Alfa Laval Alfie Cleaning system for liquids



Instruction Manual

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## **1** Safety instructions



Study this instruction manual and observe the warnings before installation, operation, service and maintenance. Not following the instructions can result in serious accidents.

The centrifugal separator, which is the major part of the cleaning unit, includes parts that rotate at high speed.

Incorrect operation and maintenance of the cleaning unit can result in serious damage and/or injury.

The following basic safety instructions therefore apply:

- Use the cleaning unit only for the purpose and parameter range specified by Alfa Laval.
- Only use the cleaning unit in non-explosion environment.
- Strictly follow the instructions for installation, operation and maintenance.
- Ensure that personnel are competent and have sufficient knowledge of maintenance and operation.
- Use only Alfa Laval genuine spare parts and the special tools supplied.



**Electrocution risk** Switch off the power supply and remove the electric cable from the socket before opening the starter/control unit.



#### **Disintegration hazard**

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.

If excessive vibrations occur, stop the separator.



#### Entrapment hazard

Make sure that rotating parts inside the separator have come to a **complete standstill** before moving the cleaning unit or starting any dismantling work.

To avoid accidental start, switch off the power supply and remove the electric cable from the socket before starting **any** dismantling work.

#### Warning labels

A warning label is placed on the separator hood. The interpretation of the label is: **STOP!** Read the instruction manual before installation, operation and maintenance. Consider inspection intervals. Another warning label is placed on the door for the heater control unit. The interpretation of the label is: Switch off the power before opening the cover.



Warning label located on separator hood

## 2 Application

The *Alfa Laval Alfie* 500 cleaning system is restricted to the removal of solids and oil from liquids with a temperature range between +15 and +70 °C and a pH value between 6 - 9.



**Disintegration hazard** The cleaning system must not be operated in an explosion environment.

### 2 Application

## 3 Machine plates

The cleaning unit has two different machine plates.

- 1. One for the separator only
- 2. One for the complete unit









When ordering spare parts for the cleaning unit (except the separator) please specify the article and serial numbers stamped on the machine plate (1) for the complete unit.

When ordering spare parts for the separator itself, please specify the type, product and serial numbers stamped on the machine plate (2) for the separator.



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### Example of machine plate (separator only)

- А. Туре:
- B. Product No.:
- C. Speed:
- D. Direction of rotation:
- E. Supply voltage:

- F. Rated current: (for separation)
- G. Manufacturer:
- H. Serial No.:
- I. Enclosure:



#### Example of machine plate (complete unit)

- A. Article No.
- B. Serial No.
- C. Manufacturing Year

Note that the illustrations are examples of a machine plates. Values shown on the illustrations are not valid for all machines.

## 4 Description of main parts

### 4.1 System overview

The *Alfa Laval Alfie* 500 cleaning system consists of the following parts (numbered in process order):

### 1. Suction device

Feed inlet with adjustable height setting. For tanks with a depth min. 100 mm.

### 2. Hoses

For in- and outlet of feed between the cleaning unit and the liquid tank.

### 3. Strainer

Greater particles are removed here before the feed enters the separator.

### 4. Pump

Feed pump for the liquid. The pump speed is raised until the counter pressure in the outlet line passes 50 kPa.

### 5. Separator

Removes oil and solids from the liquid. The separator has a bowl hood interlock(•) over the hood and connection housing. A magnetic switch indicates if the interlock is in correct position. If not, the control system prohibits the unit from starting.

### 6. Pressure sensor at separator outlet

If the counter pressure after the separator does not reach at least 50 kPa within 35 seconds after start the pump is stopped.

### 7. Motorised regulating valve

For maintaining the correct counter pressure in the outlet line (ca. 100 - 180 kPa). The valve is regulated by the control unit (9).

### 8. Collecting tank (20 litres)

Collects the oil separated out from the liquid. The tank stands on a support under the separator which is held in its upper position by a spring with adjustable tension (••). This spring is adjusted by the handle on the underside of the support. When the collecting tank is nearly full the weight will overcome the spring tension and a limit switch is actuated. The signal goes to the control unit (9) which stops the pump (4). An alarm alerts the operator.

- 9. **Control cabinet**(further described in chapter 6 Control Cabinet on page 21). The control system supervises the starting and stopping of the cleaning unit. It also supervises system functions such as:
  - frequency converters, one for the separator and one for the pump.
  - motor load
  - bowl hood interlock
  - amount of liquid in the collecting tank
  - counter pressure at outlet

The red alarm light on top of the Control cabinet (10) indicates if there is any problem with the supervised functions. Detailed information of the problem is presented on the operator panel. See 6.3 Alarm light pattern on page 28



A suction device of bellows type can preferably be used in shallow tanks (55-100 mm).

### 4.2 Separator

The separator has a bowl hood interlock (3) over the hood (2) and connection housing (1). A magnet (4) in contact with a safety switch indicates if the yoke is in correct position. If not, no power is supplied to the motor. For a description of the separator function, see 5 Working principle of the separator on page 19.



### 4.3 Pump

The flow is controlled by the VFD in the control cabinet, see chapter 6 Control Cabinet.

## 4.4 Control unit

The Control unit consist of following main parts:

- 1. Power supply, 24 V DC
- 2. PLC kit
- 3. Frequency converter, separator
- 4. Frequency converter, feed pump
- 5. Mini terminal
- 6. Contactor

See chapter 6 Control Cabinet.



## 4.5 Collecting tank

The tank stands on a support under the separator which is held in its upper position by a spring with adjustable tension. The spring can be adjusted by the handle (1) on the underside of the support. When the collecting tank is nearly full the weight will overcome the spring tension and a limit switch is actuated. The signal goes to the control unit which stops the pump. The lamp on the control unit lights up.



# 5 Working principle of the separator

Dirty liquid continuously enters at (A) and flows into the bowl (1). The bowl rotates at high speed generating powerful centrifugal forces. As the liquid rotates with the bowl, the liquid (heavy phase) and solid particles moves towards the periphery of the bowl. The particles (2) are deposited on the bowl wall, while the cleaned liquid enters the channels (3) and leaves the bowl (B) at a constant pressure. The discs (4) in the bowl improves the cleaning efficiency during the separation process. The oil (light phase) is forced towards the centre of the bowl and then leaves through the underside of the bowl at (C) down into the collecting tank.

The speed of the electric motor (6) driving the bowl spindle (5) is regulated by a frequency converter, which by that eliminates any use of a transmission such as a gear or a belt. The converter also acts as a brake when the separator is stopped.

The bowl (1) and motor (6) are suspended on vibration dampers (7).

- A. Liquid inlet
- B. Clean liquid outlet
- C. Oil outlet to collecting tank
- 1. Bowl
- 2. Particles (sediment)
- 3. Channels from bowl to outlet B
- 4. Conical discs
- 5. Bowl spindle
- 6. Electric motor
- 7. Vibration dampers





## 6 Control Cabinet

The operator panel is a 4" touch screen placed on top of the control cabinet. Do not use metal or any sharp objects to operate the panel. A stylus pen or similar however, can be used.

Inside the control cabinet there are two frequency converters for regulating the speed of the separator and the pump, a 24VDC power supply and a PLC.

There are no operator controls inside the cabinet, so it should not be opened. Qualified personnel only are allowed to open the cabinet.

On top of the cabinet there is also an alarm light. It is used to indicate the status of the unit. See 6.3 Alarm light pattern on page 28.



### 6.1 Operator panel

- 1. Start button
- 2. Stop button
- 3. Standby button

- 4. Alarm button
- 5. Dynamic Back/Overview button
- 6. Sub-equipment tiles

### **Control bar**

The control bar is always visible at the bottom of the screen.



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Start, Stop and Standby buttons are blue when they are accessible, and grey when they are not. When an operating mode is active the corresponding button is circled in green.

The Alarm button takes the operator directly to the Alarm list (see "Alarm list" on page 30). If there is an active alarm the button will be red.

The Back/Overview button has different functions depending of which screen is displayed. If **Back** is displayed the button will switch to the previous screen.

If **Overview** is displayed it will switch to the overview screen.





### Tiles

The startup screen contains three tiles, each representing a sub-equipment of the unit. When a sub-equipment is running the corresponding tile will be circled green.



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Tapping a tile will display an overview of all devices within that sub-equipment.

On the left hand side there is a status row for the sub-equipment and if applicable, setpoints for the devices and control functions for that subequipment.

On the right hand side is a graphical overview of the sub-equipment. Each device is circled green if running or open, and red if an alarm exists for that device. Actual values, such as pressure readings and speed, are displayed next to the device.

### Feed

The Feed screen shows the feed pump.

08:25:15	1.2 Feed	© Alfa Laval   👤
Feed	Running	
		19 Hz

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### Separator

The **Separator** screen shows the separator motor, the bowl hood interlock and the tank limit switch. A trip counter for batch running time is available.



#### Pressure control

The **Pressure control** screen shows the pressure sensor and the pressure regulation valve. Pressure set-point can be changed from here. By tapping the set-point value a touch dial will appear.

08:31:06	1.4 Pressure	e 🛛 🛛 🖗 Alfa Laval   👤
Pressure control	Auto	
Pressure setp.	75 kPa	76 kPa
		100 %
Service mod	e	
		! 🗂 2Touch

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When the unit is at standstill, the operator can switch to Service mode and enable manual control of the regulating valve. This is only intended as an operational test of the valve. It cannot be used when the unit is running.

### Overview

08:33:38
1.0 Settings menu
Alfa Laval
1

Image: Constraint of the set of the s

By tapping the **Overview** button the Overview screen is displayed.

From there the operator is given access to the following screens (starting on the top left hand side):

### Parameters

Configuration of the system. Only possible to change values when logged in as Administrator.

NOTE

Administrator access level is only for Alfa Laval service engineers.

Alarm history A list of all past alarms

**System time** Set system time so correct time stamps are made in the alarm list.

Language Set system language.

Login Login and logout to change access level.

### Operating timers

Separate running timers are available for System, Separator motor, Feed pump motor and Regulating valve.

### System overview

Status of the control system; program versions, used RAM, internal temperature, etc.

### Alarm list

The Alarm list shows all active and all unacknowledged alarms. It is always accessible from the Control bar.



Alarms can be for operator information only but in most cases it also forces the unit to another operating mode. See "6.4 Alarm table" on page 33.

The operator acknowledges alarms with the two buttons on the right hand side.

Red indicates an unacknowledged alarm, yellow an acknowledged but still active alarm and green an unacknowledged but no longer active alarm.

### 6.2 Connection for correct voltage



If the power supply is equipped with an ELCB (Earth Leakage Circuit Breaker) make sure that it is of industrial type that allows higher (30mA at 230 V) leakage current.

If the cleaning unit should be connected to other voltage than 230 V, the unit should be equipped with a transformer (1). Other possible voltages are then 100, 110 and 120 V.

Switching between voltages requires changing of transformer connection inside the control cabinet. See circuit diagram. This should only be done by qualified personnel.

If a transformer is connected, first check that the power cable is correctly connected in the control unit before operating the cleaning unit. For further information, see chapter *Electrical system*.



Location of transformer (1) if fitted

## 6.3 Alarm light pattern

Off	- In STOP when separator is in standstill
	- In PRODUCTION
Steady shine	- During START
	- If an active alarm that has been acknowledged
	exists
	- During STOP as long as separator is not in
	standstill
Blinking (0.5s on, 0.5s off)	- When feed pump speed is boosted (Startup
	speed)
	- If an unacknowledged alarm exists
Flashing (0.2s on, 2s off)	- If system is in STANDBY and no alarm is active

## 6.4 Alarm table

Alarm	Alarm delay	Description	Action
A001	15s	Too low counter	
Low counter		pressure.	
pressure			See 8.3 Pump stops on page 37.
A002	35s	Too low startup	
Startup pressure		pressure.	See 8.3 Pump stops on page 37.
A003	5s	Signal out of range on	
Pressure sensor		PT.	
out of range			Check sensor cable. Replace sensor.
A004	N/A	Maximum time in	
Max time in		STANDBY (180 min)	
Standby		exceeded.	Restart the cleaning unit.
A005	60s	No flow, regulator valve	
No flow		closed for too long.	See 8.7 No flow from pump on page 39.
A006	15s	High temperature in	
High temp cabinet		control cabinet	Check ventilation for control cabinet.
A100	1s	Frequency converter	Check motor connection. Check pump
Feed pump motor		fault for feed pump.	motor. Check control cables to Frequency
overload			converter.
A200	1s	Bowl hood interlock out	See 8.1 Cleaning system/separator does
Bowl hood		of correct position.	not start or stops shortly after start on
interlock open			page 37
A201	5s	Collecting tank full.	
Oil tank full		-	Empty the tank and start the pump.
A202	1s	Frequency converter	Check separator motor connection.
Separator motor		fault for separator.	Check separator motor. Check control
overload			cables to Frequency converter.
A300 (For Alfa	5s	Alarm only	
Laval Emmie with			
heater only)			
Heater overheat			

## 7 Operating instructions

### 7.1 Before first start

Check that the unit is wired for correct voltage, see 6.2 Connection for correct voltage on page 27.

### 7.2 Before normal start

- 1. If the strainer (pos. 7) has been cleaned/emptied, check that filter housing is filled with liquid.
- 2. If the cleaning unit has been out of operation for a longer period, the pump impeller should be greased before use to receive optimal suction ability.
- Place the suction device (1A) with floaters in the tank as illustrated. If using the optional suction device with bellows (1B), place it in the tank as illustrated. Fill the inside of the bellows with liquid by pressing it below the surface. The device 1A is floating while 1B stands on the tank bottom.
- 4. Check that the hose for the feed inlet (2) is connected to the strainer. Admitted suction height for the separator is max. 1.7 metres.
- 5. Check that the return hose for the feed outlet (3) is placed securely in the tank and far away from the feed inlet, if possible.
- 6. Make sure that the three hood screws (4) and the knob (5) are firmly tightened and that the bowl hood interlock(6) is in closed (vertical) position.

### 7.3 Start

1. Connect the unit to the power supply.



Fill the filter housing with liquid before start. Running the pump dry will damage the impeller and may result in damage to the pump housing and/or motor.



- 1a. Suction device for deeper tanks (min. 100 mm)
- 1b. Suction device for shallow tanks (55 100 mm)
- 2. Feed inlet
- 3. Feed outlet

- 4. Hood screws (3 pcs)
- 5. Knob
- 6. Bowl hood interlock
- 7. Strainer

2. When there is no alarm active and unacknowledged the operator can tap the Start button and the cleaning unit will start. The separator starts. When it has reached full speed the feed pump starts. The control system waits for the pressure to rise. When the pressure has reached the set-point (see tile menu for pressure under 6.1 Operator panel on page 21), the feed pump speed decreases to separation speed and the automatic pressure regulation starts. The cleaning unit is now running in Production mode.

#### **Disintegration hazard**

Some vibration 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 vibration becomes very severe or continues at full speed, stop the separator immediately. See chapter 8.6 Separator vibrates on page 39 for possible causes.

3. Check that the flow into the suction device is as illustrated. It is the surface layer A (normally oil) that should be sucked into the inlet. If the suction device is lying too high, air is sucked in. If the device is lying too low, liquid under the oil layer will be sucked instead of the oil itself.





If using the suction device with bellows (option), check that the top is located just under the surface in the tank so that the surface layer is sucked into the bellows. The setting is self-adjusted.

The suction device with bellows is delivered with an extra long hose. This hose must be positioned so that a part of the hose touches the bottom before leaving the tank and keeps the bellow suction device in position. (see illustration to the right) <image>

4. Increase the counter pressure slowly until a small stream of oil/ liquid is observed coming from the oil outlet (1). Preferably, use a torchlight to see this. Reduce the counter pressure to increase the oil concentration or increase the counter pressure to improve the oil removal efficiency of the separator.

5. After adjustment of the counter pressure, check that the pressure is within the recommended range (100 - 180 kPa).



## 7.4 Operation

1. Check the cleaning unit for correct operation (correct flow from outlet, counter pressure and vibration). This is especially important the first time the cleaning unit is run after installation or dismantling and assembly.

2. When the collecting tank is nearly full, the pump is stopped automatically and the lamp on the control unit lights up. The display shows alarm. Empty the tank and restart the pump to continue the cleaning.



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Recommended counter pressure is 100 – 180 kPa

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## 7.5 Standby

If an alarm occurs in Production mode, the system goes into Standby mode. The feed pump is stopped and the pressure regulating valve is opened. The operator can also choose to go to Standby by tapping the Standby button. When there are no alarms active and unacknowledged, the operator can tap the Start button to resume separation by returning to Production mode.



If an alarm has forced the system into standby, never do more than one pump restart. Check and remedy the cause. Several restarts can damage the pump, which can also result in damage to the pump housing and/or motor.

## 7.6 Stop

1. The cleaning unit is stopped by tapping the Stop button, or if an alarm forces the system to stop. Feed pump and separator are turned off. Pressure regulating valve is opened.



After each stop of the cleaning unit, the separator bowl must be cleaned well. If not, an unevenly spaced sludge cake will at next start result in heavy vibration and can cause damage.



### 7 Operating instructions



When the separator has nearly stopped rotating (within two minutes), the liquid content of the bowl will be drained by gravity into the collecting tank.



If the position of the tank level is higher than the inlet/outlet of the separator, there is a risk that liquid may be siphoned from the tank and drained via the separator into the collecting tank.



If the cleaning unit is not used for a longer period drain the pump from liquid. The rubber material of the impeller ages and should be treated as perishables.
# 8.1 Cleaning system/separator does not start or stops shortly after start

Possible cause	Action
No power supplied	Check the mains switch, fuses and supply line
Bowl hood interlock is not in correct position	Position the interlock correctly
Defective magnetic switch indicating the position of the bowl hood interlock	Check that the switch opens and closes when interlock is moved up and down
Incorrect assembly after cleaning. The bowl and motor shaft cannot rotate freely	Dismantle and check
Voltage protection for frequency control trips because of too low/high voltage or voltage spikes greater than $\pm 5$ %.	Check the voltage. If unstable voltage, connect a transformer.
Separator stops	See 8.4 Separator stops on page 38.
Pump stops	See 8.3 Pump stops on page 37

## 8.2 Pump does not start

Possible cause	Action
Microswitch for filled collecting tank activated	Empty the tank or adjust the spring tension for the tank support

# 8.3 Pump stops

Possible cause	Action
Collecting tank filled	Empty the tank and start the pump
Overload caused by clogged strainer	Clean the strainer. The motor protector in control unit is automatically reset
Counter pressure at separator outlet is lower than 50 kPa	<ul> <li>Check that suction inlet is not above surface in tank</li> </ul>
	Check for obstructed inlet line
	<ul> <li>Check function of regulating valve</li> </ul>
	<ul> <li>Adjust the counter pressure. See chapter 6 Control Cabinet</li> </ul>
	<ul> <li>Check the direction of rotation for separator and pump</li> </ul>
Overload caused by obstructed inlet or outlet side	Check that the feed through the whole system is sufficient

Possible cause	Action
Voltage protection on frequency card trips because of too low/high voltage or voltage spikes	Check the voltage. If unstable voltage, connect a transformer.
Defective motor/frequency converter	Remedy - replace

# 8.4 Separator stops

Possible cause	Action
Bowl hood interlock out of correct position	Reposition the interlock
Overload due to clogged disc stack	Clean the separator disc stack
Overload due to incorrect assembly	Check the bowl assembly
Tripped frequency converter due to too low or too high supplied voltage (>±5% of nominal voltage)	Check the voltage. Check the voltage. If unstable voltage, connect a transformer.
Also see possible causes and actions in 8.1 stops shortly after start on page 37.	Cleaning system/separator does not start or
Defective frequency converter	Replace frequency control in control cabinet.

# 8.5 Noise

Possible cause	Action
Vibration dampers in separator are worn	Fit new dampers
Incorrect assembly of separator bowl	Dismantle and check
Bearings damaged	Fit new bearings

# 8.6 Separator vibrates



#### Disintegration hazard

If excessive vibrations occur, STOP the separator

Possible cause	Action
<ul> <li>Bowl out of balance due to:</li> <li>Insufficient or incorrect cleaning (sludge in disc stack)</li> </ul>	Dismantle and clean the separator bowl. Be sure that the separator is assembled correctly.
<ul> <li>Unevenly spaced sludge cake (bowl not cleaned prior to start)</li> </ul>	
<ul> <li>Incorrect assembly</li> </ul>	
Vibration dampers in separator are worn	Fit new dampers
Damaged bearings	Replace the bearings

## 8.7 No flow from pump

Possible cause	Action
Incorrect setting of flow control (too low speed of pump)	Start with max. flow. See 6 Control Cabinet.
The screw fitted in pump is not closed (internal leakage too high)	Turn the adjustment screw clockwise.
Air leakage on suction side between tank and pump	Check that the inlet is below surface in tank. Check that couplings are correctly fitted.

## 8.8 Flow too low

Possible cause	Action
Impeller in pump worn or broken	Replace impeller, See 9.6 Replacing the impeller and mechanical seal for pump on page 65
Counter pressure at outlet too high	Reduce the counter pressure with the regulating valve (100 - 180 kPa is recommended)
Leakage caused by incorrect assembly	<ul> <li>The three screws fastening the bowl hood or the paring disc knob (the upper part of the separator) are not completely tightened.</li> </ul>
	<ul> <li>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.</li> </ul>
Separator or pump rotates in wrong direction	Check power supply cables.

# 8.9 No flow either through clean oil outlet or through drain to collecting tank

Possible cause	Action
Separator or pump stopped	Check function, see 8.4 on page 38 and 8.3
Inlet and outlet hoses for pump wrongly connected	Interchange the hose connections
Strainer before separator clogged	Clean strainer
Separator disc stack clogged	Clean separator bowl and disc stack
Air leakage on suction side between liquid tank and pump	Check that the inlet of the suction device is below surface in tank. Check that couplings are correctly fitted.
Impeller attachment to nave is loose	Replace impeller, see 9.6 on page 65
The sleeve fastened to the motorshaft for the pump is loose	Tighten the lock screws, see illustration, pos. 14 & 15 on page 65

# 8.10 Some liquid escaping through drain outlet to collecting tank

Possible cause	Action
Counter pressure at outlet too high	<ul> <li>Reduce the counter pressure with the regulating valve (100 - 180 kPa is recommended)</li> </ul>
	<ul> <li>Reduce the flow by adjusting the screw fitted in pump</li> </ul>
Leaking O-rings in separator	Replace O-rings
Clogged disc stack	Clean the bowl and disc stack
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

# 8.11 Oil flow through drain outlet to collecting tank only

Possible cause	Action
If operating in purifier mode: broken liquid seal in separator bowl	• Stop the pump and add water through the inlet at top of the separator.
Obstruction in cleaned oil feed line	Check that regulating valve is open
	<ul> <li>Check that outlet end to tank is open (no closed check valve in hose connection)</li> </ul>

# 8.12 Oil leakage through drain outlet to collecting tank when separator is not running

Possible cause	Action
Oil is siphoned from fluid tank due to siphon	Disconnect both hoses connected to the oil
effect	tank

# 8.13 Collecting tank overflowing but pump does not stop

Possible cause	Action
Adjustment of the spring tension for the	Adjust the setting. See description in 4.5
tank support is incorrect	Collecting tank on page 17.
Faulty limit switch	Remedy

# 8.14 Insuficient separation result

Possible cause	Action
The suction device in liquid tank lays too	Adjust the height. See description in chapter
high	7.3 Start on page 31
Separator disc stack clogged	Clean separator bowl and disc stack
	Increase the counter pressure until oil is
	observed to be discharged from the oil outlet,
The counter pressure is too low	see chapter 7.3 Start on page 31

# 8.15 Software update guide

## 8.15.1 Introduction

This document describes how to update the system software in an Alfie or Emmie Separator system from a prepared USB-stick.

- Standard version: 593167-80
- Japanese version: 593167-81



Since the update has to be done with the cabinet door open while the cabinet is powered up, you need to fulfil the qualifications required by the local safety regulations regarding "live working" to do the update

## 8.15.2 Preparation

1. Make sure to write down the current installed version of the software. The version numbers can be found in the 4.2 System overview page in the panel, see example below.





 08:33:38
 1.0 Settings menu
 @ At#a Laval
 1

 Image: Constraint of the set of the

G1237531

G1237521

08:37:17	1.2 sys	tem overview	© Alfa Laval	1
HMI CPU used	6.0 %			
HMI used RAM	35.0 %	PLC core temp	56.0 °C	
HMI used storage	64.0 %	PLC env. temp	34.0 °C	
HMI version	V1.0.6	PLC version	V1.0.6	
			0	Z Touch

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2. Compare set parameters with the default values in the parameter list in the end of this document and note any parameters that have been changed from the default value.

## 8.15.3 PLC software update

- 1. Read through the instruction before starting the update.
- 2. Disconnect the plug of the power supply cable from the socket.
- 3. Dismantle the door of the cabinet by unscrewing the 4 screws.
- 4. Insert the USB-stick in to the PLC (IF4) USB-port. The USB-port can be found on the base of the PLC (see figure below).



There is not much space in the cabinet. It might be a little difficult to find the USB-port and insert the USB-stick since the USB-port is located on the backside of the PLC, looking at it from the outside of the cabinet (see picture below).



5. Connect the plug of the power supply cable to the socket.

There will not be any indication of the update on the HMI. When the update has been installed and is running, the R-LED (see picture below) on the CPU is stable and green. The update will take approx. 5 minutes, since the PLC will be rebooting a couple of times.



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6. Disconnect the plug of the power supply cable from the socket and remove the USB stick.

## 8.15.4 HMI software update

- 1. Read through the instruction before starting the update. Some of the steps might be time sensitive.
- 2. Make sure the plug of the power supply cable is disconnected from the socket.
- Insert the USB stick in to the panel. There is a small hatch on the side of the panel, flip it open to find the USB port (see pictures below). You might need a screwdriver to be able to flip it open.







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- 4. Connect the plug of the power supply cable to the socket
- 5. When asked if you want to copy the project from external storage, answer **YES** before the timer on the **NO** button reaches **0**. If the timer reaches **0**, the update must be restarted.



6. Select the file and press OK.



7. If asked to back up the current project, answer NO.



8. The panel will now copy the project.

Unregister dlls	
Unregister file LIBEAY32.	DLL
G1238411	

- 9. When the installation is done the panel starts up. When it is fully started you can remove the USB stick (Make sure the plug of the power supply cable is disconnected from the socket first).
- 10. You may be prompted with the following question in the operator panel:



Answer "Create empty file" to create a new parameter file.

## 8.15.5 Verification

 To verify that the software has been updated, go to the 4.2 System overview page (see Chapter "Preparation" paragraph 1).

You should now see the new software version numbers instead of the old.

- 2. Always check the parameter settings after performing an upgrade. In most cases the previous parameter settings are still set after the update but depending on what is updated there may be cases where the system loses some or all settings.
- 3. In case of lost settings, set the parameters according to the parameter list and the changes noted before the update

If all parameters are 0 and/or if no/wrong system is set in P001, set the correct system and Press "Set default parameters" and then set the parameter changes noted before the update.

If it is necessary to login to change the parameters the User is "admin" and the Password is "admin".



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## 8.15.6 Parameters

### Main

ld	Security Level	Text	Default	Min	Max	Unit	Note
P001	2	System	0	0	2		
P002	2	Heater type	0	0	1		
P003	[Security level]	Sealing time	15	0	120	S	
P004	[Security level]	Feed pump startup speed	40	10	60	%	
P005	[Security level]	Feed pump separation speed	19	10	60	%	
P006	[Security level]	Pressure regulation wait time	10	0	120	S	
P007	[Security level]	Feed pump ratio	4.45	1	10	l/h	
P008	[Security level]	Startup pressure alarm delay	35	0	120	S	
P009	[Security level]	Separation pressure setpoint	140	55	200	kPa	
P010	[Security level]	Startup pressure alarm limit	55	0	185	kPa	
P011	[Security level]	Separation pressure alarm limit	50	0	185	kPa	
P012	[Security level]	Pressure control gain	0.1	0	1.5		
P013	[Security level]	Pressure control integral time	7	0	15	S	
P014	[Security level]	Pressure control pause deadband	3	0	100	kPa	
P015	[Security level]	Pressure control resume deadband	10	0	100		
P016	[Security level]	No flow delay	60	0	300		
P017	[Security level]	Pressure measurement filter	5	0	30	S	
P020	[Security level]	Program selection	1	1	6		
P021	[Security level]	P1 Temp setpoint	40	0	70		
P022	[Security level]	P2 Temp setpoint	45	0	70		
P023	[Security level]	P3 Temp setpoint	50	0	70		
P024	[Security level]	P4 Temp setpoint	55	0	70		
P025	[Security level]	P5 Temp setpoint	63	0	70		
P026	[Security level]	P6 Temp setpoint	55	0	70		
P031	[Security level]	P1 Separation speed (feed pump)	120	0	200	l/h	
P032	[Security level]	P2 Separation speed (feed pump)	115	0	200	l/h	
P033	[Security level]	P3 Separation speed (feed pump)	105	0	200	l/h	
P034	[Security level]	P4 Separation speed (feed pump)	100	0	200	l/h	
P035	[Security level]	P5 Separation speed (feed pump)	90	0	200	l/h	
P036	[Security level]	P6 Separation speed (feed pump)	100	0	200	l/h	

ld	Security Level	Text	Default	Min	Max	Unit	Note
P041	[Security level]	P1 Startup speed (feed pump)	170	0	200	l/h	
P042	[Security level]	P2 Startup speed (feed pump)	170	0	200	l/h	
P043	[Security level]	P3 Startup speed (feed pump)	170	0	200	l/h	
P044	[Security level]	P4 Startup speed (feed pump)	135	0	200	l/h	
P045	[Security level]	P5 Startup speed (feed pump)	135	0	200	l/h	
P046	[Security level]	P6 Startup speed (feed pump)	100	0	200	l/h	

### Feed

ld	Security Level	Text	Default	Min	Max	Unit	Note
P100	3	Feed pump ramp rate	20	1	100	%/s	

### Separator

ld	Security Level	Text	Default	Min	Мах	Unit	Note
P200	[Security level]	Separator ramp time	12	0.001	100	s	

### Heater

ld	Security Level	Text	Default	Min	Max	Unit	Note
P300	[Security level]	Heater cooling temp. drop limit	5	0	120	°C	
P312	[Security level]	Heater control gain	15	0	25		
P313	[Security level]	Heater control integral time	450	0	1000	S	

# 9 Maintenance



Entrapment hazard Switch off the power supply, remove the electric cables from the sockets and make sure that rotating parts have come to a **complete standstill** before starting any dismantling work.



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

## 9.1 Cleaning

## 9.1.1 Strainer

The strainer has to be cleaned regularly. During the initial period, open and inspect once every week to determine the necessary cleaning interval.



When fitting the filter housing it must first be filled with liquid to prevent the pump operating in dry condition. Otherwise the life of pump will be shortened.

## 9.1.2 Separator

The separated solids collected inside the separator bowl must be removed manually. The length of the cleaning interval depends on the liquid flow rate and on the amount of solids. During the initial period, open and inspect the bowl once a day to determine the necessary cleaning interval. The bowl must be cleaned before the solids layer has become thicker than 10 mm. Otherwise there will be risk that the clean liquid outlet in the bowl will be covered by solids.

#### Control of sludge content

Dismantle the separator and measure the thickness (A) of the sludge collected on the bowl wall. The thickness should never exceed 10 mm.

If the interval between bowl cleaning is too long, this 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 A. oil, bowl cleaning every 20 - 30 minutes could be necessary.



- Max. thickness = 10 mm (corresponds to 0.6 litre)
- 1. Sludge
- 2. Bowl wall

See 9.5.2 Cleaning of bowl on page 56 for information on procedure.

## 9.2 Once per month

### 9.2.1 Pump

Check that the vanes of the impeller are not broken. If a vane is brooken replace with a new impeller. Always check that rubber parts from the impeller does not block the hoses or separator inlet (including the inlet pipe). If blocked the new impeller will break very quickly.

The impeller is a wearing part and the performance of the pump will change with the wear. Abrasive liquids will shorten the service life of the impeller and the pump (cover and pump housing).

Frequent dry running or change of rotation will shorten the service life. When operated at high temperatures (more than 55 °C) the service life is shortened. The expected service life differs depending on installation parameters and is normally 200 - 1200 operating hours but can be longer.

## 9.3 Once per year

## 9.3.1 Separator

Replace the O-rings with new ones included in the O-ring service kit. Their positions are shown in the *Spare Parts Catalogue*.

See 9.5.3 Replacement of O-rings on page 60 for procedure.

Check the condition of discs in the bowl, replace if necessary.

Fit new vibration dampers. To get access to the dampers, only remove the three screws and washers shown in illustration 10 on page 62. Inspect the stop flanges of the dampers for possible damage and replace the stop flanges with new ones if necessary. Use Loctite 243 at assembly, see illustration 33 in chapter 9.4.5 Replacement of motor bearings.

## 9.4 Every second year

## 9.4.1 Separator

Check/replace the disc stack to maintain the separation efficiency.

See 9.5.3 Replacement of O-rings on page 60 for procedure.

## 9.5 Dismantling - assembly instructions for separator

## 9.5.1 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.

0	Remove	Screw or turn clock- wise		Press or move in the direction of arrow	Clean
0	Fit, insert	Screw or turn counter- clock- wise	•	Check, make sure	Safety

## 9.5.2 Cleaning of bowl

#### Comments to illustrations following.

#### **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.



#### **Entrapment hazard**

Switch off the power supply, remove the electric cable from the socket and make sure that rotating parts have come to a **complete standstill** before starting any dismantling work.



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:**

Some coolant will normally leak from the connecting housing when the frame hood is opened. If coolant continues to leak, the cause could be a non-sealing check valve (if any) while the separator is connected to a tank with a level higher than the separator (siphon effect).

#### **Illustration 15:**



Never use sharp or metallic tools when cleaning the bowl wall. This can damage the coating and later on cause pitting corrosion. Always use soft rags.

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



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## Dismantling



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*See comments on opposite page

#### Comments to illustrations on opposite page.

#### **Illustration 16:**

When fitting the bowl shell, 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.



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# 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 O-ring by pressing 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 overtighten when assembling parts.

### **Illustration 22:**



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 above and on opposite page.

## 9.5.3 Replacement of O-rings

Comments to illustrations on opposite page.

#### **Illustration 5:**

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 15:



Fit the upper O-ring outside the level ring, see comments to illustration 17.



First dismantle the separator bowl as described in 9.5.2 Cleaning of bowl on page 56.

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*See comments on opposite page.

## 9.5.4 Replacement of motor bearings

First dismantle the separator bowl as described in 9.5.2 Cleaning of bowl on page 56.



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## Replacing the impeller and mechanical seal for pump 9.6



- 1. Screw cap
- 2. Cover
- 3. Impeller
- 4. Pump body
- 6. Motor flange
- 7. Shaft
- 8. Screw stud
- 5. Mechanical seal (Carbon/Ceramic/Nitrile)
- 9. O-ring 10. Screw

- 11. Washer
- 12. Screw
- 13. Washer 14. Lock screw
- 15. Sleeve

#### Dismantling of impeller and mechanical seal

- 1. Check that hoses between the cleaning unit and the tank to clean are removed.
- 2. Disconnect the hoses from the pump inand outlet.
- 3. Place a vessel under the pump to collect leaking liquid at dismantling.
- 4. Remove the front cover (2) and the O-ring (9).

- 5. Remove the impeller (3) from the pump body (4) by using suitable pliers or two levers. Take care not to damage the pump body.
- 6. If replacing the mechanical seal, separate the pump body from the flange (6). Check for wear inside the pump body.
- 7. Press out the seal seat from the pump body. Remove the seal assembly from the shaft.
- 8. Inspect and clean all parts which will be re-used.

#### Assembly of impeller and mechanical seal

1. Slide the rotating seal part onto the shaft with a twisting movement and press the stationary seal part into the pump body. Lubrication with soap solution will ease the assembly.

2. Assemble the pump body to the flange, taking care not to damage the seal.

3. Lubricate the impeller with grease or vaseline.

4. Push the impeller into the pump body with a twisting movement in the operating direction,

5. Assemble the front cover O-ring and the front

centralizing the impeller hub.

Tightening torque: 2,5 - 8 Nm.





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G09869d1



cover.

If the screw caps are tightened harder the front cover will bend or crack which can cause leakages and the impeller to jam.

# 10 Technical data

# 10.1 Technical data, system

Denomination:	Alfa Laval Alfie 500 Use is restricted to removal of solids and oil from water-based liquid with the following specifications	
	Process media:	Water-based liquid
Technical design		
-	pH value: Separation temperature:	6 – 9 +15 – +70 °C
Max. throughput: Max. ambient temperature: Counter pressure at outlet of unit:	500 litres/hour +45 °C	(50/60 Hz)
- Recommended	100 - 180 kPa	
- Max.	185 kPa	
Suction height:	Max. 1.7 metres	
Volume in collecting tank:	20 litres	
	230 V (±5%), 1 phase, 50/60 Hz 100/110/120 V (±5%), 1 phase, 50/60 Hz (option, with fitted	
Power supply:	transformer) 10 A (230 V), 16 A (100 – 120	
Amperage:	V)	
Sound:	Sound power: Sound pressure level:	Max. 8.9 Bel(A), ISO 3744 Max. 75 dB(A), ISO 3744
Enclosure class:	IP 54	
Weight, total:	60 kg (135 lbs) 620 x 1140 x 510 mm (24" x	
Dimensions (LxHxW):	45" x 20")	

## 10.2 Declaration

Alfa Laval ref. 594945 Rev. 4

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

Manufacturer: .	
Manufacturer address: .	
Type:	
Product specification:	
Configuration number:	
Serial number: .	

### **EU Declaration of Conformity**

The machinery complies with the following Directives:

Designation	Description
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive

To meet the requirements the following standards have been applied:

Designation	Description
EN 60204-1	Safety of machinery - Electrical equipment of machines. Part 1: General requirements
EN 61000-6-2	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-4	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN ISO 13849-1	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN ISO 3744	Acoustics - Determination of sound power levels of noise sources using sound pressure

The technical construction file for the machinery is compiled and retained by the authorized person Fredrik Nytomt within the Business Unit High Speed Separators, Alfa Laval Tumba AB, SE-14780 Tumba, Sweden. By reasoned request all relevant technical documentation will be sent by post to national authorities.

Signed for and on behalf of:	
Place:	
Date of issue:	
Signature:	
Name:	
Function:	

# 11 Lifting instruction

# 11.1 Cleaning unit

Attach two lifting straps (1) to the lifting hooks.

The distance between the lifting hooks and crane hook should be min. 1 metre (A).



Weight of unit is approx. 60 kg.



Entrapment hazard Only attach the lifting straps to the two lifting hooks when lifting the cleaning unit.

A falling unit can cause accidents resulting in serious injury to persons and damage to equipment.



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Lifting procedure for cleaning unit



#### **Electrical system** 12.1

Alfa Laval ref. 9014733 Rev. 7






Note		iOHz (Max fuse 10A)																				à Laval delivery	ording to VFD/motor specification	main supply is connected to transformer panel	ige Revision Revised date Page <b>4</b>	test Revision Document No. 2013-20 Next page
Function text	Ethernet to OP	Power Supply: 1x230V 50/60Hz (Max fuse 10A) Option: 1x100/110/120V 50/60	Separator	Pump	Tank full	Cover open	Pressure transmitter	Pressure regulating valve														Note: 1) Cable not included in Alfa	2) Cable type and size accord 3) Optional	<ul> <li>4) If external transformer, m</li> </ul>	Location Pag	Mounting
Conductors	nseu 1	· ~	4	4	2	2	4	4																	0.1 - 1 - V	70±04 - T · A
Conductors /	AIEd	3G1,5	4G1,5	4G1,5	5x0,75	1x2x0,75	4x0,34	4x0,34														ectrical drawinos.		ŕ	Title Cable overview	
Cable type	581803 45	576705 01	9009089 81	9005079 80	571937 01	554151 03	9017476 03	901747604														d to earth as shown in the el		ives sufficient EMC protection		
Target (to)	=9014733+CP01-OP1	=CUSTOMER+PS-MAINS	=9014733+Field-M1	=9014733 +Field-M2	=9014733+Field-LS1	=9014733+Field-S1	=9014733+Field-PT1-1	=9014733+Field-V1-1														the shield properly connected	irth bar.	vn in the electrical drawings g	Project Alfia / Fmmi.a	
Source (from)	14733+CP01-A1	14733+CP01-X1	14733+CP01-U1 =	14733+CP01-U2 =	14733+CP01-X2	14733+CP01-X2 =	14733+CP01-X401 =	14733+CP01-X401														proved cables may be used. e a Signal Shielded Cable with	r must be connected to the ea	connected to the earth as show	3I Revised by SFTLITTRI	Approved by
2	:06=	:06=	:06=	:06=	= 90:	= 90:	= 90:	=90														quivalent and app I cables should be	er cables, armour	g the armour is c	Created by SFTLITR	Approved date

12 Diagrams

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0 1 2	4	α	6 8 9
Wiring Table			
Wire Type			N07V-K (or equivalent flame retardent)
Wire Colour			EN 60204-1:2006 / IEC 60204-1:2005
Wire Code			IEC 60757
Power Circuits	0-16A	2,5mm²	Black
	16-25A	4mm²	Black
	25-32A	6mm²	Black
	32-48A	10mm ²	Black
	48-64A	16mm²	Black
	64-85A	25mm²	Black
	85-104A	35mm²	Black
	104-130A	50mm ²	Black
Earth (PE)		1,5mm²	Yellow / Green
Auxiliary Circuits 24VAC		0,5mm²	Red
Auxiliary Circuits 24VDC		0,5mm²	Blue
External auxillary Circuits		1mm²	Orange
ted date Costate by Revised by Project 21-04-01 SETUTBL SETUTBL Alfie/Emmie Alfie/Emmie Alfie/Emmie Alfie/Emmie	The Wiring table	Eccation =9014733 Monting	Page Revision         Revision         Revision         Page           02         2014-09-05         March registric         March registric           Latest Revision         Document No.         Mont 4722         March registric
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12 Diagrams

Alfa Laval ref. 9014733 Rev. 7

This document constitutes a contractual obligation on our part only to the extent expressly agreed upon.






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