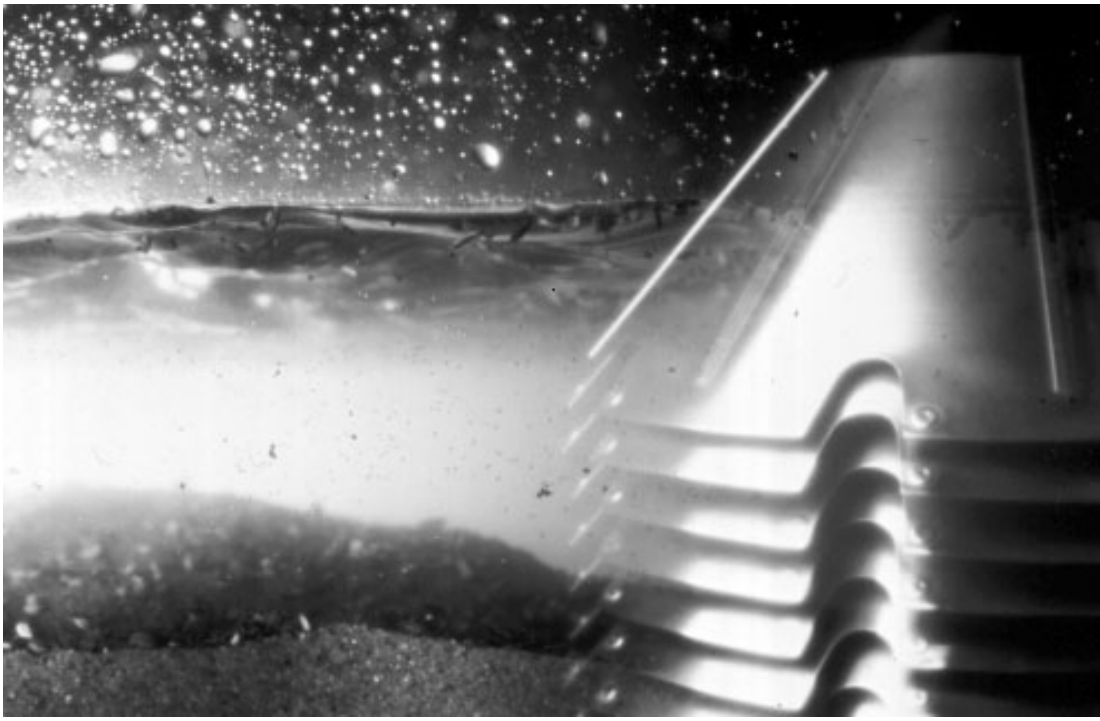
A L F A L A V A L S E P A R A T I O N

MMB 203S-33



Separator Manual

Product No. 881176-05-01
Book No. 1270798-02 Rev. 1

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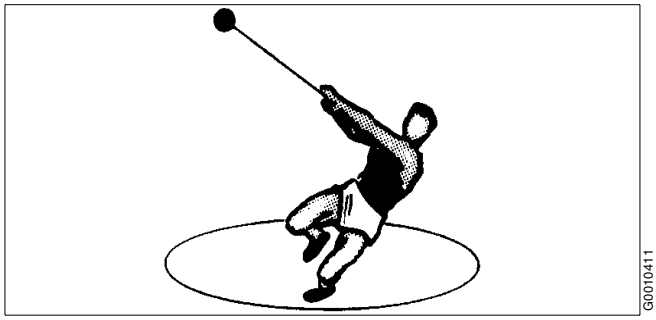
Study instruction manuals and observe the warnings before installation, operation, service and maintenance.

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 centrifugal separator includes parts that rotate at high speed. This means that:

- Kinetic energy is high
- Great forces are generated

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.**

DANGER

Disintegration hazards

- Use the separator only for the purpose and parameter range specified by Alfa Laval.
- If excessive vibrations occur, keep liquid **feed on** and **stop** separator.
- 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.

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.

Electrical hazards

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

Warning signs in the 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.

WARNING

Type of hazard

This type of safety instruction indicates a situation which, if not avoided, could result in **disabling injury** or disabling damage to health.

CAUTION

Type of hazard

This type of safety instruction indicates a situation which, if not avoided, could result in **light injury** or light damage to health.

NOTE

This type of instruction indicates a situation which, if not avoided, could result in damage to the equipment.

Warning label

Warning label placed on the separator hood.

Text on label:

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

Failure to strictly follow instructions can lead to fatal injury.

S0068721

Warning label

Machine plate

Plate placed on the separator base.

Text on label:

Separator type	MMB 203S-33
Product number	881176-05-01
Speed max.	7500 r/min
Rotation	----->
Supply voltage	230V ~50/60 Hz
Current max.	4 A

S0061411

2 Separator Basics

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2.1 Basic principles of separation

2.2 Application

The MMB 203S-33 is a small, solid-walled bowl, disc-stack centrifugal separator. It clarifies mineral oil from solids.

Its use is restricted to the removal of solids from oils that have the following specifications:

Oil type	**Viscosity at +40 °C**
Lube oil	≤ 150 cSt

The maximum permissible separation temperature is +70 °C.

WARNING

Do not use the MMB 203S-33 separator for separating any oils or liquids other than those specified above.

2.3 Description of main parts

A general view of the MMB 203S-33 separator is shown in fig 1.

The oil is fed to the oil inlet (A) and down to the rotating bowl (E) where separation of solid particles takes place. At stand-still the bowl is drained through channel (B) to the drain outlet (C). The cleaned oil leaves the separator at (D).

The bowl and motor (G) are suspended on rubber cushions (F).

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

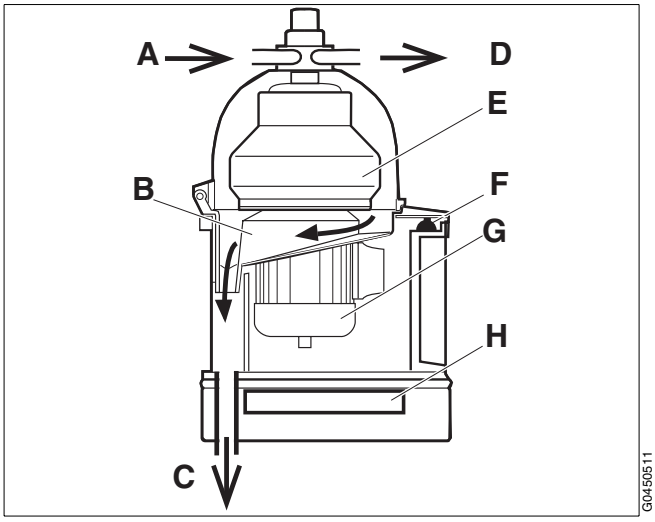


Fig. 1 Separator

A. Oil inlet
B. Bowl draining channel
C. Oil draining outlet
D. Clean oil outlet
E. Bowl
F. Rubber cushions
G. Motor
H. Frequency converter

More details shown in " Fig. 2 Separator main parts" on page 15

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 is a level ring (4).

The motor flange rests on three rubber cushions (17) in the frame (8). An inclined channel in the motor flange directs the oil from the bowl when the bowl stops and drains (10).

The motor (9) is powered via an electronic frequency converter (11), which converts the 50/60 Hz mains to 125 Hz. This gives the motor and bowl an operating speed of 7500 rpm. When the current is switched off the converter acts as a brake quickly reducing the speed.

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.

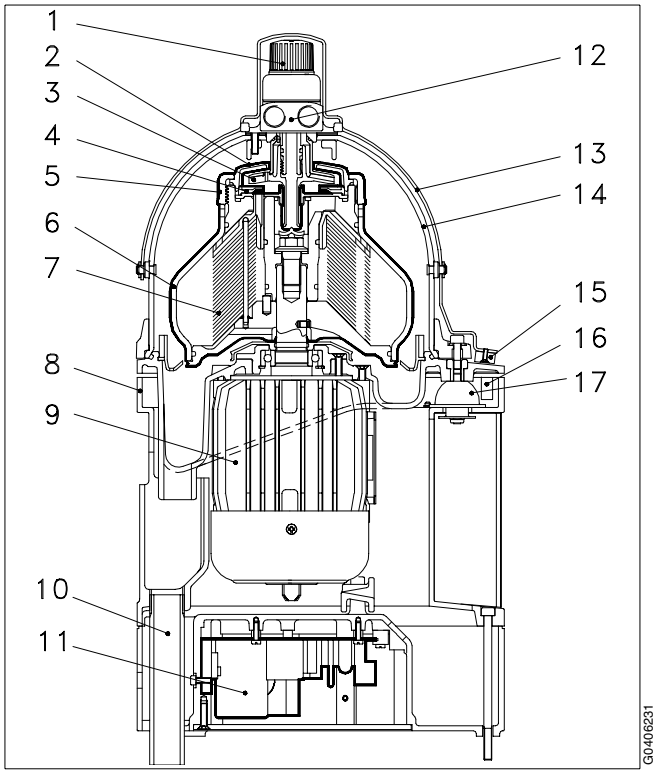


Fig. 2 Separator main parts

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

2.4 Working principle

Dirty oil continuously enters at (1), in fig 3, and flows into the bowl (2). The bowl rotates at high speed generating powerful centrifugal forces. As the oil rotates with the bowl, the heavier contents of the oil, such as solid particles and water, move towards the periphery of the bowl. The particles are deposited on the bowl wall, while water collects in the sludge and water space (3) and drains into the channel below the bowl, when the rotation is stopped.

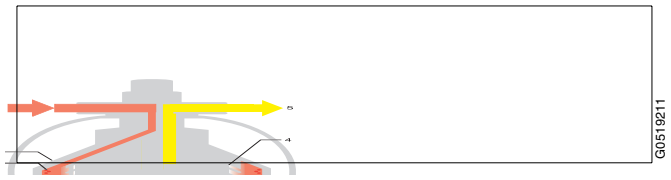
The discs (4) in the bowl make the separation process very efficient and the cleaned oil (5) leaves the bowl through the paring chamber at a constant pressure. The paring chamber which contains the stationary paring disc is not shown in this illustration.

More information about the theory of centrifugal separation can be obtained from your local Alfa Laval representative.

Fig. 3 Process principle (opposite page)

1. *Oil inlet*
2. *Bowl*
3. *Collected solid particles*
4. *Bowl discs*
5. *Oil outlet*

Detta blad utbytes mot färgbild:



3 Operating Instructions

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3.1 Operating routine

WARNING

The separator is supplied with a safety yoke and a magnetic safety switch. Modifications to the machine which put the safety devices out of operation can lead to serious injury or damage.

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.

3.2 Before start

Make sure that the separator is installed according to the instructions.

Make sure that the hood screws and the paring disc knob are firmly tightened and that the safety yoke is in its closed (vertical) position.

3.3 Start

1. Make sure that the outlet valve is open.
2. Start the separator.
3. After 20 seconds, when the separator has gained full speed.
4. Turn on the feed to the separator.

3.4 Operation

Check the separator for correct operation.
This is especially important the first few times the separator is run after installation or after any dismantling and assembly has been carried out.

3.5 Stop

1. Turn off the feed.
2. Stop the separator.

   The bowl will almost have stopped rotating after about 1 minute. Approximately 1 litre of oil will flow out of the drain outlet at the bottom of the separator. This is the normal draining of the bowl as it stops.
3. Make sure that the valves are closed on both the feed and outlet sides of the separator. If this is not done oil may siphon off through the separator and the oil collecting vessel will overflow.

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 converter

Auxiliary safety devices, that also stop the separator:

CAUTION

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 24.

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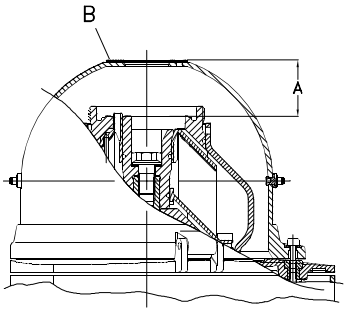
4.1 The separator does not start

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.	Make sure that the switch opens and closes when the safety yoke is moved up and down. Measure across terminal points No. 5 and 6 on the frequency converter board. Replace the switch if faulty.
Incorrect assembly after cleaning.	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.	CHECK: The height adjustment of the paring disc is measured as shown in figure. The height A should be 48,5 ±0,5 mm and can be adjusted by the number of washers B (1-3 pcs) under the oil connection housing.  G0417831
Defective frequency converter.	Have an Alfa Laval representative test the converter.

4.2 Low outlet flow (low outlet pressure)

Possible cause	Action
Low feed flow.	Check feed line.
Paring disc knob is not completely tightened, causing leakage.	Tighten the knob.
Leakage caused by incorrect assembly.	Dismantle. Check especially that no O-rings are missing, defective or incorrectly installed. Assemble correctly.

4.3 No outlet flow (no outlet pressure)

Possible cause	Action
No feed.	Check feed line.
Leakage caused by incorrect assembly.	Dismantle. Check especially that no O-rings are missing, defective or incorrectly installed. Assemble correctly.

4.4 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.
Defective frequency converter.	Have an Alfa Laval representative test the converter.

4.5 The separator vibrates

Possible cause	Action
Bowl out of balance due to:	
– Insufficient or incorrect cleaning.	Clean the bowl carefully.
– Centre screw is missing.	Install the centre screw.
– Paring chamber cover and lock-nut are not correctly installed.	Dismantle. Assemble correctly. Press the paring chamber cover down firmly (see figure), otherwise the lock nut cannot be installed correctly.
Vibration dampers are worn.	Fit three new dampers.
Motor bearings are damaged.	Fit new bearings.

G0500811

4.6 Insufficient separation

Possible cause	Action
Insufficient cleaning.	Clean the bowl. Shorten the cleaning interval.
Oil feed rate is too high.	Reduction of the feed rate improves the separation result.

4.7 Noise

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

5 Maintenance

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5.1 Periodic cleaning

WARNING

Switch off the main power supply before dismantling for repair. Lock the mains switch in its OFF position.

5.1.1 Bowl cleaning

The separator must be stopped at regular intervals and the bowl opened for removal of collected solids. This is important for correct operation of the separator and achieving the desired result.

The length of the periods between cleaning depends on the feed rate of the oil and on the quantity of solid particles in the oil. During the initial period, open and inspect the bowl once every 24 hours to determine the necessary cleaning interval.

The bowl must be cleaned before the solids layer of the bowl has become thicker than 10 mm.

The cleaning procedure is shown in “6.2 Operation chart selection” on page 34.

WARNING

Never use cleaning agents with a pH below 6 or above 8 as they will damage the metal surfaces.

5.2 Preventive maintenance every year

Replace the O-rings with the new ones supplied in the O-ring Service Kit. Their positions are shown in the Spare Parts Catalogue and the dismantling and assembly procedures are shown in the Dismantling and Assembly chapter “6.2 Operation chart selection” on page 34.

Before fitting, lubricate the O-rings with the silicone grease supplied in the service kit.

5.3 Preventive maintenance every two years

5.3.1 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 replacement procedure is shown in the Dismantling and Assembly chapter “6.2 Operation chart selection” on page 34.

The vibration dampers are available as a set.

WARNING

The separator must not be operated unless the stop flanges for the vibration dampers are correctly installed.

5.4 Disc stack replacement

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.

The replacement procedure is shown in the “6.2 Operation chart selection” on page 34.

The disc stack is available as a set.

6 Dismantling and assembly

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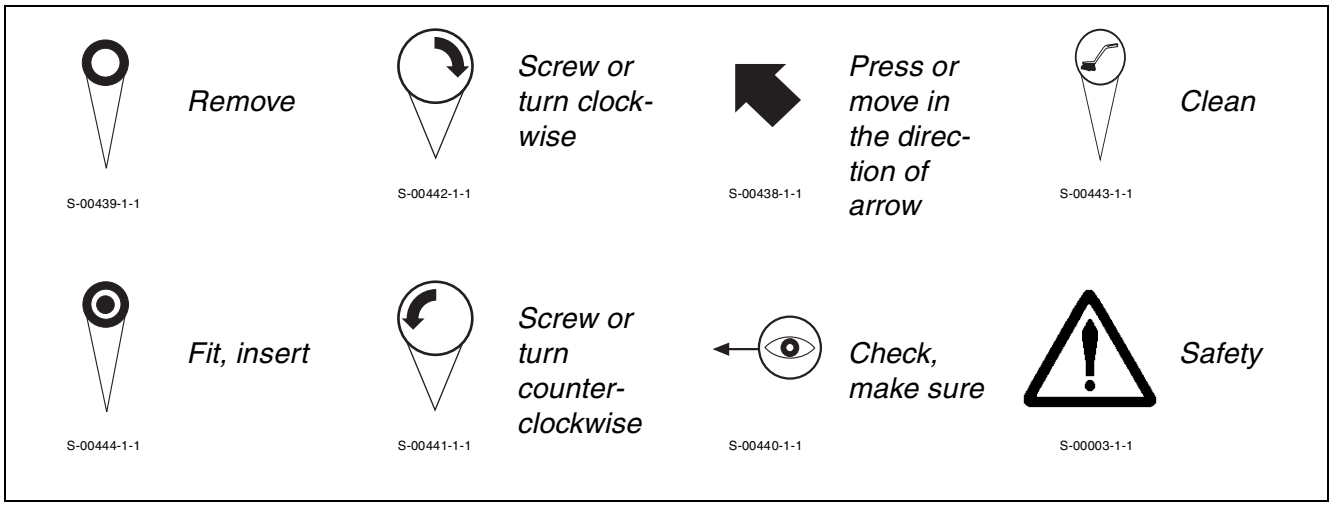
6.1 Instructions

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 only symbols to indicate the action required. The key to the symbols is given below.



A. Select the correct chart.

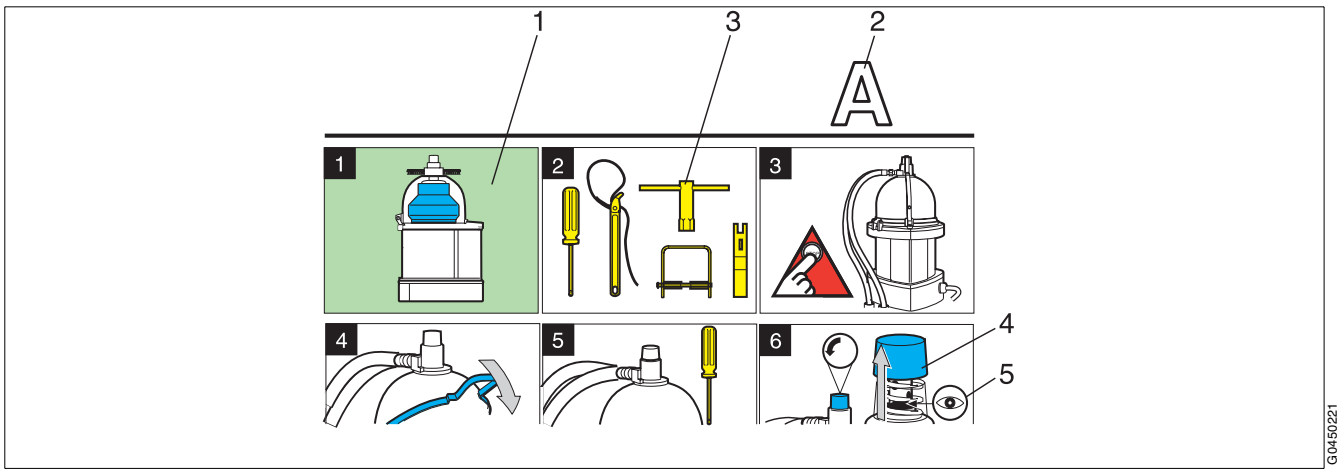
The green introductory illustration (1) indicates the part which will be dealt with in the chart (see the chart designation letter (2)) and “6.2 Operation chart selection” on page 34.

B. Collect the tools needed.

Tools required are marked in Yellow (3).

C. Follow the instructions in numerical order.

The part concerned is marked in blue (4).
The symbol indicates the action required (5).



6.2 Operation chart selection

Operation	Charts and illustrations	
Bowl cleaning	A + B	G0480011
O-rings and disc stack replacement	A + C + B	G0480111
Bearing replacement	A + D + B	G0480211
Connection housing dismantling and assembly	E	G0480311
Frequency converter replacement	F	G0480411
Vibration damper replacement	A + D 1–11 / D 33–41 + B	G0480611

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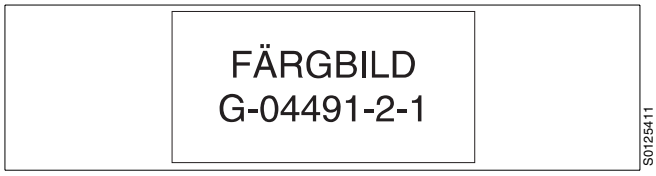

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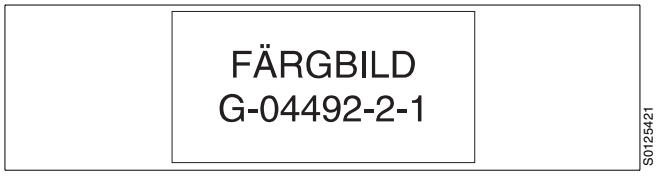

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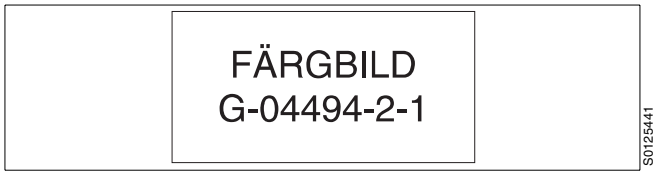

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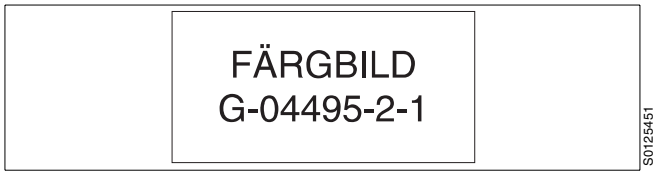

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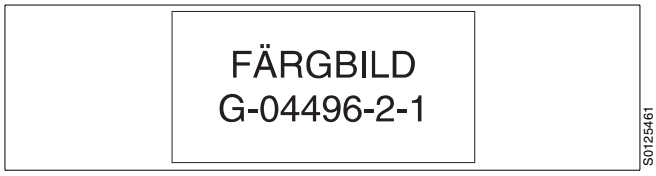

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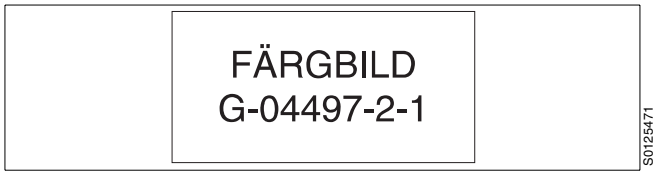

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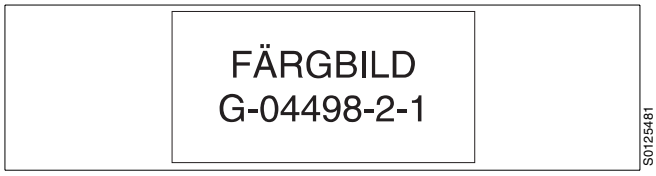

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7.1 Technical data

7.1.1 Type designation

MMB 203S-33

7.1.2 Application

The use of the separator is restricted to removal of water and solids from oils having the following specifications:

Oil type	**Viscosity at +40 °C**
Lube oil	≤150 cSt
Maximum separation temperature	+70 °C

7.1.3 Capacities

Maximum throughput capacity at 14 cSt	600 l/h
Sludge space	0,7 litres
Normal working counter pressure	40 - 60 kPa

7.1.4 Electric motor drive

The drive comprises a frequency converter and a motor. The motor is wired to suit the voltage and frequency delivered by the frequency converter.

Motor power	0,45 kW
Power consumption	
– idling	0,2 kW
– at maximum capacity	0,4 kW
Speed	7500 r/min
Direction of rotation	Counter-clockwise
Running up time	20 seconds
Stopping time	100 to 120 seconds

The frequency converter brakes the bowl speed to below 1000 r/min within 25 seconds after switching off the current.

7.1.5 Lubrication

Permanently lubricated bearings
(no extra lubrication is required).

7.1.6 Operation conditions

Ambient temperature, maximum	55 °C
Enclosure class, motor and frequency converter	IP 54

7.1.7 Weight

Total weight	18 kg

7.1.8 Dimensions

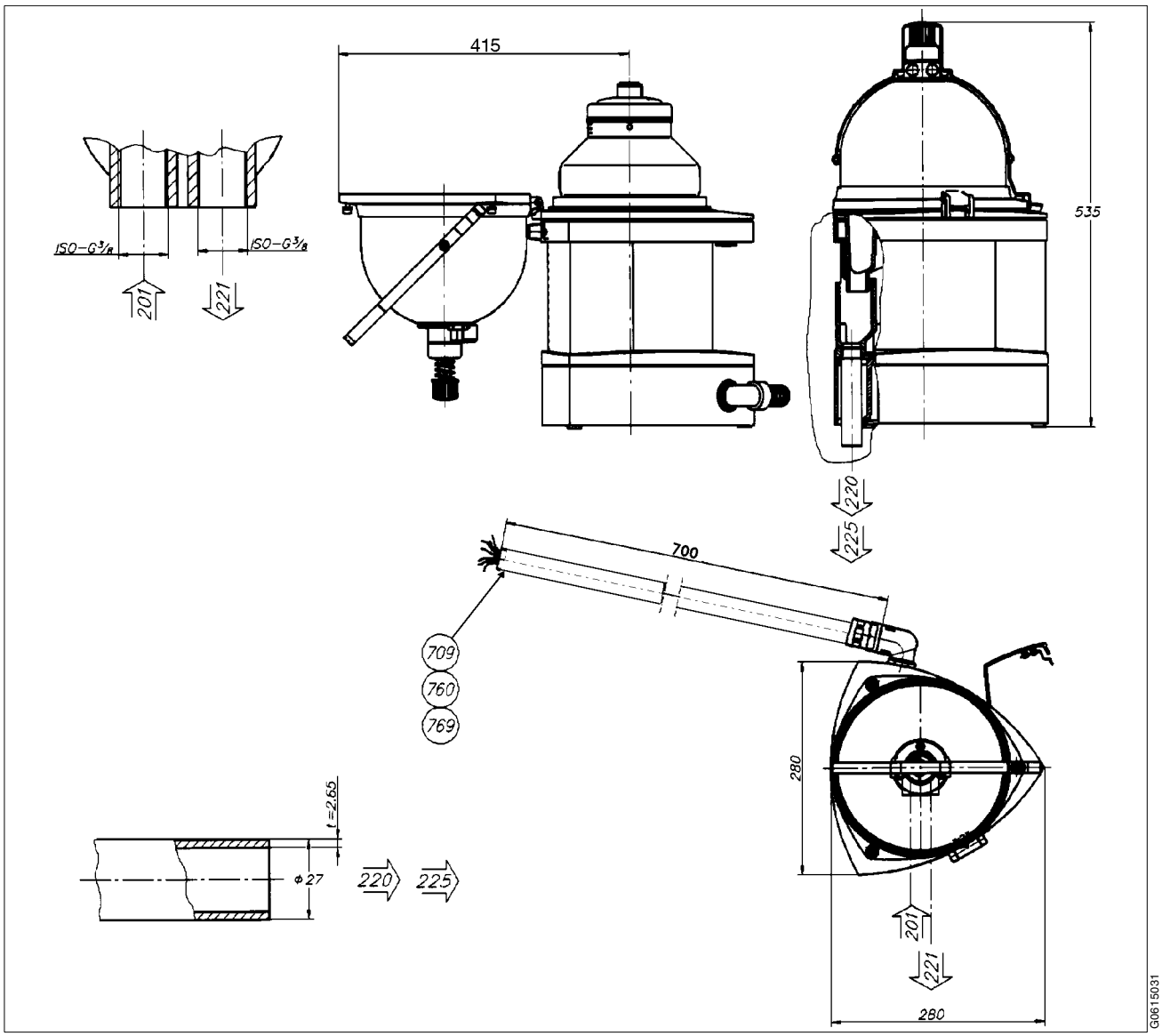
See “7.2 Basic size drawing” on page 54.

7.1.9 Sound

- Sound power 7,9 Bel(A)
- Sound press. level 65 dB(A)

7.2 Basic size drawing

Alfa Laval ref. 557885 rev. nr 0



All connections to be installed non-loaded and flexible

7.2.1 Connection list

Alfa Laval ref. 557884 rev. nr 0

No.	Description	Requirements/limits
201	Inlet for product	
	-Allowed temperature	Min. 15 °C Max.70 °C
	-Viscosity	Max. 50 cSt
	-Flowrate max.	1000 l/h
	-Pressure	0-60 kPa
220	Outlet for light phase	
	-Pressure	170 kPa
	-Flowrate max.	0-1000 l/h
225	Bowl drain outlet	
709	Electrical connection	See “7.2.2 Interface description”
	-Power supply	230 V 1 phase 50/60 Hz
	-Fuse	Max. 10 A
760	Cover interlocking switch	See “7.2.2 Interface description”
	-Type	Magnetic proximity switch
	-Switch rating, resistive load max.	230 V AC, 20VA
769	Frequency converter protection	See “7.2.2 Interface description”
	-Motor overcurrent trip	2,5 A in 15 seconds
	-Out frequency trip	Max. 140 Hz
	-Overtemperature trip (heat sink)	70 to 75 °C

7.2.2 Interface description

Alfa Laval ref. 557647 rev. nr 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 insure that a certain speed has been reached within a certain time, See “7.1 Technical data” on page 52.

The start procedure continues until the full speed has been reached and a stabilization 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**

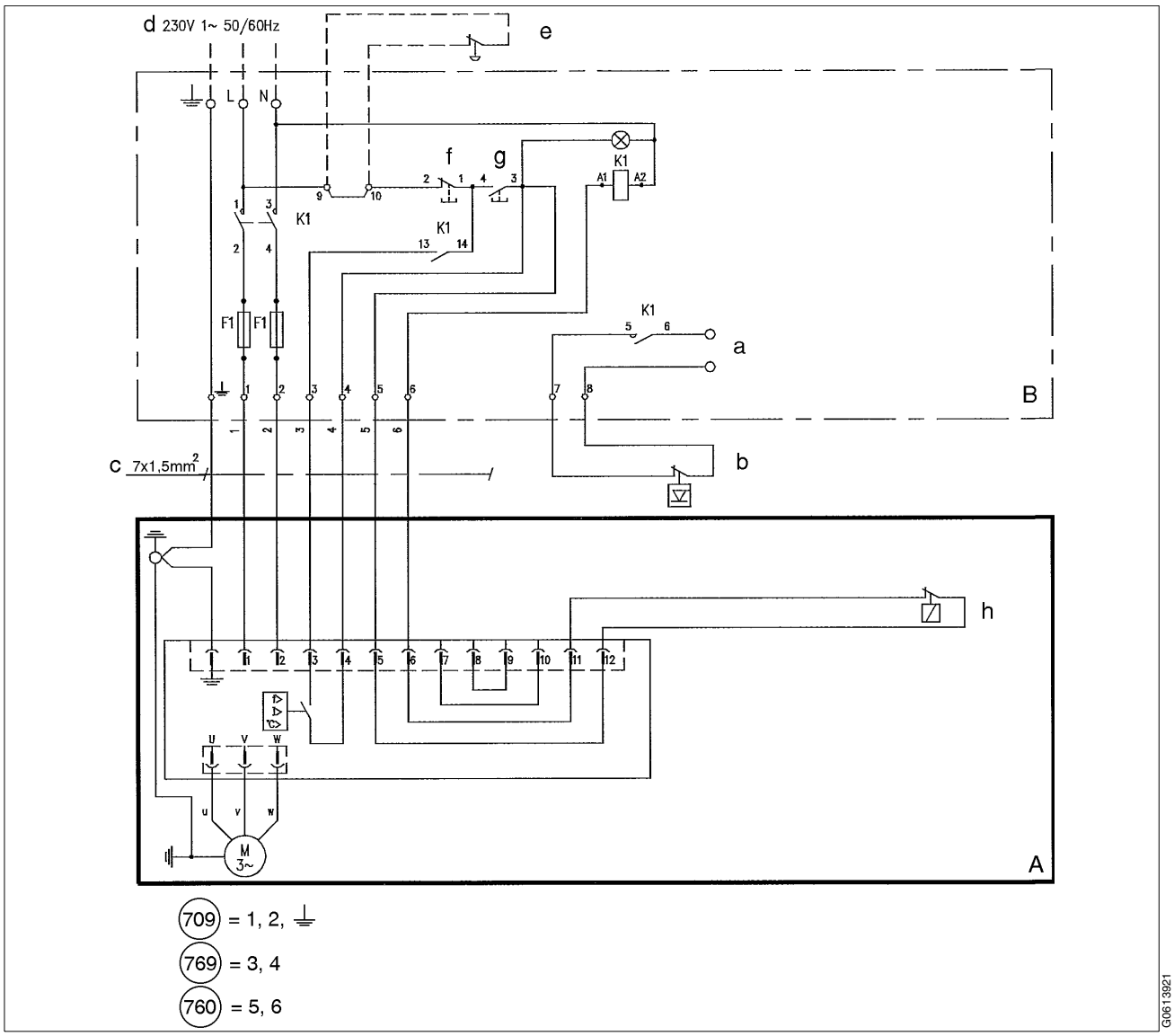
- The built in frequency converter interlocking switch function contains three sensors, connected in series for overtemperature, over frequency trip and overcurrent.

Signal processing:

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

7.3 Connection diagram

Alfa Laval ref. 554581 rev. nr 2



A. Separator incl. frequency converter
B. Starting equipment (not included in all separators)

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

F1= Fuse 6,3A delayed action