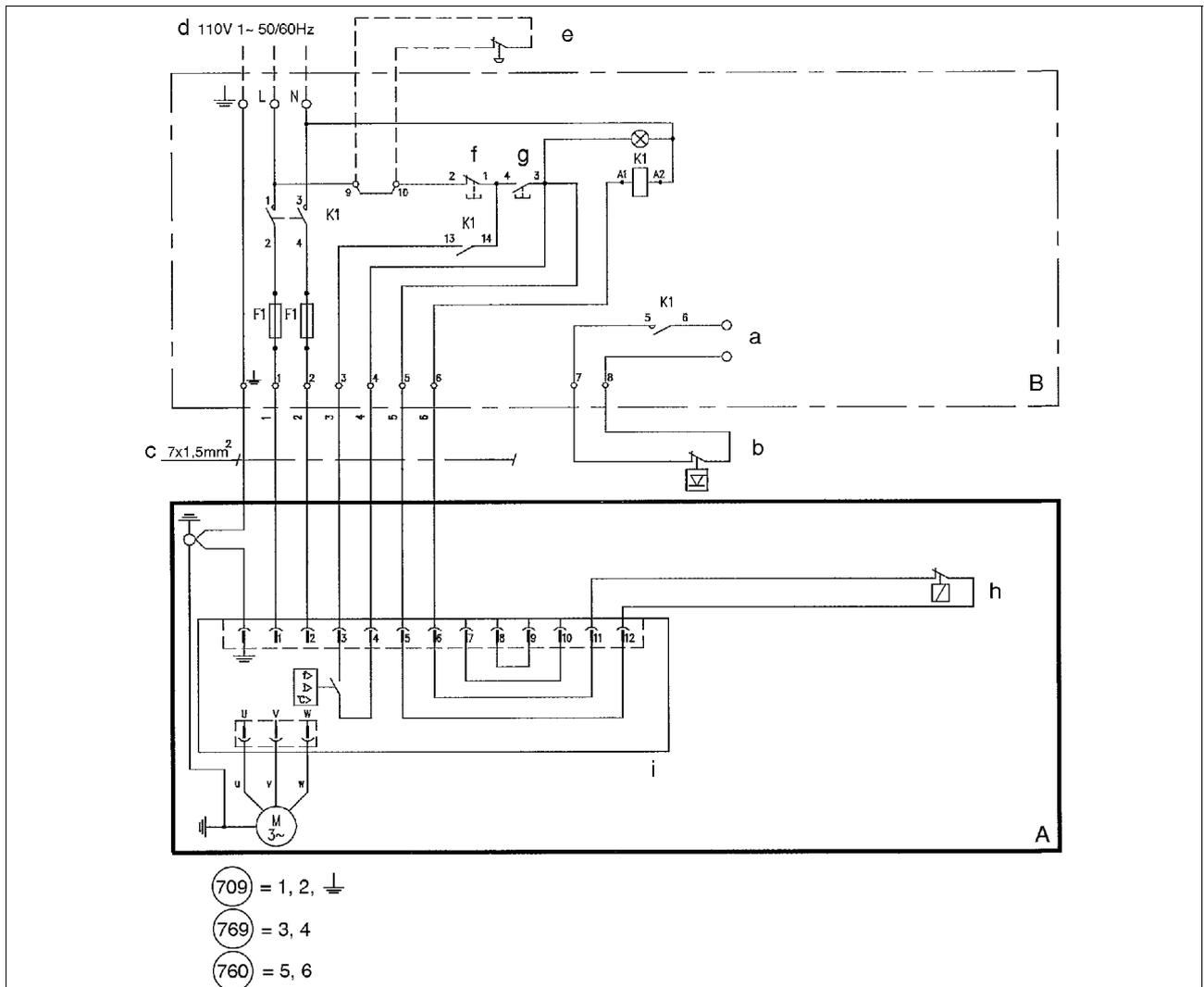
B. Starting equipment (not included in all separators)

- a. Pump control
- b. External level guard
- c. Cable
- d. Power supply 230 V AC, 50/60 Hz. Max. fuse 10 A
- e. External emergency stop (replaces jumper when used)
- f. Stop
- g. Start
- h. Interlocking switch
- i. Frequency converter

F1= Fuse 6,3 A, delayed action

6.7.2 110 V AC

Alfa Laval ref. 562879, rev. 0



A. Separator, frequency converter included

B. Starting equipment (not included in all separators)

- a. Pump control
- b. External level guard
- c. Cable
- d. Power supply 110 V AC, 50/60 Hz. Max. fuse 16 A
- e. External emergency stop (replaces jumper when used)
- f. Stop
- g. Start
- h. Interlocking switch
- i. Frequency converter

F1= Fuse 10 A, delayed action

