Instruction Book
Centrifuge for purification of crankcase ventilation gas

PureVent
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Read and understand instruction manuals and observe the warnings before installation, operation, service and maintenance.

Not following the instructions can result in serious accidents.

In order to make the information clear only foreseeable conditions have been considered. No warnings are given, therefore, for situations arising from the unintended usage of the machine and its tools.
This Instruction Book is designed for operators and service engineers working with the Alfa Laval separator PureVent.

This Instruction Book consists of:

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

**General information**
Read this chapter if you are not familiar with this type of separator.

**Technical description**
Description of the function of the parts of the separator.

Personnel who deal with advanced maintenance and service must have a thorough knowledge of this section.

**Operating instructions**
This chapter contains instructions for usage of the separator

**Maintenance and fault finding**
This chapter gives instructions for daily checks, cleaning, servicing and check points.

**Technical reference**
This chapter contains technical data concerning the separator.

**Installation**
General information on installation planning.
Instructions for the installation of the separator.

**Spare parts**
PureVent include a centrifuge rotor that rotates at approx. 7100 rev/minute.

As long as the unit is sealed, fixed mounted and operated according to instructions and specifications it is considered to constitute no danger.

- Use the unit 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.
- Use only Alfa Laval genuine spare parts and the special tools supplied.

**WARNING**

**Disintegration hazard**

- If excessive vibrations occur, **stop** the unit.

**Entrapment hazard**

- Make sure that rotating parts inside the separator have come to a **complete standstill** before moving the unit or starting any dismantling work.
- To avoid accidental start, switch off and make sure the main switch is in the "OFF" position before starting any dismantling work

**Warning label**

A warning label is placed on the cleaning unit.

The interpretation of the label is:

**STOP!** Read the instruction manual before installation, operation and maintenance. Consider inspection intervals.
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 media, rotational speed, temperature etc.) and must not be used for any other purpose.

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

The following basic safety instructions therefore apply:

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

• When power cables are connected, always check direction of motor rotation.

• Use the separator only for the purpose and parameter range specified by Alfa Laval.

• Since the separator is equipped with a frequency controlled motor, it is extremely important to ensure that the motor speed does not exceed the allowed maximum speed. A serious break down may be the consequence.

  All settings of the frequency converter are preset from factory and should not be changed other than by certified Alfalaval representatives.

• Welding or heating of parts that rotate can seriously affect material strength.
2 Safety Instructions

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 hazard

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

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

Crush hazards

- Use correct lifting tools and follow lifting instructions.

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

- Use ear protection in noisy environments.

Burn hazards

- Various machine surfaces can be hot and cause burns.

Skin irritation hazards

- When using chemical cleaning agents, make sure you follow the general rules and suppliers recommendation regarding ventilation, personnel protection etc.
## 2.1 Warning signs in text

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

<table>
<thead>
<tr>
<th>Type of Hazard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DANGER</strong></td>
<td>Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.</td>
</tr>
<tr>
<td><strong>WARNING</strong></td>
<td>Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.</td>
</tr>
<tr>
<td><strong>CAUTION</strong></td>
<td>Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.</td>
</tr>
</tbody>
</table>

**NOTE**

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

Unpacking

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

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

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

Metal straps should be sent for material recycling.

Maintenance

During maintenance 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.

Metal parts should be sent to a licensed handler for material recycling.

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

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

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

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

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

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

PureVent is a separator designed to remove oil droplets and soot from crankcase ventilation gas in combustion engines. By means of centrifugal separation, oil and soot is removed from the vent gas and leaves the filter through a drain pipe for recirculation or collection. The PureVent efficiency is constant in time, and no costly filter changes are necessary.

Crankcase gases originate from exhaust gases that leak down to the crankcase from the combustion chamber via gaps between the cylinder wall and the piston rings. In order to prevent pressurizing the crankcase, there must be a continuous flow of ventilated gases from the crankcase.

It is desirable from environmental reasons to feed these gases back into the inlet manifold for recombustion ("closed combustion system"). If this is done without filtering the gas it will however cause harm to the motor:

- The efficiency of the turbocharger drops as a consequence of coke deposits.
- The intercooler performance will be reduced.

It is these problems that the PureVent Separator eliminates. Gas filtered through the PureVent separator is clean enough either to be recombusted or to be ventilated out into the ambient air without further filtering.
4 Technical description

4.1 Working principle

The crankcase ventilation-gas enters the inlet “A” and is purified in the rotating disc stack. The gas then leaves the unit through the outlet “C”.

The separated oil and soot flow down towards the oil outlet “B” at the bottom.

The frequency converter unit “D” controls the separator motor through the cable connected at “F”. The electrical supply to the frequency converter is connected at “E”.

![Diagram of the technical description](image-url)
5 Operating instructions

5.1 Operating routine

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

The instructions are related only to the separator itself.

5.2 Before first start

Before first start ensure the machine is installed correctly according to the installation instructions. See “8 Installation”

Technical requirements for connections and logical limitations for the separator are described in the following documents:

1. Technical data
2. Basic size drawing
3. Connection list and interface description
5.3 Start

Start separator concurrent with the engine it is connected to.

1. Start the separator by pressing the start button on the control unit.

   **NOTE**

   PureVent may be connected for automatic operation. If so, no manual starting is needed.

2. If this is the first start after commissioning or major service, let the separator run empty for about one hour before connecting the hot gases.

3. Check the separator for vibration. Some vibration may occur for short periods during the starting cycle when the separator passes through its critical speeds. This is normal and passes without danger. Try to learn the vibration characteristics of the critical speed pattern.

4. The separator has reached full speed approximately 15 seconds after start

   **CAUTION**

   If excessive vibration occurs, **stop** separator

   At any sign of abnormal vibrations or noise, shut off unit and contact your Alfa Laval representative.
5.4 Operation

1. Check that the oil outlet is free from blockage, and connected with downward slope. Outlet use gravitation to drain the separator.

2. Daily condition checks
   The following should be carried out daily:
   - Check all hose connections for leakage.
   - Check the separator for noise and vibration.
   - Check that the oil outlet is free from blockage.
   If separate vessel is used for the oil, check for required emptying.

5.5 Stop

1. Stop the unit by pressing the stop button.

   NOTE
   PureVent may be connected for automatic operation. If so, no manual stopping is needed.

2. It takes approximately 1 minute for the separator to come to complete standstill. This can be verified by checking the motor fan.
6 Maintenance and fault finding

6.1 Separator unit

PureVent is a product designed for minimal maintenance. Please follow the maintenance steps mentioned below to ensure trouble free operation.

### CAUTION

Disintegration hazard

At any sign of abnormal vibrations or noise, shut off unit and contact your Alfa Laval representative.

6.1.1 Daily inspection

- Check all hose connections for leakage.
- Check the separator for noise and vibration.
- Check that the oil outlet is free from blockage.
  If separate vessel is used for the oil, check for required emptying.
6.1.2 Every 16 000 hours of operation

Every 16 000 hours of operation the motor and disc stack (1) need to be replaced by following the steps below:

1. Shut down the separator and make sure the main switch is in the "OFF" position.
2. Disconnect the power cable from the motor.
3. Unscrew the 6 bolts holding the motor and disc stack in place.
4. Lift the motor and disc stack out of the housing using the eye bolts.
5. Clean the inside of the housing.
6. Inspect the upper and lower oil drains and verify that they are still open.
7. Replace the O-ring with the one supplied in the spare parts package.
8. Move the eyebolts to the spare motor housing and lift the new motor and disc stack in place.
9. Rescrew the 6 bolts.
10. Reconnect power.

DANGER

Electrical Hazard

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

After replacing the motor and disc stack follow the routines described before first start and start in "5 Operating instructions" on page 23. Pay particular attention to how to verify direction of rotation.
6.1.3 Every 16 000 hours of operation or at least every 5 years

at regular intervals (see above) the rubber isolators (2) need to be replaced.

1. Shut down the separator and make sure the main switch is in the "OFF" position.
2. Unscrew the separator unit from the mounting brackets.
3. Disconnect hoses and power cable if necessary.
4. Lift the unit and unscrew the rubber isolators.
5. Mount the replacement isolators.
6. Remount the separator.
7. Reconnect power and hoses if necessary.

DANGER

Electrical Hazard

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

The information in this chapter only mentions basic maintenance of the frequency drive. No user programming of the unit is recommended, and Alfa Laval takes no liability for damages caused by user manipulation of the drive settings.

Before doing any work on the frequency drive make sure to shut down the separator and make sure the main power switch switch in the "OFF" position.

6.2.1 Fault finding

If the separator stops without obvious reason, try to restart the separator by shutting the power off with the power switch, and wait 5 minutes before trying to restart the separator. If the separator doesn't start, the problem may be the frequency drive.

To find locate the fault follow the following procedure:
1. Switch off the main power switch on the drive cabinet.

2. Open the cabinet door.

3. Switch on the main power from within the cabinet.

4. Look at the LEDs (1) on the frequency drive. Use the following key to locate the error:

**LED off**
No power to the drive. Check fuses and electrical connections.

**LED green and steady**
Power supply and drive ok. Check motor and motor connections.

**LED green and blinking**
Power supply OK, drive in alarm state. Shut down power and restart to clear alarm.

**LED Red and blinking**
Drive in fault state. Shut down power and restart to reset the fault.

**LED Red and steady**
Drive in fault state. Shut down power and restart. If the separator still malfunctions after shutdown and restart, replace the frequency drive.
6.2.2 Replacing Frequency drive.

Before doing any work on the frequency drive make sure to shut down the separator and lock the power switch in the "OFF" position.

**DANGER**

**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.

**Remove faulty drive**

1. Remove the terminal cover (1) by simultaneously pushing the recess and sliding the cover off the frame.

2. Mark the signal cables 9 - 22 according to the numbering on the terminal and in "6.2.3 Connection diagram" on page 34.

3. Disconnect the signal cables.

4. Mark the power cables U1, V1, W1, U2, V2 and W2 according to the numbering on the terminal and "6.2.3 Connection diagram" on page 34.

5. Disconnect the power cables.

6. Remove the clamping plates to gain access to the lower 2 cabinet screws.

7. Loosen the screws and lift the faulty drive from the cabinet rear wall.
Mount exchange drive

1. Unpack the new drive and make sure there is no transportation damage.
2. Position the new drive on the screws
3. Tighten the screws securely
4. Fasten the clamps (1) loosely to the clamping plates with the provided screws.
5. Fasten the clamping plate to the bottom of the drive with the provided screws (2).
6. Fasten the I/O (signal cables) clamping plate to the clamping plate with the provided screws (3).
7. Reattach the power cables according to previous installation. Use a tightening torque of 0.8 Nm (7 lbf in).
8. Reattach signal cables according to previous installation.

After replacing the frequency drive, follow the routines described before first start and start in “5 Operating instructions” on page 23. Pay particular attention to how to verify direction of rotation.

If the separator is running backwards, stop and switch off the main switch and change place of the power cables U2 and V2.
6.2.3 Connection diagram

Ref: 577391 Rev. 1 Floating network
Ref: 577213 Rev. 1 Grounded network
7 Technical references

7.1 Technical data *

Comersial name: PureVent

Type designation:

Application: Crankcase ventilation gas

Main dimensions 698 x 342 x 401 mm

Weight: Approx. 39 kg

Max. gas temperature: 80 °C, continuously

Surrounding temperature: 5°C to +50°C

Start time: Approx. 15 seconds

Stop time: Approx. 60 seconds

Rotation speed: Max. 7100 rev/minute

Mounting angle: Max. 3° from plumbline

Vibration: Max. 30 mm/second (Max. 8 mm/s when new)

Sound level: 78 dB (A)

Bearings: Ball bearings, permanently lubricated

Nominal flow: 150 m³/h *

Purification efficiency at nom. flow: > 98%

Maximum capacity: 800 m³/h (efficiency not specified *)

*Technical data not final at time of printing.
7.2 Basic size drawing
7.3 Lifting instruction

Lifting weight: 39 kg
7.4 Transporting of goods

The separator is transported unassembled, the 3 parts (Frame complete, Rotor with motor and control unit) in the same box. For assembly see “6.1.2 Every 16 000 hours of operation” on page 28.
Pure Vent has 4 rubber isolators "F", with threaded holes (M8) at the bottom. These rubber isolators must be used between the unit and the bracket. Refer to foundation drawing above for details.
Connections:
Gas inlet at the bottom (diam. 114 mm, hose clamp)
Gas outlet in the top (diam. 89 mm, hose clamp)
Oil outlet at the bottom (diam. 11 mm, hose clamp)

Hose for oil outlet, must be installed with opened end, with no back pressure, (open air), and connected with slope.

Electrical supply to frequency converter 3x400 V. Check for correct direction of separator rotation by checking that the direction of the motor fan is clockwise seen from top.
After installation, follow the routines described before first start and start in “5 Operating instructions” on page 23. Pay particular attention to how to verify direction of rotation.

If the separator is running backwards, stop and switch off the main switch and change place of two of the phases.
Hoses for gas inlet and outlet should be installed in such a way that there are no risk that any liquid seal occur.
8.2 Storage and transport of goods

8.2.1 Storage

**Specification**

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

- well stored and protected from mechanical damages
- dry and protected from rain and humidity

8.2.2 Transport

**Specification**

- The separator must always be well slinged when lifted. See "lifting instruction..."
- During installation, all inlets and outlets on the separator and its accessories must be covered to be protected from dirt and dust

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**WARNING**

**Crush hazards**

Use correct lifting tools and follow lifting instructions.

Do **not** work under hanging load.

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8.2 Storage and transport of goods
## 9 Spare parts

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Denomination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>578628-01</td>
<td><strong>Service kit 1</strong>&lt;br&gt;-including disc stack, drive and electric motor assembled</td>
</tr>
<tr>
<td></td>
<td>578628-03</td>
<td><strong>Service kit 3A for grounded network</strong>&lt;br&gt;-including frequency converter exclusive cabinet</td>
</tr>
<tr>
<td></td>
<td>578628-04</td>
<td><strong>Service kit 3B for floating network</strong>&lt;br&gt;-including frequency converter exclusive cabinet</td>
</tr>
<tr>
<td></td>
<td>578628-02</td>
<td><strong>Service kit 2</strong>&lt;br&gt;Isolators</td>
</tr>
</tbody>
</table>