

# Original Operating Instructions

## Coolant Separator

### Handte Oil Expert



Creator: Technical Documentation Camfil Handte APC GmbH

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# 1 Important notes about this document

## 1.1 About this manual

These operating instructions

- Are part of the separator,
- Are valid for all these classes and types,
- Describe the safe and proper use in all operating phases.


## 1.2 Target groups

Target group	Task
Operator	Keep this guide available on the plant site for later use.
	Make sure employees read and observe these instructions and the applicable documents, in particular the safety and warning notices.
	Note additional investment-related regulations and rules.
Personnel/technician	Read this manual and follow the applicable documents. Note and follow in particular the safety and warnings.

## 1.3 Other applicable documents

Document	Purpose
Order confirmation	Task, specifications, conditions, limitations, warranted characteristics (warranty).
Dimensional drawing	Dimensions, etc.
Technical description	Technical data.
Sectional drawing	Sectional drawing, part numbers, names of parts.
Supplier documentation	Technical documentation for industrial supplies.
Spare parts list	Ordering of spare parts.
Declaration of conformity	Conformity with standards.

## 1.4 Terminology





Technical terms are explained in the glossary, see chapter 14. 





### 1.5 Warnings and symbols

In the operating instructions, some terms and characters are used for safety hazards and safety regulations.

The safety symbols along with the text draw attention to the safety information regarding unavoidable residual hazards when using the separator. These residual risks are related to:

- Persons,
- The plant,
- The environment,
- Other items.

Warning	Threat level and consequences of non-compliance
	<b>DANGER!</b> Identifies an imminent danger. Non-observance has resulted in severe injuries or death.
	<b>WARNING!</b> Describes a dangerous situation. Non-observance has resulted in severe or life-threatening injury.
	<b>CAUTION!</b> Describes a potentially dangerous situation. Non-observance can result in minor or moderate injury or property damage.
	<b>DANGER!</b> Indicates a risk of electric shock.

Warning	Threat level and consequences of non-compliance
	<b>Safety signs</b> Follow all of the measures that are marked with the safety signs to prevent death, injury or property damage.
	<b>Guide to action</b>
1. 2. , ...	<b>Multi-step instructions</b>
✓	<b>Prerequisite</b>
	<b>Cross reference</b>
	<b>Note!</b> Describes a situation. Non-observance can result in damage.



## **1.6 Safety information**

Read these operating instructions through carefully before starting work on the system.

The prerequisite for the safe handling and trouble-free operation of this system is the knowledge of the basic safety instructions and safety regulations.

All those who have to do with the installation, commissioning, operation, servicing or maintenance of the plant must be qualified or trained and observe this operation manual in detail.

In addition, you are to observe the rules and regulations for accident prevention on the job site.

For safety reasons, unauthorized modifications and alterations on the unit are not permitted.

Attach directly to the machine instructions such as:

- Arrows indicating direction of rotation,
- Symbols for connections and
- Safety instructions

Must be strictly observed and kept in a fully legible state.

## **1.7 Keep information available**

The operating instructions are to be kept with the separator. It must be ensured that all persons who carry out activities on the machine can access the operating instructions at any time. In addition to the operating instructions, instructions for the purposes of the Employment Protection Act and the Work Equipment Regulation must be provided.

## **1.8 Examination**

All separators undergo a quality assessment before they leave our factory. Only separators which meet the promised benefits of Camfil APC leave the factory. Guarantee for trouble-free operation is given if you observe the following operating instructions.

### **1.9 Warranty**

Liability for defects sustained in delivery is assumed by Camfil APC. For damages caused by not following the operating instructions and the operating conditions, no liability is assumed.

Should the operating conditions change at a later date (e.g. process change), we recommend you contact Camfil APC.

During the warranty period provided by Camfil APC repairs or changes should only be made by authorized Camfil APC customer service personnel. Only original parts or parts approved by Camfil APC are to be used, otherwise the EC declaration is no longer valid, and Camfil APC assumes no liability for any defects.

## 2 Product description

### 2.1 Important information about the product



#### 2.1.1 Intended use

The separator is **suitable** for extraction and separation of mineral, biological and synthetic

- Non water-miscible coolants,
- Lubricants and
- Smoke

with a concentration below the explosive limit.

The separator is **limited** for the separation of

- Gaseous components.

The separator is **not suitable** for the extraction and separation of explosive

- Dusts,
- Gas air mixture and
- Mists.

**2.1.2 Precautions**

Incorrect use of the separator can increase the concentrations of

- Cooling lubricants
- Lubricants
- Smoke

in the ambient air, the cleanroom air recirculation or in the exhaust air of the process.

**2.1.3 Tasks (during operation)**

Special areas are not accessible by the operator.

**2.1.4 Hazards**

Special hazard areas are not accessible during the daily operation.

**2.1.5 Conformity**

This product meets the currently valid requirements of the CE marking to be placed on the market.

Please refer to the Declaration of Conformity.

**2.1.6 Type key**

Handte Oil Expert	X	-X	-X	-X	-X	-X	-X	-X
Device size	✓							
Volume flow		✓						
Main filter stage			✓					
After filter				✓				
Base					✓			
Upper part						✓		
Overfill protection							✓	
Special version								✓

### 2.1.7 Product markings

The separator is marked with a label as follows:

- Contact data
- Camfil Handte APC
- Type designation
- Order number
- Device number
- Performance data
- Filter elements
- CE marking

## 2.2 Product data

### 2.2.1 Features

Refer to the technical data sheets for performance characteristics.

### 2.2.2 Dimensions and weights

Refer to the technical data sheets for dimensions and weights.

### 2.2.3 Supply/Interfaces/Ports

#### Mechanical connections:

- The piping network of the entry point of the air to be filtered,
- The piping network of the exit point of the air to be filtered,
- Drainage system of the deposited medium.

For more information, see chapter 4.3 Mechanical interfaces...



#### Electrical connections:

Standard version

- Fan

Optional

- Recirculation pump,
- Digital differential pressure measurement for the total level of the filters,
- Digital differential pressure measurement for air performance monitoring,
- Level sensor for base level detection,
- Level sensor for drip tray level detection,
- Camfil APC switchgear.

For more information, see chapter 4.4 Electrical interfaces...



#### **2.2.4 Environment**

The separator is designed for installation in a frost-proof, and weather protected room. The ambient temperature must not fall below +5° C or exceed +40° C. The installation should be in the immediate vicinity of the process to be ventilated.

An outdoor installation is only possible if additional modifications are provided.

These are, for example, weather protection and frog guards, as well as a suitable surface treatment.

Please refer to your order confirmation as to whether an outdoor installation is provided.

A consultation with Camfil APC is required for an outdoor installation.

#### **2.2.5 Emissions**

The separator has no emissions during normal function.

Residual emissions from drained cooling lubricants are possible.

See safety data sheet provided by cooling lubricant manufacturer.

### 3 Safety regulations

#### 3.1 Presentation






##### 3.1.1 Warnings

Warnings are marked with the signal word and hazard-specific icon.

Warnings are initiated by signal words, expressing the extent of the risk.

An additional risk-specific icon warns of a possible danger to people.

The warnings are structured according to the following scheme:

 <b>SIGNAL WORD</b>	<hr/> <p><b>Nature of the hazard and their source.</b>                  The potential indicators for man and machine.                  ► Measures to avert the danger.</p> <hr/>
	<h5>3.1.2 Signal words</h5> <ul style="list-style-type: none"> <li>- DANGER</li> <li>- WARNING</li> <li>- CAUTION</li> <li>- NOTE</li> </ul>
 <b>DANGER</b>	<hr/> <p><b>Dangerous situation in which the non-observance of the safety information will lead to death or serious injury.</b></p> <hr/>
 <b>WARNING</b>	<hr/> <p><b>Dangerous situation in which the non-observance of the safety information can lead to death or serious injury.</b></p> <hr/>
 <b>CAUTION</b>	<hr/> <p><b>Dangerous situation in which the non-observance of the safety information can lead to minor injuries.</b></p> <hr/>
 <b>NOTE</b>	<hr/> <p><b>Indicates actions, which can lead to damage to property.</b></p> <hr/>

### 3.1.3 Notes on source, type, and to avoid danger

The warnings contain information about the source and nature of the hazard, as well as instructions on how to behave to avoid the risk.

**Example:**



---

#### High Center of Gravity

Risk of injury from falling separator

- ▶ Attach lifting equipment only in the slots provided for this purpose.
- 

### 3.1.4 Icons



#### Protective gloves

Wear protective gloves.



#### Footwear

Wear resistant, insulating safety shoes with steel toes. They protect the feet from falling parts.



#### Safety glasses

Wear safety glasses when servicing and performing maintenance work.



#### Clothing

Wear appropriate clothing.

## 3.2 Product safety

### 3.2.1 Handling the separator

The separator is made in accordance with the state of the art, the recognized technical safety rules as well as the valid standards, directives, and regulations of CE-marking.

Nevertheless, it can present dangers to body and life of the user or third parties when in use. It also may cause impairment of the separator, or other property.



**Danger zones include**

- Moving parts,
- Components of electrical equipment (power supply).

**Hazardous materials are:**

- Harmful substances,
- Toxic substances,
- Carcinogenic substances,
- Teratogenic substances,
- Mutagenic substances,
- Oxidizing and inflammatory substances,
- Substances which are dangerous in other ways.

**3.3 Hazardous areas****3.3.1 Hazards of deposited materials**

Health dangers can occur through inhalation or direct contact with mist, vapor and deposited materials.

**3.3.2 Falling pipelines**

The pipe is generally set to install. During installation, the weight of piping including possible deposits is taken into account. Regular inspection of the pipeline for leaks and deposits must be carried out.

**3.3.3 Climbing aids**

Climbing aids for maintenance and repair work are to be selected so that they are stable and can safely bear the weight of personnel, spare parts and tools.

**3.3.4 Pollution of groundwater**

During assembly and operation of the system, the local conditions and structurally existing protective measures (such as sealed soils at the site) must be considered.


It is important to ensure that no contamination of groundwater e.g. by oil is produced.

**3.3.5 Fire and explosion hazard**

In the extraction and separation of flammable or explosive substances, there is a residual risk of fire and explosion. Protection measures cannot be excluded.

Basically, water-miscible cooling lubricant, lubricant and quenching media mist (aerosol) can be flammable. There exists an increased risk of fire and explosion everywhere containing oil aerosols, In particular, machine tools, quenching tank and extraction systems.

Please refer to the manufacturer safety data sheets for coolants, lubricants or quenching media.

Liability in the event of a fire and/or explosion event is generally rejected (see also intended use chapter **Error! Reference source not found.** )

**Note:**

There is a risk of explosion if too large concentrations (typically greater than 5g/m<sup>3</sup>) of aerosol/mist, solvent or other explosive gases are ventilated.

**3.3.6 Hazards of moving parts**

Finger protection for moving parts must not be removed during operation of the separator.

**3.3.7 Hazards of electrical components**

Electrical hazards exist when working on the separator

- By direct contact with live parts or parts that have become energized due to fault conditions.
- Through high voltage
- Short circuit and overload
- By electrostatic processes

**3.3.8 Residual hazards**

Type of risk	Location	Danger	Measure
<b>DANGER AREA</b>	<b>Separator</b>		
<b>Mechanical hazard</b>			
By tipping over	Installation	Risk of injury	Place only on an appropriate foundation or stage.
By pinching	Service door	Risk of injury	Open and close door only at idle.
<b>Exposure to substances</b>			

Type of risk	Location	Danger	Measure
Contact with cooling lubricant materials, lubricants, quenching media and/or oils	Filter elements	Health hazard	Wear personal protective equipment Safety data sheet of the - Cooling lubricant - Lubricant - Quenching media - Note oil manufacturer.
Contact with cooling lubricant materials, lubricants, quenching media and/or oils	Base	Health hazard	Wear personal protective equipment Safety data sheet of the - Cooling lubricant - Lubricant - Quenching media - Note oil manufacturer.

### 3.3.9 Safety and monitoring devices

Standard:

- Analog differential pressure display for each filter stage.

Optional:

- Digital differential pressure measurement for the total level of the filter,
- Measurement for air performance, monitoring,
- Level sensor for base level detection,
- Level sensor for drip tray level detection,
- Run-dry sensor for recovery pump,
- Camfil APC switchgear.

### 3.3.10 Warning signs

Standard:

- None

Optional:

- Digital differential pressure controller for the overall level of the filter,
- Digital differential pressure controller for monitoring air performance,
- Level sensor for base level detection,
- Level sensor for drip tray level detection,
- Camfil APC switchgear.

### **3.3.11 Organizational, personnel**

Only trained personnel may work on the separator.

The following procedures must be carried out before the staff attends to work on the separator

- Instruction about any dangers.
- Clearly define responsibilities for operation, maintenance and repair.
- The operator must read the technical documentation before beginning any activities on the separator.
- The user is advised to confirm in writing that the technical documentation has been read and understood.
- The staff is regularly trained on the possible residual risks and behavior.

### **3.3.12 Recognized rules of safety**

Rules for occupational safety are country-specific.

### **3.3.13 Qualifications and requirements of the user**

**User: Expertise**

**Maintenance: Expertise**

**Installation: Qualified personnel**

**Repair: Qualified personnel**

### **3.3.14 Operating instructions to read and understand**

The operator is recommended to confirm in writing that the technical documentation has been read and understood.

### **3.3.15 Modifications and alterations to the product**

Modifications or changes to the system are permitted only by prior arrangement with Camfil APC.

Original spare parts and accessories authorized by the manufacturer are provided for safety.

The use of non-approved parts voids the declaration of conformity and releases Camfil APC from liability.

## 4 Structure and function

### 4.1 Principle

The Handte Oil Expert is used for the filtration of oil-containing waste air.

The exhaust air is continuously drawn off and filtered. The deposited oily substances are continuously removed for recycling or disposal.

See appendix B for principle of operation flow chart.

The separator is supplied in two versions:

- **Option 1:**

Version without switchgear.

The wiring and control of the electrical components is done by the customer.

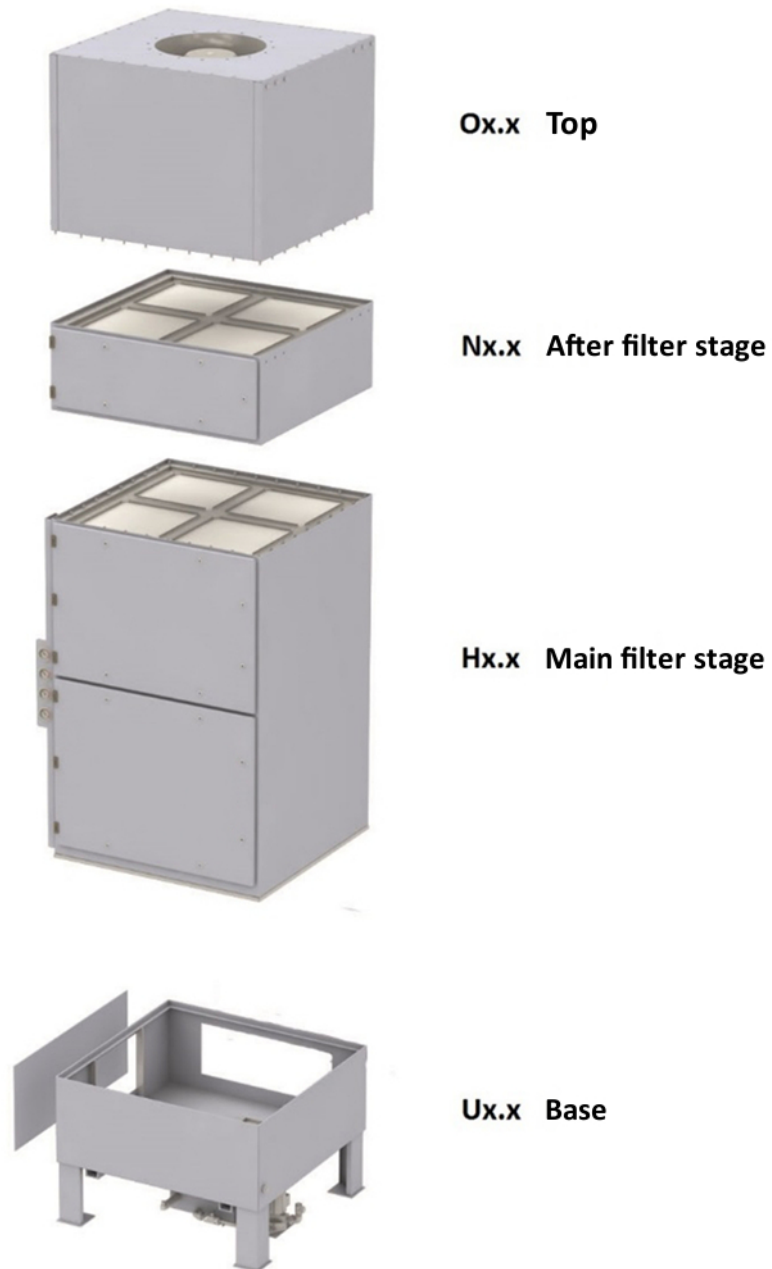
Note:

Electric drives such as fan and recirculating pump motors must be equipped with appropriate motor circuit breakers. In addition, an emergency stop switch is required.

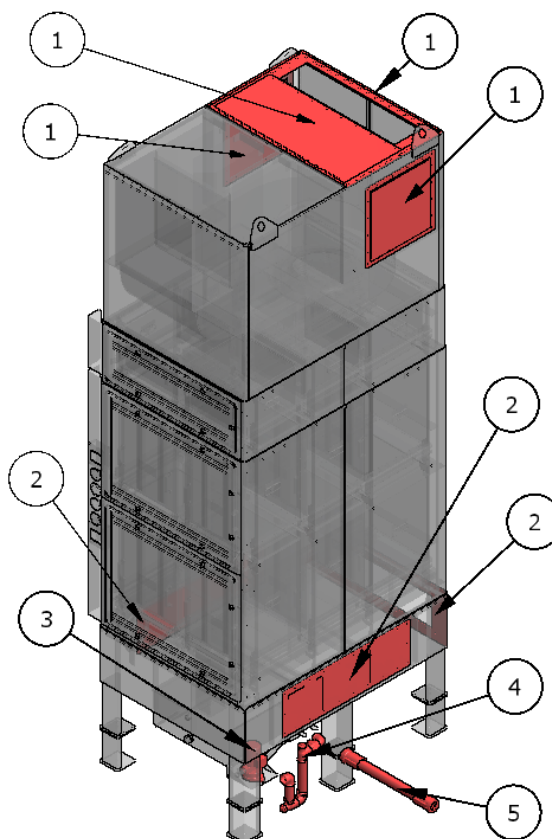
- **Option 2:**

Camfil APC standard version with switchgear.

## 4.2 Mechanical construction

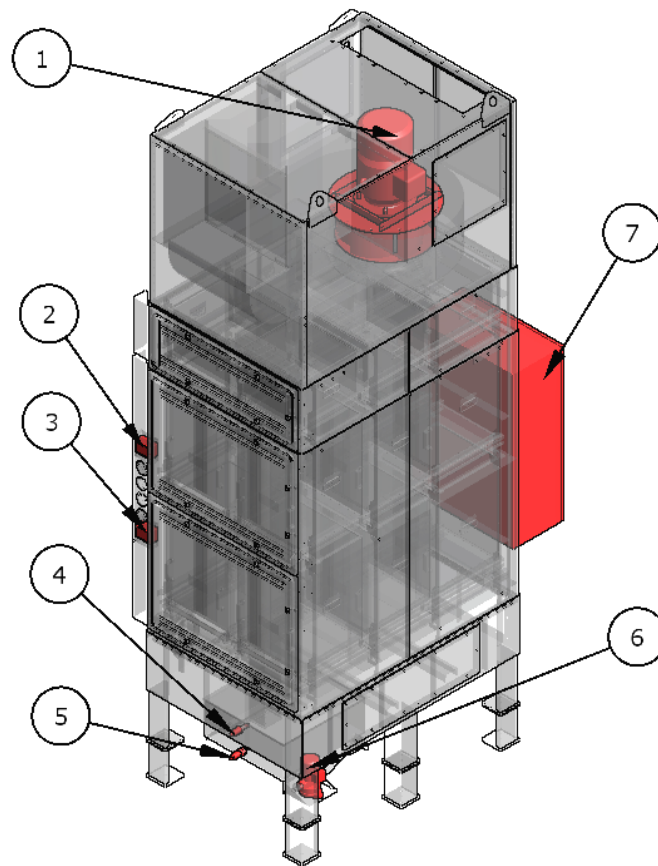


### 4.3 Mechanical interfaces for fan installation



Pos.	Name	Comment	
1	Clean gas connection built-in fan	- Left - Right - Top possible	
1	Clean gas connection assembly fan	Connection to the fan	
1	Clean gas connection side fan	- Back - Left - Right possible	
2	Raw gas connection	- Back - Left - Right possible	
3	Recirculation pump	left or right	Optional
4	Siphon	left or right	Optional
5	Connection hose	left or right	Optional

#### 4.4 Electrical interfaces for fan installation



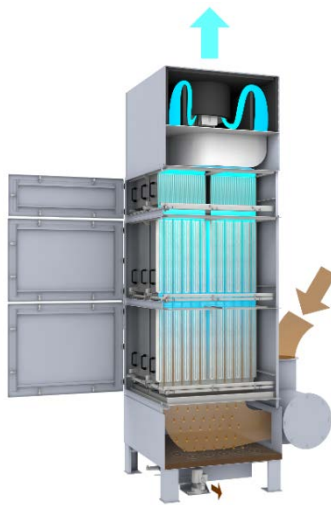
Pos.	Name	Comment	
1	Fan	- Installation - Construction - Side fan possible	
2	Differential pressure indicator	Monitoring total filter stages	Optional
3	Vacuum gauge	Air performance measurement/monitoring	Optional
4	Overfill protection sensor		Optional
5	Run-dry protection sensor	In conjunction with Recirculation pump	Optional
6	Recirculation pump		Optional
7	Switchgear sensor		Optional
-		Drip tray (not shown here)	Optional



## 4.5 Function description

### Air inlet

Contaminated oil exhaust flows laterally through the crude gas inlet into the separator. Flow through the filter stages takes place from bottom to top.



### Filtration

The exhaust air must first pass through a coarse Demister filter stage (optional) for separating larger droplets and particles on their way through the separator.

The pre filtered air then reaches the core of the Handte Oil Expert containing the two part main filter stage with the CoaPack and fine filters.

The CoaPack filter stage filters smaller droplets and particles.

The CoaPack fine filter stage filters liquid aerosols and fine particulate matter.

The HEPA after filter stage filters fine aerosols such as smoke.

### Exhaust air outlet

A shell with a built-in fan or a shell for a construction fan makes up the top of the separator.




The connection of external fans can be realized with the addition of a top with three-sided duct connection.

The purified air may be dissipated to the outside depending on the requirements (exhaust air guide). Use the filter level with HEPA filter element for the deposition of smoke. The purified air can be recirculated to the work area.

### Trace



Secluded, oil-based substances accumulate in the bottom section and flow, depending on the base module, either through a siphon in free fall, or they can be drained or fed back by means of recovery pump for recycling.

#### 4.6 Safety and monitoring devices




Image	Name	Function	Available
	NG63	Visual monitoring indicator for each built-in filter level	
	DPC	Digital monitoring display for entire filter level. Digital air performance measure/monitor	optional
	Sensor	Run-dry protection level monitoring, base/drip tray	optional

## 5 Operating and display elements, operating modes

### 5.1 Fault displays

Image	Name	Function	Available
	NG63	Visual monitoring indicator for each built-it filter level	
	DPC	Digital monitoring display for entire filter level. Digital air performance measure/monitor	optional

### 5.2 Fault messages

Image	Name	Function	Notification type
	NG63	Visual monitoring indicator for each built-it filter level	Visual display directly on the separator
	DPC	Digital monitoring display for entire filter level. Digital air performance measure/monitor	DC PNP 4-20 mA analog
	Sensor	Run-dry protection level monitoring, base/drip tray	DC PNP

### **5.3 Operating modes**

We recommend the following operating modes.

#### **Manual operation**

For commissioning, maintenance and repair work.

#### **Automatic operation**

Automatic operation starts with a “lead time”.

This ensures that the separator is in good operating condition before beginning suction.

When switching off automatic mode a follow-up time is started.

Automatic mode remains active until the expiry of this interim time.

## 6 Installation/commissioning

### 6.1.1 Safety regulations

There are applicable local rules and regulations for the prevention of accidents.

### 6.1.2 Requirements for the executive staff

The installation and commissioning must be completed by qualified and authorized personnel only.

### 6.1.3 Technical documents

Dimensional drawings for mounting points on the floor or stage.

Technical documentation for parts to be electrically connected.

## 6.2 Delivery and installation

### 6.2.1 Delivery condition

The separator is supplied in accordance with the order confirmation.

### 6.2.2 Scope of delivery

Check the completeness of the delivery against the delivery note and the order confirmation.

Report any transport damage and/or missing parts immediately in writing.

### 6.2.3 Prerequisites

Prepare the foundation and installation stage according to weight.

### 6.2.4 Transport



#### NOTE

---

#### Before transport, loading and lifting of the separator.

- ▶ Fix or remove all loose parts of the separator.
- 



#### WARNING

---

#### High center of gravity.

There is a danger of injury from falling separator.

- ▶ Attach lifting equipment only in the slots provided for this purpose.
- 



#### NOTE

---

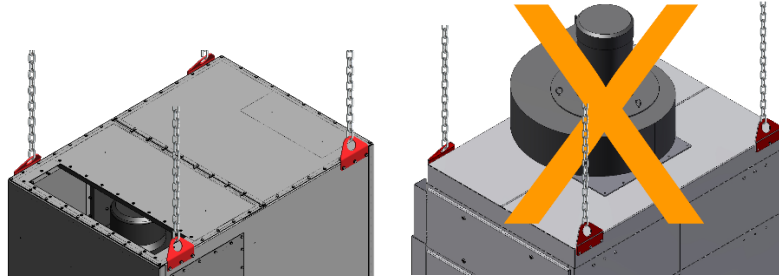
#### Laying of the separator on the side of the service door(s) is prohibited.

Damage to the service door(s).  
Filter elements can fall out.

---

**NOTE**

**Hang the separator by the lifting eyes provided for this purpose. Under no circumstances use the eyelets on the fan enclosure. Damage resulting from suspension.**



**6.2.5 Horizontal delivery with built-in fan.**



**WARNING**

**High center of gravity.**

There is a danger of injury from falling separator.

- ▶ Attach lifting equipment only in the slots provided for this purpose.



**DANGER**

**Tipping, tipping over the separator when righting.**

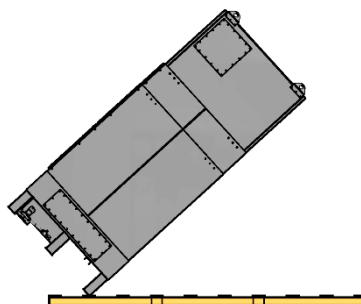
- ▶ Perform the righting task very carefully.

**1.**



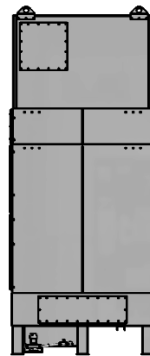
- ▶ Remove the fittings that connect the separator to the pallet.
- ▶ Attach the hoist to the eyebolts.

**2.**



- ▶ Carefully lift the separator.

3.



- ▶ Carefully place the separator in the vertical position.

### 6.2.6 Horizontal delivery with fan assembly



**WARNING**

#### High center of gravity.

There is a danger of injury from falling separator.

- ▶ Attach lifting equipment only in the slots provided for this purpose.

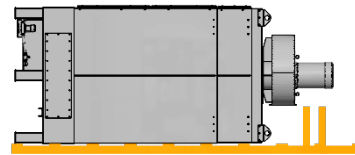


**DANGER**

#### Tipping, tipping over the separator when righting.

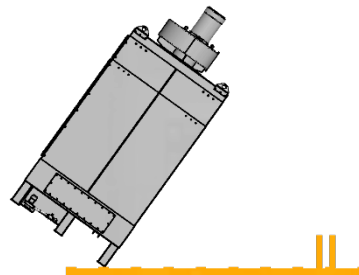
- ▶ Perform the righting task very carefully.

1.



- ▶ Remove the fittings that connect the separator to the palette.
- ▶ Attach the hoist to the eyebolts.

2.



- ▶ Carefully lift the separator.

3.



- ▶ Carefully place the separator in the vertical position.

### 6.2.7 Transport to the installation site



**NOTE**

**Before transport, loading and lifting of the separator.**  
Fix or remove all loose parts of the separator.



**WARNING**

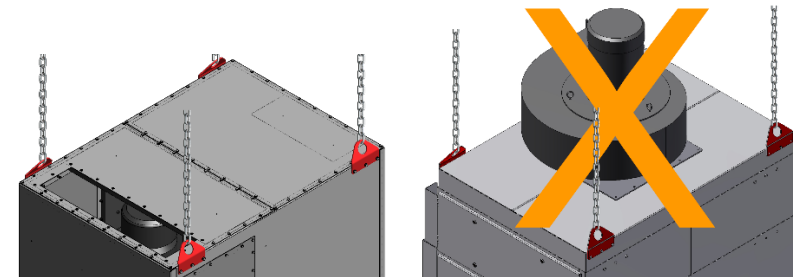
**High center of gravity.**

There is a danger of injury from falling separator.

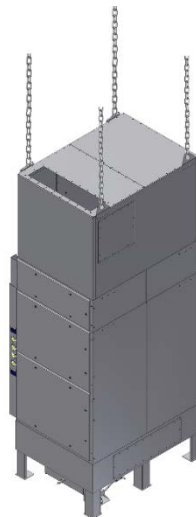
- ▶ Attach lifting equipment only in the slots provided for this purpose.

**NOTE**

**Hang the separator by the lifting eyes provided for this purpose.**  
**Under no circumstances use the eyelets on the fan enclosure.**  
Damage resulting from suspension.



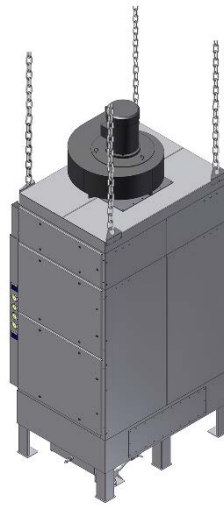
**1.**



- ▶ Attach the hoist to all four transport loops.
- ▶ Carefully transport the separator to the installation location.



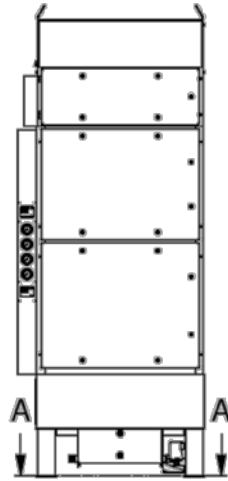
**2.**



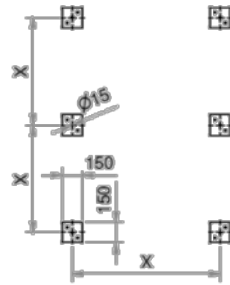
- ▶ Attach the hoist to all four eyebolts.
- ▶ Carefully transport the separator to the installation location.

### 6.2.8 Location and attachment

Single module

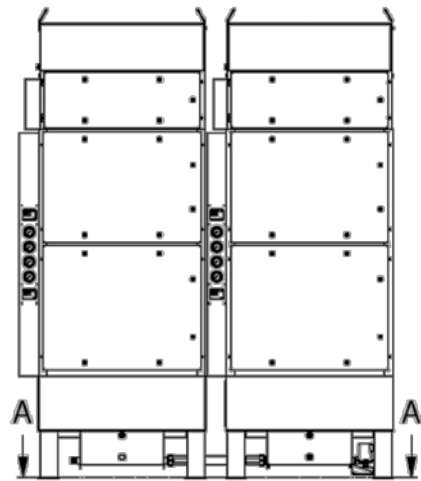


A-A

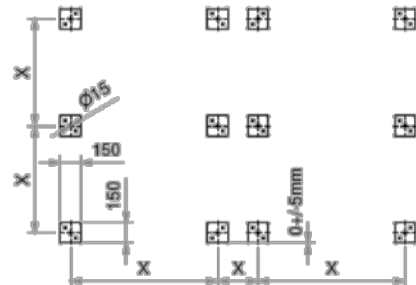


Mounting according to the drilling template (separate dimension sheet)

Multiple module



A-A



Mounting according to the drilling template (separate dimension sheet)  
Note the module spacing to ensure a connection of the ports.

#### Mounting recommendation

Concrete floor

FIX ANCHOR W-FAZ/S



Stage, podium set-up

Screw M12



#### NOTE

Clearances for maintenance and installation must be provided.

► See separate data sheet

### 6.2.9 Mechanical coupling



#### NOTE

Connection data can be found in a separate data sheet.

1. Connect the raw gas connection of the separator to the extraction point.
2. Connect the clean gas connection of the separator with the respective exhaust air system.
3. Connect the drain siphon or the recirculation pump to the building-side cooling lubricant feedback system.

### 6.2.10 Electrical connection



#### NOTE


Commissioning must be performed only by trained personnel. The separator is without active extraction point in operation.



**Attention:**  
Electric shock possible.

The separator is supplied in two versions:

- Option 1: Without switchgear (switchgear on site).
- Option 2: Camfil APC standard with switchgear.

See chapter 4.1 Principle. 



#### NOTE

**Be sure to perform all connections as specified.**

This applies to both versions.

- ▶ The regulations of the local network operator must be observed.

#### Version 1

1. Connect the fan to the on-site substation.
2. Connect sensors to the on-site substation.
3. Connect the switchgear and the recirculation pump.
4. Connect the digital differential pressure devices with the on-site substation.

#### Version 2

1. Connect the power grid to the Camfil APC switchgear.

**NOTE**

---

**Check the phase sequence by briefly applying voltage to the fan and recirculation pump.**

▶ Arrow notes direction of rotation.

---

### 6.2.11 Startup behavior of fans

The fan/motor units can have three different operation settings.

During startup a sufficient acceleration torque must be available, covering the complete range up to the rated speed. Network, switching, monitoring equipment (if applicable) and cable cross-sections must respect starting, starting time and peak current to be dimensioned and checked by the customer.

#### Startup via direct activation

During the startup of the fan, the engine develops a high torque at a high starting current.

The starting current is 5 to 10 times the rated current during the startup phase depending on the rotor class.

This high power consumption must be considered when securing.

#### Star delta starting

In the case of star-delta activation, only one third of the starting torque is applied for the star connection of the drive motor. From an initial startup speed, the torque load on the fan is higher than the starting torque of the motor. This prevents startup of the motor. In this phase, the triangle position must be toggled. The resulting current peak is then significantly lower than in the case of direct activation.

#### Startup via frequency converter

The advantage of this variant is the demand-oriented change of the fan performance. By changing the frequency and thus the speed of the fan, it is possible to regulate the flow of the separator. The negative pressure at the inlet into the separator is suitable as the control variable for the frequency converter.

### 6.3 Commissioning

Commissioning must be performed by trained personnel only.

The separator is without active extraction point during operation.



#### **NOTE**

---

**All filter elements must be used to ensure that the readings are correct during commissioning.**

- ▶ Check that all filter elements are used.
- 

#### 6.3.1 Required measuring instruments

- Gauge for determining air velocity
- Gauge for determining the pressure conditions
- Clamp meter to determine the power consumption
- Gauge for detecting rotating electrical field

#### 6.3.2 Commissioning (Checklist)


- Filter elements installed
- Maintenance doors closed
- Suction line connected
- Siphon or recirculation pump connected
- Fan/recirculation pump direction of rotation checked
- Power consumption measured and recorded
- Raw gas velocity measured and recorded
- Clean gas velocity measured and recorded
- Pressures measured and recorded
- Separator seals tested (visually)

## **7 Service/operation**

Switching on the separator:

- External power,
- Power to the substation.

### **7.1 Operation**

For more information, see chapter 5.3 Modes 

## **8 Maintenance**

### **8.1 Introduction**

Maintenance may be carried out only by trained personnel.

Carry out servicing, dismantling, cleaning, conversion, and troubleshooting only when system is switched off.

Secure system against unexpected startup when switched off.

Ignition hazards are to be avoided when cleaning.

During cleaning and maintenance work, wear the required personal protective equipment (E.g. safety shoes, protective gloves, safety goggles, etc.)

#### **Dirt deposits/encrustation**

Deposits should be removed at an early stage, because they are very difficult to eliminate once encrusted.

#### **Cleaning**

Weekly cleaning of the environment surrounding the separator, such as walls, ceiling and surfaces of the separator and the connected piping should be done if necessary.

#### **Log book**

Cleaning and maintenance should be recorded in a log book.

#### **Maintenance contract**

If desired, you can enter into a maintenance contract with Camfil APC.

### **8.2 Operating supplies and tools**

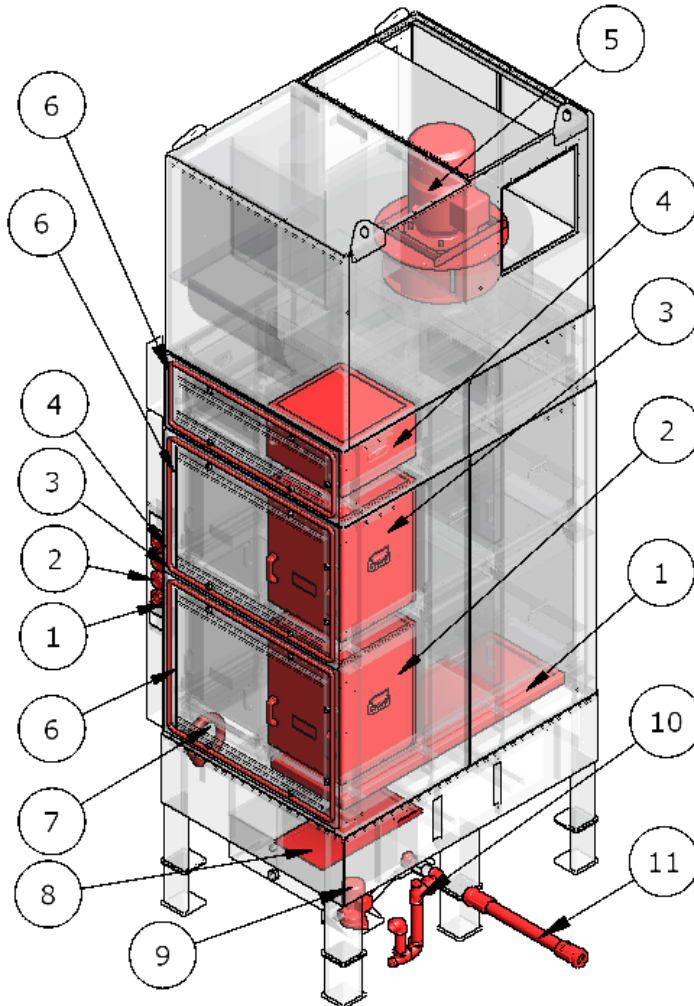
#### **8.2.1 Lubricant**

No lubricant required

#### **8.2.2 Measuring and test equipment**







- Gauge for determining the air speed (flow)
- Gauge for determining pressure ratio
- Gauge for determining power consumption
- Gauge for determining electrical orientation

### 8.3 Maintenance plan



Pos.	Service center	Interval	Maintenance note
-	Separator housing	6M	<p>Visually inspect the interior for dirt. Clean if there are heavy deposits. Check filter elements for correct placement and corruption.</p> <p>Clean the housing if necessary.</p>



Pos.	Service center	Interval	Maintenance note
1	Coarse filter stage Demister filter element	W	<p>Visual inspection</p> <p>at 6 mbar: Demister filter element</p> <ul style="list-style-type: none"> <li>▶ Clean, se chapter <b>Error! Reference source not found.</b> </li> <li>▶ Exchange, see chapter <b>Error! Reference source not found..</b> </li> </ul>
2	Pre-filtering level CoaPack filter element	W	<p>Visual inspection</p> <p>at 9 mbar: CoaPack filter element</p> <ul style="list-style-type: none"> <li>▶ Clean, see chapter <b>Error! Reference source not found.</b> </li> <li>▶ Exchange, see chapter <b>Error! Reference source not found.</b> </li> </ul>
3	Main filter level CoaPack filter element	W	<p>Visual inspection</p> <p>at 9 mbar: CoaPack filter element</p> <ul style="list-style-type: none"> <li>▶ Exchange, see chapter <b>Error! Reference source not found.</b> </li> </ul>
4	After filter level HEPA filter element	W	<p>Visual inspection</p> <p>at 10 mbar: HEPA filter element</p> <ul style="list-style-type: none"> <li>▶ Exchange, see chapter <b>Error! Reference source not found.</b> </li> </ul>
5	Fan	6M	<p>Vibration control</p> <p>Clean the fan impeller</p>

Pos.	Service center	Interval	Maintenance note
6	Seals	6M	Visual inspection: Check the flexibility and condition of the seals. Replace hard or damaged seals.
7	Siphon	6M	Test flow: Clean if necessary.
8	Recirculation pump cover	6M	Test flow: Clean if necessary.
9	Recirculation pump	6M	Test flow: Clean the hose if necessary.
10	Siphon	6M	Test flow: Clean if necessary.
11	Connection hose, if available	6M	Test flow: Clean if necessary.
-	Measuring hoses filter pressure indicator 1-4	6M	Remove the measuring hoses. Blow out with compressed air.
<b>Intervals apply for single-layer operation (8 hours)</b>			
		M	= Months
		W	= Weeks

## 8.4 Changing the coarse filter elements

General safety instructions and applicable local rules and regulations for the prevention of accidents must be observed.

Switch off separator and secure against unintentional startup.



### NOTE

Suction power loss and high differential pressure are signs of dirty filter elements.

- ▶ Change the filter elements.



### CAUTION



Change contaminated filter elements.

Risk of injury from crushing and heavy weights.

Health risk due to cooling lubricants.

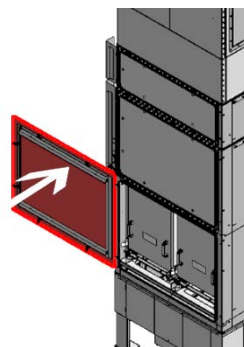
- ▶ Wear appropriate personal protective equipment (helmet, safety gloves, and goggles).

### 8.4.1 Required tools/equipment

- Personal protective equipment
- Hex wrench 8 mm
- Hooks to remove and insert filters
- Drip tray (optional)
- Appropriate climbing and lifting aids if needed

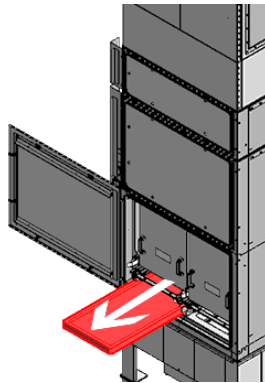
### 8.4.2 Coarse filter element replacement

1.



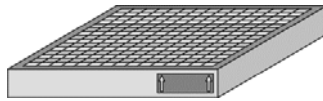
- ▶ Open the maintenance door with an 8 mm Allen key.

2.



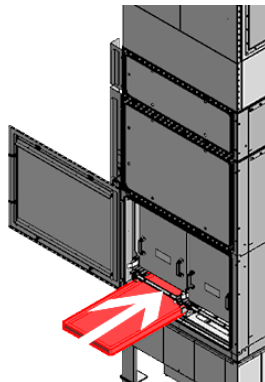
► Pull out the filter element.

**i**




The filter element has a SKU on the front side displaying filter element size, position and two location arrows. The arrows must be facing upwards for proper installation.

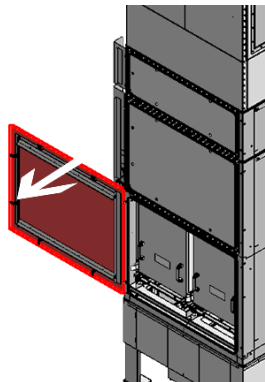
3.



► Insert the cleaned or new filter element in the separator housing.

Cleaning see chapter **Error!**  
**Reference source not found..** 

4.



► Close the service door.

## 8.5 Changing the pre-filter elements

General safety instructions and applicable local rules and regulations for the prevention of accidents must be observed.

Switch off separator and secure against unintentional startup.



### NOTE

**Suction power loss and high differential pressure are signs of dirty filter elements.**

- ▶ Change the filter elements.



### CAUTION



**Change contaminated filter elements.**

Risk of injury from crushing and heavy weights.

Health risk due to cooling lubricants.

- ▶ Wear appropriate personal protective equipment (helmet, safety gloves, and goggles).



### NOTE

**Note the weight of the filter elements**

Filter element final weight ca. 60 kg

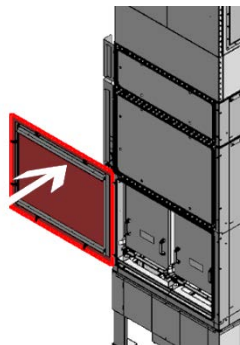
- ▶ Two people required to lift the filter elements.

### 8.5.1 Required tools/equipment

- Personal protective equipment
- Hex wrench 8 mm
- Hooks to remove and insert filters
- Drip tray (optional)
- Appropriate climbing and lifting aids if needed

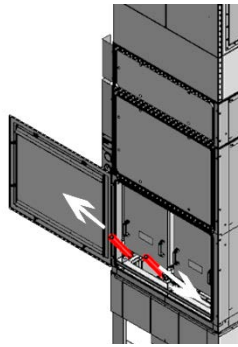
### 8.5.2 Pre-filter element replacement

1.



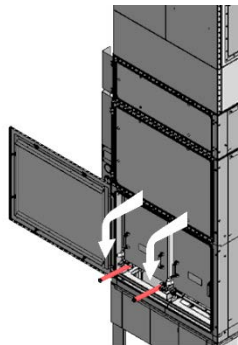
- ▶ Prepare appropriate climbing aids such as lifts. These must be capable of carrying the weight of two people and the filter elements (60 kg).
- ▶ Open the maintenance door with an 8 mm Allen key.

**2.**



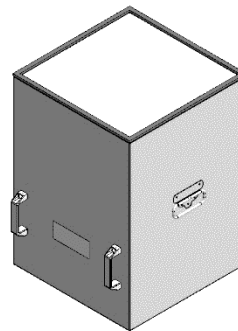
- ▶ Fold the clamping lever sideways, right and left from the inside out.

**3.**



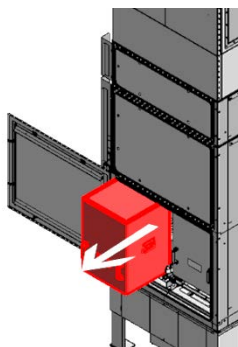
- ▶ Fold the clamping lever down.

**4.**



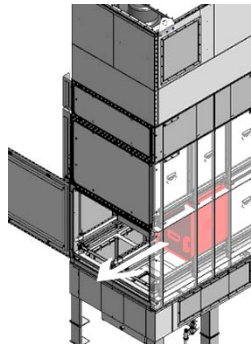
- ▶ Lift the filter elements by the handles.

**5.**



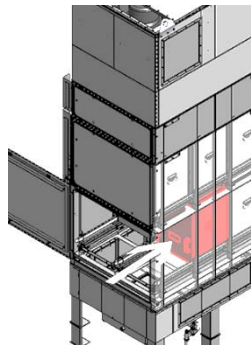
- ▶ Note the approximate weight ca. 60 kg.
- ▶ Pull out the filter element.

6.



- ▶ Note the approximate weight ca. 60 kg.
- ▶ Remove the rear filter element with a suitable hook.

7.

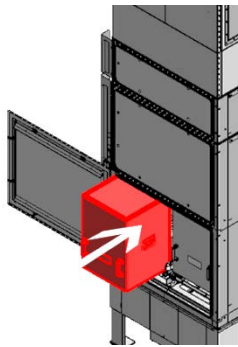


- ▶ Insert the cleaned or new filter element in the separator housing.

Cleaning see chapter **Error!**

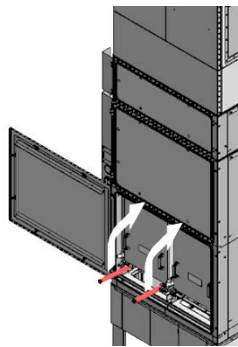
Reference source not found.. 

8.



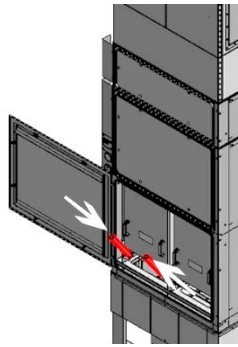
- ▶ Slide all filter elements up to the stop in the separator housing.

9.



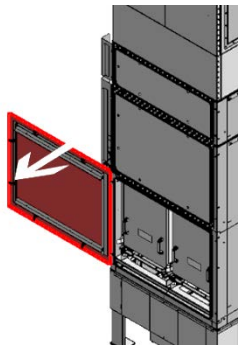
- ▶ Fold the clamping lever up.

10.



- ▶ Fold the clamping lever inward.

11.



- ▶ Close the service door.

### 8.6 Changing the fine filter elements

General safety instructions and applicable local rules and regulations for the prevention of accidents must be observed.

Switch off separator and secure against unintentional startup.



#### NOTE

**Suction power loss and high differential pressure are signs of dirty filter elements.**

- ▶ Change the filter elements.



#### CAUTION



**Change contaminated filter elements.**

Risk of injury from crushing and heavy weights.

Health risk due to cooling lubricants.

- ▶ Wear appropriate personal protective equipment (helmet, safety gloves, and goggles).



#### NOTE

**Note the weight of the filter elements**

Filter element final weight ca. 60 kg

- ▶ Two people required to lift the filter elements.

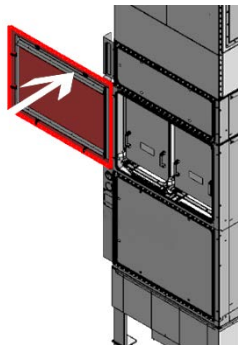


### 8.6.1 Required tools/equipment

- Personal protective equipment
- Hex wrench 8 mm
- Hooks to remove and insert filters
- Drip tray (optional)
- Appropriate climbing and lifting aids if needed

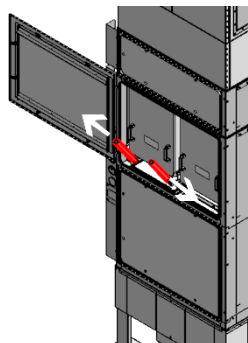
### 8.6.2 Fine filter element replacement

1.



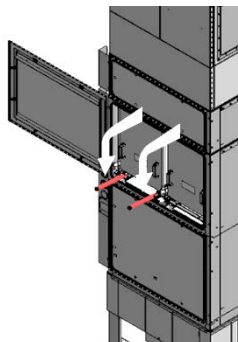
- ▶ Prepare appropriate climbing aids such as lifts. These must be capable of carrying the weight of two people and the filter elements (60 kg).
- ▶ Open the maintenance door with an 8 mm Allen key.

2.



- ▶ Fold the clamping lever sideways, right and left from the inside out.

3.



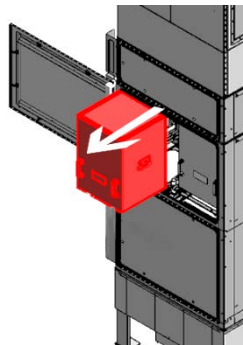
- ▶ Fold the clamping lever down.

4.



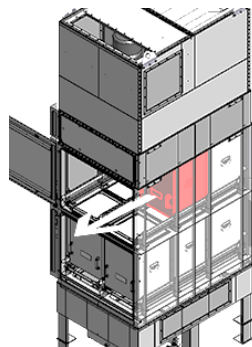
- ▶ Lift the filter elements by the handles.

5.



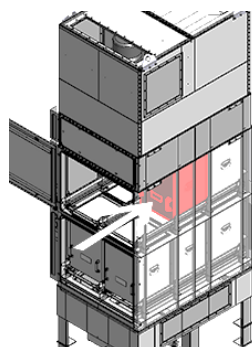
- ▶ Note the approximate weight ca. 60 kg.
- ▶ Pull out the filter element.

6.



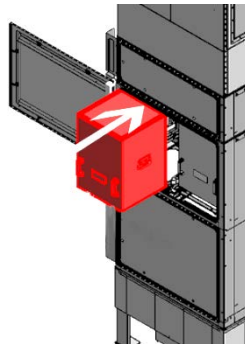
- ▶ Note the approximate weight ca. 60 kg.
- ▶ Remove the rear filter element with a suitable hook.

7.



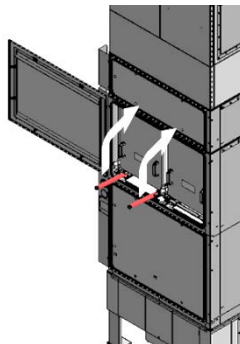
- ▶ Push the new filter element in the separator housing.

8.



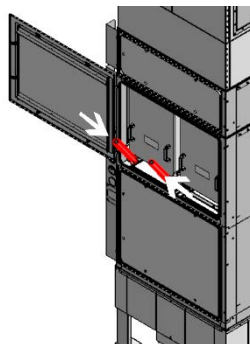
► Slide all filter elements up to the stop in the separator housing.

9.



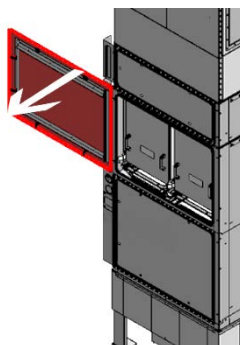
► Fold the clamping lever up.

10.



► Fold the clamping lever inward.

11.



► Close the service door.

## 8.7 Changing the post filter elements

General safety instructions and applicable local rules and regulations for the prevention of accidents must be observed.

Switch off separator and secure against unintentional startup.



### NOTE

**Suction power loss and high differential pressure are signs of dirty filter elements.**

- ▶ Change the filter elements.



### CAUTION



**Change contaminated filter elements.**

Risk of injury from crushing and heavy weights.

Health risk due to cooling lubricants.

- ▶ Wear appropriate personal protective equipment (helmet, safety gloves, and goggles).



### NOTE

**Note the weight of the filter elements**

Filter element final weight ca. 30 kg

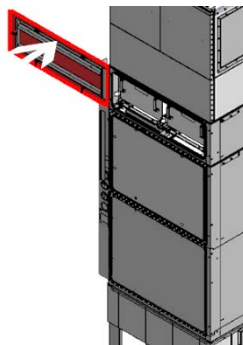
- ▶ Two people required to lift the filter elements.

### 8.7.1 Required tools/equipment

- Personal protective equipment
- Hex wrench 8 mm
- Hooks to remove and insert filters
- Drip tray (optional)
- Appropriate climbing and lifting aids if needed

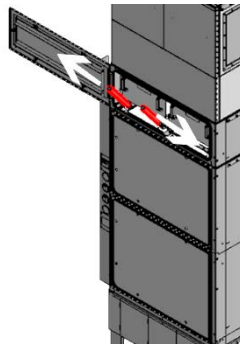
### 8.7.2 Post filter element replacement

1.



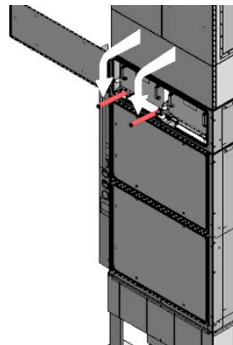
- ▶ Prepare appropriate climbing aids such as lifts. These must be capable of carrying the weight of two people and the filter elements (30 kg).
- ▶ Open the maintenance door with an 8 mm Allen key.

2.



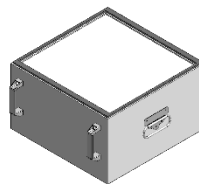
- ▶ Fold the clamping lever sideways, right and left from the inside out.

3.



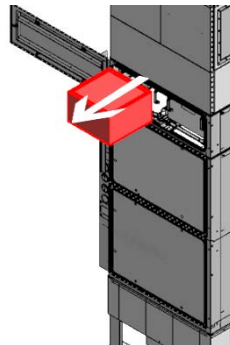
- ▶ Fold the clamping lever down.

4.



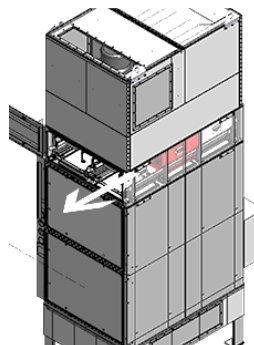
- ▶ Lift the filter elements by the handles.

5.



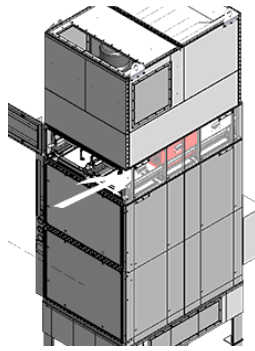
- ▶ Note the approximate weight ca. 30 kg.
- ▶ Pull out the filter element.

6.



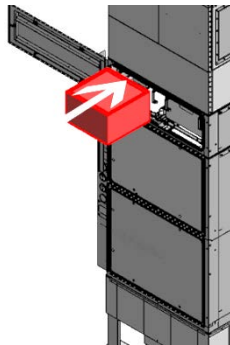
- ▶ Note the approximate weight ca. 30 kg.
- ▶ Remove the rear filter elements with a suitable hook.

7.



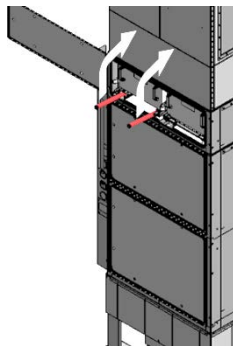
▶ Push the new filter elements into the separator housing.

8.



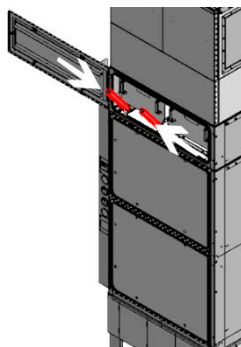
▶ Slide all filter elements up to the stop in the separator housing.

9.



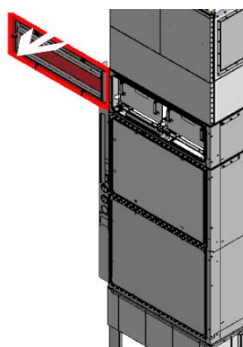
▶ Fold the clamping lever up.

10.



▶ Fold the clamping lever inward.

**11.**



▶ Close the service door.

## **8.8 Cleaning the filter elements**

### **8.8.1 Cleaning the coarse filter elements**

The coarse filter elements can be cleaned several times.

When the filter elements are no longer regenerated by cleaning, they must be replaced by new filter elements.

The cleaning can be done either by an ultrasonic cleaning bath or alternatively with a high pressure cleaner.

When washing the filter elements, wear suitable protective equipment such as rubber gloves, safety glasses, etc.

Place the filter elements in an ultrasonic or cleaning bath for several hours to loosen the dirt.

Heat the bath from +45°C to +65°C.

Mix in appropriate cleaning products. Then, rinse the loosened dirt from the filter element with water.

Additional rinsing with a high pressure cleaner is possible.

Suitable cleaning agents are all products that are oil, grease and lime scale expectorant. Corrosive properties are prohibited.

When cleaning the filter elements with a high pressure cleaner make sure that the spray does not deform the mesh of the filter element. Otherwise, the filter element can be permanently damaged. First, clean the filter element from the air outlet side.

Set up the filter element diagonally and dry it from top to bottom.

The distance to avoid damage to the filter element depends on the performance of the high pressure cleaner and the shape of the water jet.

We recommend a maximum water pressure < 4 bar as well as a spraying distance of at least 30 cm.

After cleaning, place the filter element diagonally.

Leave the filter element at least two hours to dry.

Assemble only dry filter elements.

**Camfil APC assumes no liability for damages incurred by cleaning.**

The washing liquid is to be disposed of according to the statutory regulations.

### **8.8.2 Cleaning the pre-filter elements**

The preliminary filter elements can be cleaned several times.

When the filter elements are no longer regenerated by cleaning, they must be replaced by new filter element.

When washing the filter elements, wear suitable protective equipment such as rubber gloves, safety glasses, etc.

Clean the filter element in a suitable washing facility.

For cleaning, use a hot detergent solution with a maximum temperature of +65°C.

Distribute the washing detergent on the trailing side of the filter element against the direction of flow. Depending on the soiling of the filter element, up to 90 liters of detergent are required for flushing.

The detergent must be made from water and a suitable cleaning agent.

Suitable cleaning agents are all products that are oil, grease and lime scale expectorant. Corrosive properties are prohibited.

Caution: do not use high pressure cleaners for cleaning.

After cleaning, place the filter element diagonally.

Let it stand at least a day to dry.

Assemble only dry filter elements.

**Camfil APC assumes no liability for damages incurred by cleaning.**

The washing liquid is to be disposed of according to the statutory regulations.



## **9 Repair**

### **9.1 Introduction**

Repairs by the operator during the warranty period requires consultation with Camfil APC. Otherwise, the warranty expires.

Maintenance work must be performed only by trained, qualified personnel.

Maintenance may be done only when separator is switched off and secured.

Switch off separator and secure against unintended startup.

Personal protective equipment (E.g. safety shoes, protective gloves, safety goggles, etc.) must be worn!

Unauthorized modifications and alterations on the unit are not permitted for any reason.

#### **9.1.1 Safety regulations**

Observe the rules applicable to the place of use and accident prevention regulations.

### **9.2 General information**

We recommend that Camfil APC perform any necessary repairs.

Training can be completed at Camfil APC.

#### **9.2.1 Special tools and test equipment**

Special tools are not required.

Gauge for determining air speed (flow)

Gauge for determining pressure ratio

Gauge for determining power consumption

Gauge for determining direction of spin

### **9.3 Wiring diagrams and drawings**

Provided by Camfil APC in case of need.

#### **9.4 Information about repair services**

##### **Manufacturer and service address**

##### **Camfil Air Pollution Control**

3505 South Airport Road

Jonesboro, AR 72401

Phone: 870-933-8048

Fax: 870-933-8381

Email: [filterman@camfil.com](mailto:filterman@camfil.com)

Internet: [www.camfilapc.com](http://www.camfilapc.com)

**SERVICE PHONE: 870-933-8048**

## 10 Decommissioning/storage

### 10.1 Introduction

During decommissioning and storage over a long period of time, the separator should be handled as follows.

### 10.2 Cleaning

The separator must be cleaned thoroughly.

The clean elements must be dry before installation.

Reinstall the dry filter elements.

### 10.3 Storage conditions

The separator must be stored dry

### 10.4 Transporting, loading and lifting the separator



#### NOTE

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#### Before transporting, loading and lifting the separator

- ▶ Fix or remove all loose parts of the separator
- 

#### 10.4.1 Type of storage



#### NOTE

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#### Storing the separator on its back.

- ▶ Do not place the separator on the sides.
  - ▶ Place the separator, if possible, on the back.
  - ▶ Remove any back switchgear.
  - ▶ Lower the separator gently on the back.
- 



#### NOTE

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#### Horizontal storage of the separator on its front

- ▶ Do not place the separator on its sides.
  - ▶ First remove the filter elements.
  - ▶ Secure the maintenance door against accidental opening.
  - ▶ Carefully lay the separator on its front side
- 



#### NOTE

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#### Upright storage of the separator

- ▶ Secure the separator sufficiently against tipping and overturning.
- 

#### 10.4.2 Shelf life

Separator may be stored indefinitely.

### 10.5 Maintenance during storage

During storage, no maintenance is required.

#### 10.5.1 Operation after storage

See chapter **Error! Reference source not found.**

## 11 Disposal

Empty the system and clean thoroughly.

Dispose of the components at the appropriate recycling facilities.

Dispose of the individual components in accordance with the local regulations and policies.

Cleaned housing	<b>Steel recycling</b>
Fittings	<b>Steel recycling</b>
Seals	<b>Waste management facility</b>
Filter elements	<b>Waste management facility</b>
Washing liquid	<b>Waste management facility</b>

## 12 Malfunction

### Safety shut-off

Protect the system during maintenance, malfunctions or repairs against accidental startup.

Disorder	Possible cause	Measure
Air output too low	Fan spinning wrong direction.	Check the direction of rotation.
	High filter resistance across one or more filters elements.	Check the filter resistance of the different filter levels.
	High vacuum or overpressure in the pipe system.	Review the layout of the pipeline system.
	Polluted piping system.	Check piping system for deposits and dirt.
	Leaks in the piping system.	Check for leakage of the pipeline system.
	If a frequency controlled fan is used, speed or frequency is set too low.	Check fan speed or frequency inverter set point.
	If a frequency and pressure controlled fan is used, negative pressure is set too low.	Check set point pressure.
	Base overfill due to poor drainage.	Check siphon, recirculation pump system or return flow line.
Unusually short life for demister filter elements	The filter element is filled with shavings.	Check the suction power or integrate a chip pre-separator in the pipe system.
	The filter element is filled with high viscosity oil.	Check with Camfil APC if the right filter element has been selected for the application.
	The filter element is not suitable for the application.	Check with Camfil APC if the right filter element has been selected for the application.
	Base overfill due to poor drainage.	Check siphon, recirculation pump system or return flow line.
Unusually short life for CoaPack pre filter elements	The filter element is filled with shavings.	Check the suction power or integrate a chip pre-separator in the pipe system.
	The filter element is filled with an excessive amount of oil.	Check the suction power or retrofit coarse filter element.

Disorder	Possible cause	Measure
	The filter element is filled with high viscosity oil.	Check with Camfil APC if the right filter element has been selected for the application.
	The filter element is not suitable for the application	Check with Camfil APC if the right filter element has been selected for the application.
	Base overflow due to poor drainage.	Check siphon, recirculation pump system or return flow line.
Unusually short life for CoaPack fine filter elements	The filter element is filled with an excessive amount of oil.	Check the suction power or retrofit coarse filter element.
	The filter element is filled with high viscosity oil.	Check with Camfil APC if the right filter element has been selected for the application.
	The seal and/or the position of the CoaPack pre filter elements are not in order.	Check the seals and position of the filter elements.
	Base overflow due to poor drainage.	Check siphon, recirculation pump system or return flow line.
	The filter element is not suitable for the application	Check with Camfil APC if the right filter element has been selected for the application.
Unusually short lifetime for HEPA filter elements	The seal and/or the position of the HEPA filter elements are not in order.	Check the seals and position of the filter elements.
	Base overflow due to poor drainage.	Check siphon, recirculation pump system or return flow line.
	The filter element is not suitable for the application	Check with Camfil APC if the right filter element has been selected for the application.
Increased emissions in the clean gas	The seal and/or the position of the filter elements are not in order.	Check the seals and position of the filter elements.
	There is no HEPA filter level installed.	Check with Camfil APC if a HEPA filter level is necessary for the application.
	Base overflow due to poor drainage.	Check siphon, recirculation pump system or return flow line.
Overfilling base	Clogged siphon, pump or return line	Check equipment for blockages.
	Defective pump.	Check function of pump.
	Return flow rate too low.	Check pump performance with return feed line system or siphon and return line.

Disorder	Possible cause	Measure
Fan does not run smoothly	Build-up on the impeller blades.	Check, clean and balance impeller if necessary.
	Damage to the motor bearing.	Replace motor bearing.
Fan does not start	Motor stuck in star with star delta connection.	Shorten time from star to delta.
	Running against low system resistance.	Set the fan operating point.
	Insufficient motor protection device.	Ensure equipment is capable of supporting the high current at startup.
	Motor too warm from high switching frequency	Operate fan in continuous operation and with restrictor or frequency converter control.
	High starting current.	Incorrect voltage. Local network too weak. Check power supply.
Sluggish fan	Damage to the motor bearing.	Replace motor bearing and check installation.

## 13 Glossary

### **Exhaust air mode**

The purified air is not returned to the work space after filtration.

### **Separator**

The capture serves as a mechanical separation process for the separation of mixtures of materials. The goal is the complete removal of one or more components of the mixtures in the event that the air contains foreign substances. The capture device is referred to here as separator.

### **Aerosol**

Mixture of solid or liquid airborne particles (E.g. cooling lubricant mist) and gas (E.g. air).

### **CoaPack**

Fiberglass filter element with special drainage fittings for the separation of liquid drops and liquid aerosols in gaseous media such as air or process gases.

### **Demister**

Stainless steel mesh filter elements for the separation of liquid droplets of gaseous media, such as air or process gases.

### **Emulsion**

Finely distributed mix of two different (normally non-miscible) liquids without visible segregation (E.g. coolant/water ratio <15%).

### **Exhaust air**

Exhaust air is air blown into the open. The air is no longer usable. Heat or cold recovery energy is removed from the air, and they are reintroduced into the process.

### **HEPA filter element**

HEPA Filters (High Efficiency Particulate Airfilter) are filters for the deposition of aerosols in the air. These filters can be divided according to effectiveness of the filtration. The names indicate their particle filter class.



**Coalescence**

Coalescence generally refers to the confluence of small colloidal particles to form larger particles, such as oil droplets. The surface of the larger particles is smaller than that of the sum of the individual smaller particles. The reduction of the surface results in a lower frictional resistance of the particle.

**Cooling lubricants (CLS)**

Cooling lubricants are used for heat dissipation and to reduce the friction between the tool and work piece.

**Media**

In raw gas containing particles etc.; Particulate etc.

**Oleo phobic**

Oil repellent

**Smoke**

Smoke arises mostly by combustion processes in aerosol, finely divided dust particles and/or mist droplets (E.g. water, oil vapors) in moist exhaust.

**Clean air recirculation**

The cleaned air is returned to the work space after filtration.

## 14 Appendix A – recommended log

Service center	Maintenance note	Expected	Actual	Pass	Fail	Date	Initials
Separator housing	Interior visual inspection for dirt	-	-	<input type="checkbox"/>	<input type="checkbox"/>		
	Filter elements correctly secured	-	-	<input type="checkbox"/>	<input type="checkbox"/>		
	Damaged filter elements	-	-	<input type="checkbox"/>	<input type="checkbox"/>		
Coarse filter stage Demister filter element	Visual inspection pressure display	6 mbar		<input type="checkbox"/>	<input type="checkbox"/>		
Pre-filtering level CoaPack filter element	Visual inspection pressure display	9 mbar		<input type="checkbox"/>	<input type="checkbox"/>		
Mail filter level CoaPack filter element	Visual inspection pressure display	9 mbar		<input type="checkbox"/>	<input type="checkbox"/>		
After filter level HEPA filter element	Visual inspection pressure display	10 mbar		<input type="checkbox"/>	<input type="checkbox"/>		
Fan	Vibration control	-	-	<input type="checkbox"/>	<input type="checkbox"/>		
Seals	Visual inspection for damaged seals	-	-	<input type="checkbox"/>	<input type="checkbox"/>		
Siphon	Flow tested	-	-	<input type="checkbox"/>	<input type="checkbox"/>		
Recirculation pump cover	Flow tested	-	-	<input type="checkbox"/>	<input type="checkbox"/>		
Recirculation pump	Flow tested	-	-	<input type="checkbox"/>	<input type="checkbox"/>		
Siphon	Flow tested	-	-	<input type="checkbox"/>	<input type="checkbox"/>		
Connection hose, if available	Flow tested	-	-	<input type="checkbox"/>	<input type="checkbox"/>		
Measuring hoses filter pressure display 1-4	Flow tested	-	-	<input type="checkbox"/>	<input type="checkbox"/>		

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 Tested

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 Place/date



## 16 Appendix C – technical data

### 16.1 Separator general

		Frame size							
		3.0	4.5	6.0	9.0	13.5	18.0	27.0	40.5
Weight max.	[kg]	1075	1420	1745	2585	3895	5170	7790	11685
Volume flow	[m <sup>3</sup> /h]	3000	4500	6000	9000	13500	18000	27000	40500
Sound pressure level, measured at 1m from the site and 1.60 m from the floor	[dB(A)]	75.0	75.0	75.0	75.0	75.0	78.0	78.0	79.8
Coarse filter stage: Demister	[ Number ]	1	1	2	2	3	4	6	9
Pre filtering level: CoaPack	[ Number ]	2	3	4	6	9	12	18	27
Fine filter level: CoaPack	[ Number ]	2	3	4	6	9	12	18	27
After filter stage: HEPA Filter	[ Number ]	2	3	4	6	9	12	18	27
Operating weight max.	[kg]	1075	1420	1745	2585	3895	5170	7790	11685

### 16.2 Built-in fan

#### 50 Hz Version

		Frame size							
		3.0	4.5	6.0	9.0	13.5	18.0	27.0	40.5
Motor power [kW]		5.5	7.5	7.5	18.5	22.0	2x18.5	2x22.0	3x22.0
Motor speed [1/min]		2937	2930	2930	2940	2940	2x2940	2x2940	3x2940
Rated voltage [V]		400	400	400	400	400	400	400	400
Rated current [A]		10.6	13.7	13.7	32.5	38.1	2x32.5	2x38.5	3x38.1
Operating point	Volume flow V [m <sup>3</sup> /h]	3000	4500	6000	9000	13500	18000	27000	40500
	Pressure P [Pa]	3150	3150	3150	3550	3550	2x3550	2x3550	3x3550
Sound pressure level, measured at 1m from the site and 1.60 m from the floor	[dB(A)]	75.0	75.0	75.0	75.0	75.0	78.0	78.0	79.8

#### 60 Hz Version

		Frame size							
		3.0	4.5	6.0	9.0	13.5	18.0	27.0	40.5
Motor power [kW]		4.8	6.6	9.0	18.0	22.2	2x18.0	2x22.2	3x22.2
Motor speed [1/min]		2937	2930	2930	2940	2940	2x2940	2x2940	3x2940
Rated voltage [V]		400	400	400	400	400	400	400	400
Rated current [A]		10.6	13.7	13.7	32.5	38.1	2x32.5	2x38.1	3x38.1
Operating point	Volume flow V [m <sup>3</sup> /h]	3000	4500	6000	9000	13500	18000	27000	40500
	Pressure P [Pa]	3150	3150	3150	3550	3550	2x3550	2x3550	3x3550
Sound pressure level, measured at 1m from the site and 1.60 m from the floor	[dB(A)]	75.0	75.0	75.0	75.0	75.0	78.0	78.0	79.8

### 16.3 Assembly fan

See separate documentation from fan manufacturer.

### 16.4 Side fan

See separate documentation from fan manufacturer.


### 16.5 Recirculation pump

	Module	Conveying capacity [m <sup>3</sup> /h]	Conveyor height [m]	Motor output [kW]	Voltage [V (+/-5%)]	Control voltage [V DC]	Frequency [Hz]	Type of protection	Connection diameter [“]
Pump-I-50Hz	U1.1	0.3 to 2.4	12 to 2	0.22	400	24	50	IP55	¾
Pump-II-50Hz	U1.2	0.3 to 3.6	16 to 2	0.63	400	24	50	IP55	¾
Pump-I-60Hz	U1.3	0.3 to 2.4	12 to 2	0.22	460	24	60	IP55	¾
Pump-II-60Hz	U1.4	0.3 to 3.6	16 to 2	0.63	460	24	60	IP55	¾















## 17 Appendix D – spare parts list

**B = Requirement level**  
 1 = storage absolutely recommended  
 2 = storage conditionally recommended  
 3 = storage not necessary

**A = Type of component**  
 W = Wear part  
 SP = Spare part  
 Stk. = Required stock  
 Rec. = Recommended for storage

Collector size		3.0		4.5		6.0		9.0		13.5		18.0		27.0		40.5		A	B	
		Stk.	Rec.	Stk.	Rec.	Stk.	Rec.	Stk.	Rec.	Stk.	Rec.	Stk.	Rec.	Stk.	Rec.	Stk.	Rec.			
<b>Main separation stage H1</b>																				
	Filter stage 3 CoaPack HN10066002	2	2	3	3	4	4	6	6	9	9	12	12	18	18	27	27	W	1	
	Filter stage 2 CoaPack HN10066001	2	2	3	3	4	4	6	6	9	9	12	12	18	18	27	27	W	2	
	Differential pressure Indicator NG 63W 033988940	2	-	2	-	2	-	2	-	2	-	4	-	6	-	6	-	SP	3	
	Sealing maintenance door - top 204574004	12.6'	13.1'	12.6'	13.1'	13.5'	13.1'	13.5'	13.1'	16.1'	16.4'	26.9'	29.5'	40.4'	42.7'	48.2'	49.2'	W	1	
	Sealing maintenance door - bottom 204574004	13.5'	16.4'	13.5'	16.4'	14.1'	16.4'	14.1'	16.4'	16.7'	19.7'	28.2'	29.5'	42.3'	42.7'	50.2'	52.5'	W	1	
	Hinge 225194124	4	-	4	-	4	-	4	-	4	-	8	-	12	-	12	-	SP	3	
	Bolt latch HN10012102	8	-	8	-	12	-	12	-	16	-	24	-	36	-	48	-	SP	3	
<b>Main separation stage H2</b>																				
	Filter stage 3 CoaPack HN10066002	2	2	3	9	4	9	6	9	9	9	12	12	18	18	27	27	W	1	
	Filter stage 2 CoaPack HN10066001	2	2	3	9	4	9	6	9	9	9	12	12	18	18	27	27	W	2	
	Filter stage 1 Demister HN10008010	1	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	W	3	

Appendix D – spare parts list










	Filter stage 1 Demister HN10008014	-	-	1	-	-	-	2	-	3	-	4	-	6	-	9	-	W	3
	Differential pressure Indicator NG 63W 033988940	3	-	3	-	3	-	3	-	3	-	6	-	9	-	6	-	SP	3
	Sealing maintenance door - top 204574004	12.6'	13.1'	12.6'	13.1'	13.5'	13.1'	13.5'	13.1'	16.1'	16.4'	26.9'	29.5'	40.4'	42.7'	48.2'	49.2'	W	1
	Sealing maintenance door - bottom 204574004	13.5'	16.4'	13.5'	16.4'	14.1'	16.4'	14.1'	16.4'	16.7'	19.7'	28.2'	29.5'	42.6'	42.7'	50.2'	52.5'	W	1
	Hinge 225194124	4	-	4	-	4	-	4	-	4	-	8	-	12	-	12	-	SP	3
	Bolt latch HN10012102	8	-	8	-	12	-	12	-	16	-	24	-	36	-	48	-	SP	3
2H1	Consists of 2 x H1																		
2H2	Consists of 2 x H2																		
3H1	Consists of 3 x H1																		
3H2	Consists of 3 x H2																		
<b>Post separation stage N1</b>																			
	Sealing maintenance door 204574004	8.9'	9.8'	8.9'	9.8'	10.2'	13.1'	13.5'	16.4'	13.8'	16.4'	26.9'	29.5'	40.5'	42.7'	87.3'	42.7'	W	1
	Hinge 225194124	2	-	2	-	2	-	2	-	2	-	4	-	6	-	6	-	SP	3
	Bolt latch HN10012102	3	-	3	-	5	-	5	-	7	-	10	-	10	-	21	-	SP	3
<b>Post separation stage N2</b>																			
	Filter stage 4 HEPA filter, H13 HN10076018	2	2	3	3	4	4	6	6	9	9	12	12	18	18	27	27	W	1
	Sealing maintenance door 204574004	8.9'	9.8'	8.9'	9.8'	10.2'	13.1'	13.5'	16.4'	13.8'	16.4'	26.9'	29.5'	40.4'	42.7'	41.3'	42.7'	W	1
	Differential pressure Indicator NG 63W 033988940	1	-	1	-	1	-	2	-	1	-	2	-	3	-	3	-	SP	3
	Hinge 225194124	2	-	2	-	2	-	2	-	2	-	4	-	6	-	6	-	SP	3
	Bolt latch HN10012102	3	-	3	-	5	-	5	-	7	-	10	-	10	-	21	-	SP	3

Basic module U1.1																			
	Protection level sensor, FTL 20 225198102	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	SP	3
	Pump SB 40, 50 Hz 225198103	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	SP	3
	Valve 225197117	1	-	1	-	1	-	1	-	1	-	2	-	3	-	3	-	SP	3
no picture	Hose, 3/4" dia. 225199115	0.98'	-	0.98'	-	0.98'	-	0.98'	-	0.98'	-	1.97'	-	2.95'	-	2.95'	-	SP	3
	Hose clamp W1 REQUEST	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	SP	3
	Non return valve 225197146	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	SP	3
	Cover 27x13x1.6 HN10021071	1	-	1	-	2	-	2	-	4	-	4	-	6	-	12	-	SP	3
Basic module U1.2																			
	Protection level sensor, FTL 20 225198102	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	SP	3
	Pump SB 40, 50 Hz 225198103	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	SP	3
	Valve 225197117	1	-	1	-	1	-	1	-	1	-	2	-	3	-	3	-	SP	3
no picture	Hose, 3/4" dia. 225199115	0.98'	-	0.98'	-	0.98'	-	0.98'	-	0.98'	-	1.97'	-	2.95'	-	2.95'	-	SP	3
	Hose clamp W1 REQUEST	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	SP	3
	Non return valve 225197146	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	SP	3
	Cover 27x13x1.6 HN10021071	1	-	1	-	2	-	2	-	4	-	4	-	6	-	12	-	SP	3




Appendix D – spare parts list

Basic module U1.3																			
	Protection level sensor, FTL 20 225198102	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	SP	3
	Pump SB 40, 50 Hz 225198103	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	SP	3
	Valve 225197117	1	-	1	-	1	-	1	-	1	-	2	-	3	-	3	-	SP	3
no picture	Hose, 3/4" dia. 225199115	0.98'	-	0.98'	-	0.98'	-	0.98'	-	0.98'	-	1.97'	-	2.95'	-	2.95'	-	SP	3
	Hose clamp W1 REQUEST	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	SP	3
	Non return valve 225197146	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	SP	3
	Cover 27x13x1.6 HN10021071	1	-	1	-	2	-	2	-	4	-	4	-	6	-	12	-	SP	3
Basic module U1.4																			
	Protection level sensor, FTL 20 225198102	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	SP	3
	Pump SB 40, 50 Hz 225198103	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	SP	3
	Valve 225197117	1	-	1	-	1	-	1	-	1	-	2	-	3	-	3	-	SP	3
no picture	Hose, 3/4" dia. 225199115	0.98'	-	0.98'	-	0.98'	-	0.98'	-	0.98'	-	1.97'	-	2.95'	-	2.95'	-	SP	3
	Hose clamp W1 REQUEST	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	SP	3
	Non return valve 225197146	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	SP	3
	Cover 27x13x1.6 HN10021071	1	-	1	-	2	-	2	-	4	-	4	-	6	-	12	-	SP	3
Basic module U2																			
	Protection level sensor, FTL 20 225198102	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	SP	3
	Connection hose HN10026378	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	SP	3
	Screw connection HN10026001	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	SP	3
	Cover 27x13x1.6 HN10021071	1	-	1	-	2	-	2	-	4	-	4	-	6	-	12	-	SP	3

Basic module U3																			
	Drainage siphon	1	-	1	-	1	-	1	-	1	-	1	-	On Req.	-	1	-	SP	3
	On Request																		
	Cover 27x13x1.6	1	-	1	-	2	-	2	-	4	-	4	-	6	-	12	-	SP	3
	HN10021071																		
Basic module U4																			
	Drainage siphon	1	-	1	-	1	-	1	-	1	-	1	-	On Req.	-	1	-	SP	3
	On Request																		
	Cover 27x13x1.6	1	-	1	-	2	-	2	-	4	-	4	-	6	-	12	-	SP	3
	HN10021071																		
Basic module U5																			
	Cover 27x13x1.6	1	-	1	-	2	-	2	-	4	-	4	-	6	-	12	-	SP	3
	HN10021071																		
2U5.1	Consists of 1 x U1.2 and 1 x U2																		
2U5.2	Consists of 1 x U1.4 and 1 x U2																		
2U5.3	Consists of 1 x U3 and 1 x U5																		
2U5.4	Consists of 1 x U4 and 1 x U2																		
3U5.1	Consists of 1 x U1.2 and 2 x U2																		
3U5.2	Consists of 1 x U1.4 and 2 x U2																		
3U5.3	Consists of 1 x U3 and 2 x U5																		
3U5.4	Consists of 1 x U4 and 2 x U2																		
Fan module O1.1																			
	Fan motor, 50 Hz	1	-	1	-	1	-	1	-	1	-	2	-	3	-	3	-	SP	3
	On Request																		
	Fan impeller	1	-	1	-	1	-	1	-	1	-	2	-	3	-	3	-	SP	3
	On Request																		
Fan module O1.2																			
	Fan motor, 60 Hz	1	-	1	-	1	-	1	-	1	-	2	-	3	-	3	-	SP	3
	On Request																		
	Fan impeller	1	-	1	-	1	-	1	-	1	-	2	-	3	-	3	-	SP	3
	On Request																		
O2	Consists of 1 x U1.2 and 1 x U2																		
O3	Consists of 1 x U1.4 and 1 x U2																		
2O1.1	Consists of 1 x U3 and 1 x U5																		
2O1.2	Consists of 1 x U4 and 1 x U2																		
2O2	Consists of 1 x U1.2 and 2 x U2																		
2O3	Consists of 1 x U1.4 and 2 x U2																		
3O1.1	Consists of 1 x U3 and 2 x U5																		
3O1.2	Consists of 1 x U4 and 2 x U2																		
3O2	Consists of 1 x U3 and 2 x U5																		
3O3	Consists of 1 x U4 and 2 x U2																		

Appendix D – spare parts list

Overfill protection F0																			
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Overfill protection F1																			
	Protection level sensor, FTL 20 225198102	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	SP	3
2F1	Consists of 2 x F1																		
3F1	Consists of 3 x F1																		
Special design																			
S0	Without special design (manufacturer standard)																		
S1	Special design, see external spare part list																		



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