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## Operation and Maintenance

Envistar Flex 060–1540

Home Concept FTX Flex 060-600



Order number:

Project:



# Unit specifications

- Cooling unit ECO, ECX
- Reversible heat pump TCH
- Home Concept model

## Control equipment

- MX
- US
- UC
- MK
- HS

## Unit parts and accessories

- Plate heat exchanger EXP
- Counter-flow exchanger EXM
- Rotary heat exchanger EXR
- Run-around coil unit EXL
- Air heater water EMT-VV, ELEV
- ThermoGuard ESET-TV, ELTV
- Air heater electric ESET-EV, ELEE  
Eff-var 1  2  3  4  5
- Air cooler water  
ESET-VK, ELBC, ESET-DX, ELBD
- Damper ESET-TR, EMT-01
- Intake section MIE-IU
- Exhaust air section EAU
- Recirculating unit EBE
- Sound attenuator EMT-02, MIE-KL
- Carbon filter section ECF
- Filter bypass ENFT-10

## Size

- |                              |                              |                               |
|------------------------------|------------------------------|-------------------------------|
| 060 <input type="checkbox"/> | 300 <input type="checkbox"/> | 740 <input type="checkbox"/>  |
| 100 <input type="checkbox"/> | 360 <input type="checkbox"/> | 850 <input type="checkbox"/>  |
| 150 <input type="checkbox"/> | 400 <input type="checkbox"/> | 980 <input type="checkbox"/>  |
| 190 <input type="checkbox"/> | 480 <input type="checkbox"/> | 1250 <input type="checkbox"/> |
| 240 <input type="checkbox"/> | 600 <input type="checkbox"/> | 1540 <input type="checkbox"/> |

## Filter, supply air

- Coarse-65% (G4)
- ePM10-60% (M5)
- ePM2,5-50% (M6)
- ePM1-50% (F7)
- ePM1-70% (F8)
- ePM1-85% (F9)
- ePM1-70% (C7)
- Aluminium
- Excl. filter

- Set of filters Black Ridge BR

## Filter extract air

- Coarse-65% (G4)
- ePM10-60% (M5)
- ePM2.5-50% (M6)
- ePM1-50% (F7)
- ePM1-70% (F8)
- ePM1-85% (F9)
- ePM1-70% (C7)
- Aluminium
- Excl. filter



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# 1 Safety precautions

Observe warning labels on the unit as well as the following safety precautions:

## 1.1 Lockable safety switch



**WARNING!**

High voltage and rotating fan impeller, risk of personal injury. Working on/servicing the unit – Shut down the unit via the service switch in the control equipment, then turn the safety switch to the 0 position and lock it.

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**NB:**

The safety switch is not designed for starting/stopping the unit. Always use the service switch in the control equipment to start and shut down the unit.

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## 1.2 Inspection doors



**WARNING!**

Positive pressure inside the unit, risk of personal injury. Allow the pressure to drop before you open the inspection doors.

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**WARNING!**

Rotating fan impeller, risk of personal injury. Shut down the unit via the service switch in the control equipment, then turn the safety switch to the 0 position and lock it. Wait at least 3 minutes before opening inspection doors.

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**NB:**

The doors in front of moving parts should normally be locked; there are no safety guards. Before carrying out work, unlock the doors with the key provided.

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## 1.3 Electrical connection



**WARNING!**

Rotating fan impeller, risk of personal injury. The unit must not be energised until all ducts have been connected.

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**NB:**

Wiring of connections and other electrical work may only be carried out by a qualified electrician or by service personnel recommended by IV Produkt.

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## 1.4 Cooling unit/Reversible heat pump



**WARNING!**

Hot surfaces, risk of personal injury. Shut down the unit via the service switch in the control equipment, then turn the safety switch to the 0 position and lock it. Wait at least 30 minutes before opening the compressor inspection doors.

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## 2 General

### 2.1 Intended use

The air handling units in the Envistar Flex series are intended for comfort ventilation in buildings.

When installed indoors, the air handling unit must be installed in an area that maintains a temperature between +7 and +30°C, and with a moisture content of <3.5 g/kg in the fan room in winter. The unit can also be equipped for outdoor installation.

Any other use and installation in other environments is prohibited unless specifically permitted by IV Produkt AB.

### 2.2 Manufacturer

The Envistar air handling units (AHUs) are manufactured by:

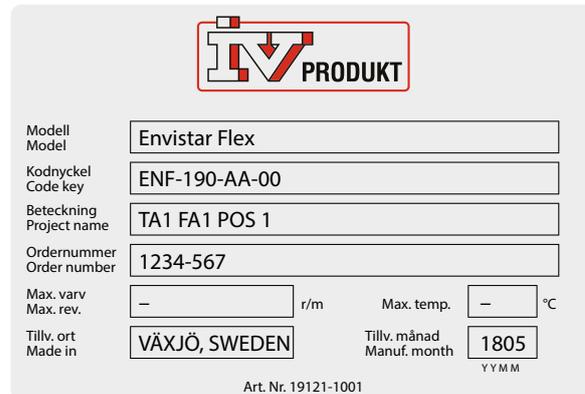
IV Produkt AB  
 Sjöuddevägen 7  
 SE-350 43 VÄXJÖ

### 2.3 Designations

Envistar Flex air handling units consist of a number of different block sections.

Each block section is supplied with a model identification label located at the front.

The model plate shows the order number and the required designations to identify the block part.



	
Modell Model	Envistar Flex
Kodnyckel Code key	ENF-190-AA-00
Beteckning Project name	TA1 FA1 POS 1
Ordernummer Order number	1234-567
Max. varv Max. rev.	— r/m
Max. temp.	— °C
Tillv. ort Made in	VÄXJÖ, SWEDEN
Tillv. månad Manuf. month	1805 YYMM
Art. Nr. 19121-1001	

*Typical model identification label*

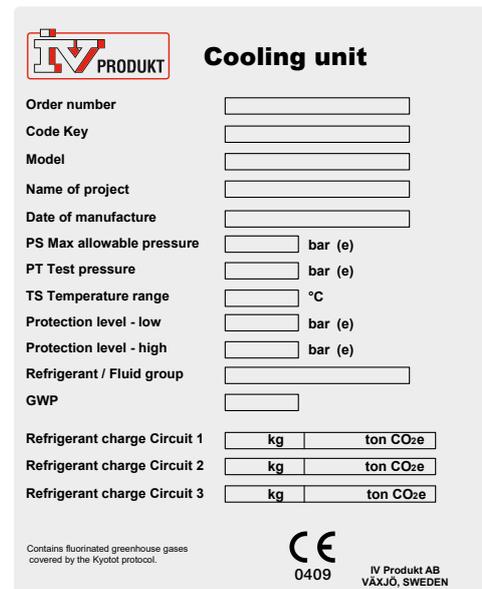
## 2.4 CE marking and EU Declaration of Conformity

The air handling units and any incorporated cooling units are CE marked, which means that upon delivery they conform to applicable provisions in EU Machinery Directive 2006/42/EC as well as to other EU Directives applicable to the types of air handling units, e.g. Pressure Equipment Directive PED 2014/68/EU.

As certification confirming that the requirements have been met, we provide an EU Declaration of Conformity, which is available under Documentation at [ivprodukt.docfactory.com](http://ivprodukt.docfactory.com), or under Order Unique Documentation at [docs.ivprodukt.com](http://docs.ivprodukt.com).



Typical CE label for air handling units



**Cooling unit**

Order number

Code Key

Model

Name of project

Date of manufacture

PS Max allowable pressure  bar (e)

PT Test pressure  bar (e)

TS Temperature range  °C

Protection level - low  bar (e)

Protection level - high  bar (e)

Refrigerant / Fluid group

GWP

Refrigerant charge Circuit 1  kg  ton CO<sub>2</sub>e

Refrigerant charge Circuit 2  kg  ton CO<sub>2</sub>e

Refrigerant charge Circuit 3  kg  ton CO<sub>2</sub>e

Contains fluorinated greenhouse gases covered by the Kyoto protocol.

**CE**  
0409  
IV Produkt AB  
VÄXJÖ, SWEDEN

Typical CE label for cooling units

### For units without integrated control equipment

The EC declaration applies only to units in the condition in which they have been delivered and installed at the facility in accordance with the enclosed installation instructions. The declaration does not include components that were subsequently added or measures subsequently taken on the unit.

## 2.5 Maintenance

The ongoing maintenance of this unit can be carried out either by the person normally in charge of maintaining the building or through a contract with a well-reputed service company.

## 2.6 Handling of refrigerant

- For refrigerant management of cooling unit EcoCooler (code ECO, ECX), see the separate Operation and Maintenance instruction on [docs.ivprodukt.com](http://docs.ivprodukt.com).
- For refrigerant management of reversible heat pump ThermoCooler HP (code TCH), see the separate Operation and Maintenance instruction on [docs.ivprodukt.com](http://docs.ivprodukt.com).



## 2.7 Extended warranty

In cases in which the equipment delivered falls under a 5-year warranty, in accordance with ABM 07 with supplement ABM-V 07 or in accordance with NL 09 with supplement VU13, the IV Produkt Service and Warranty Manual is supplied with the product.

In order to lay claim to an extended warranty, a complete, documented and signed IV Produkt Service and Warranty Manual must be presented.

## 2.8 Spare parts

Spare parts and accessories for this unit are ordered from your nearest IV Produkt sales representative. When ordering, state the order number and designation. These are stated on a model type plate, affixed to each component. There is a separate spare parts list for the unit, refer to Order Unique Documentation at [docs.ivprodukt.com](https://docs.ivprodukt.com).

## 2.9 Dismantling and decommissioning

When an air handling unit is to be dismantled, separate instructions must be followed, see Dismantling and decommissioning the AHU under Documentation at [ivprodukt.docfactory.com](https://ivprodukt.docfactory.com).

## 3 Technical description

### 3.1 Envistar Flex air handling unit



The Envistar Flex is manufactured as a modular unit comprising block sections in various sizes. The versions are named according to the supply air and can be freely selected: right-hand or left-hand, up or down.

The units are equipped with either a rotary heat exchanger, counter-flow heat exchanger, plate heat exchanger or run-around coil unit.

The units are also available as single-stacked supply air or extract air units in sizes 060-600.

The units are usually supplied with integrated control equipment, but can also be obtained without control equipment.

Cooling units EcoCooler and Cooling heat pump ThermoCooler HP are available as an option.

## 4 Wiring instructions and fuse protection

### 4.1 MX – Complete control equipment and UC – Complete electrical connection to terminal without controller unit

Applies to:

- Code MX - units supplied prewired with complete, integrated Siemens Climatrix control equipment.
- Code UC - units supplied without controller unit but with sensor and damper actuator connected electrically to the terminal block. Fans and heat exchangers are fused and connected electrically to the terminal. The terminal connections are positioned at a shared place in the unit. For further connection to an external process unit, we recommend using a multi-conductor cable.

#### Safety switch

A safety switch is mounted on the air handling unit.

#### Wiring diagrams

For wiring diagrams for units with control equipment, see the order-unique wiring diagram supplied with the unit at [docs.ivprodukt.com](https://docs.ivprodukt.com) (Control Diagram).

#### Unit functions, power supply and fuse protection

For power supply to the unit functions and recommended fuses, refer to Order Unique Documentation at [docs.ivprodukt.com](https://docs.ivprodukt.com) (Technical Data and Control Diagram), or the product program IV Produkt Designer.

Recommended fuse protection refers to fuses with type C characteristics.

### 4.2 MK – Fans and heat exchangers electrically connected to terminal

Code MK - units supplied without control equipment but with fans and heat exchangers connected electrically to terminals.

Connections to terminal blocks are located on each unit section.

For wiring instructions and recommended fuses, refer to Order Unique Documentation at [docs.ivprodukt.com](https://docs.ivprodukt.com) (Terminal Connection and Technical Data).

#### Safety switch

A safety switch is fitted and wired on each power supply.

### 4.3 HS, US - Without control and without electrical connection

- Code HS - units without control equipment and without electrical connection, control diagrams are available for the heat exchanger under order unique documentation at [docs.ivprodukt.com](http://docs.ivprodukt.com), for other connection instructions, see below.
- Code US - for units without control equipment and without electrical connection, refer to the connection instructions below.

Recommended fuse protection refers to fuses with type C characteristics.

#### Safety switch

A safety switch must be fitted and wired on each power supply.

#### Fan, power supply and fuse protection

For separate power supply of each fan, read and note the “Type” from the fan data plate.

NB: The fans may be different sizes/variants. Read both the supply air and extract air fan labels.

For the relevant power supply and recommended fuse protection, refer to [docs.ivprodukt.com](http://docs.ivprodukt.com) (Technical Data).

Fläkt / Fan / Puhallin Wentylator / Ventilator / Ventilateur			
Type	<input type="text"/>	-	r/m
	<input type="text"/> kW	<input type="text"/> A	Utløksfrekvens Out frequency Tásljúrúðalska Časová hodnota výstupu Ausg.frequenz 2 Fréq. sort Max. temp.
	<input type="text"/> V		<input type="text"/> Hz
K-faktor K-factor K-faktor Wsp.K. K-faktor Facteur	<input type="text"/>	$Q=1/K \times \sqrt{p}$ (m³/s)	<input type="text"/> °C
<b>Ref.</b>			
ErP data			
Eff.degr.type	$\eta_{total}$	N=	N=
Speed ctrl			

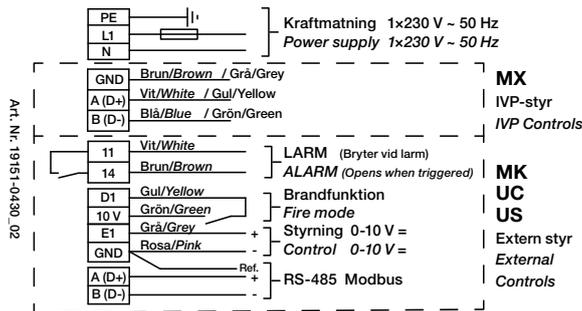
Typical fan data label

**Fans (ELFF)**

Read and make a note of the size and power shown on the fan data label; see example on previous page. Actual connection instructions can be found below.

**ELFF Ziehl EC**  
**1x230 V 0.50-0.78 kW**  
**fan impeller 025**

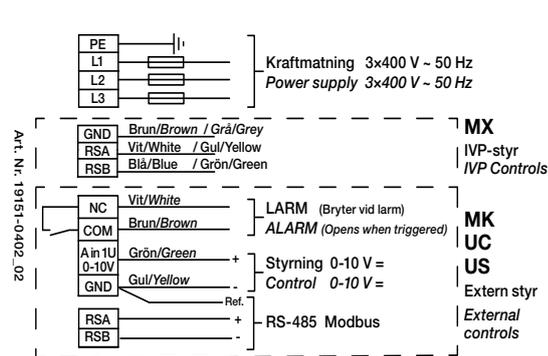
Size 060



**INKOPPLING / WIRING**  
**Ziehl 1x230 V - BD**

**ELFF EBM EC**  
**3x400 V 1.10-5.70 kW**  
**fan impeller 031-056**

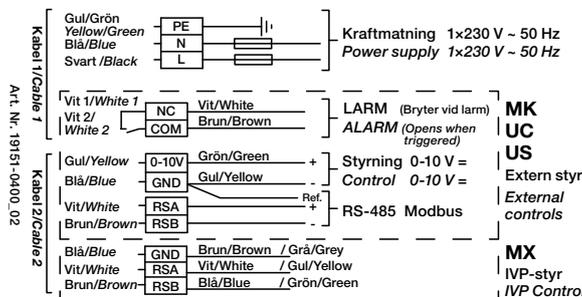
Size 100-740



**INKOPPLING / WIRING**  
**EBM 3x400 V - P8, M3, M5**

**ELFF EBM EC**  
**1x230 V 0.75 kW**  
**fan impeller 028**

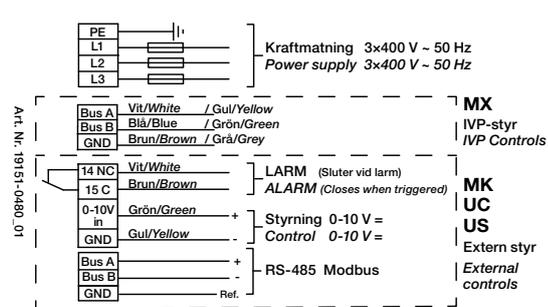
Size 100



**INKOPPLING / WIRING**  
**EBM 1x230 V - P5**

**ELFF DOMEL PFJ1**  
**3x400 V 4.3-6.5 kW**  
**fan impeller 063-071**

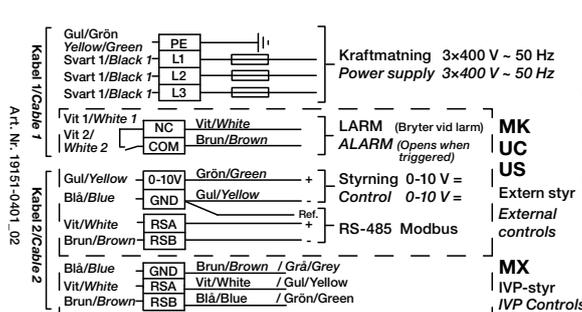
Size 480-980



**INKOPPLING / WIRING**  
**OJ-DV 3x400 V**

**ELFF EBM EC**  
**3x400 V 1.05 kW**  
**fan impeller 028**

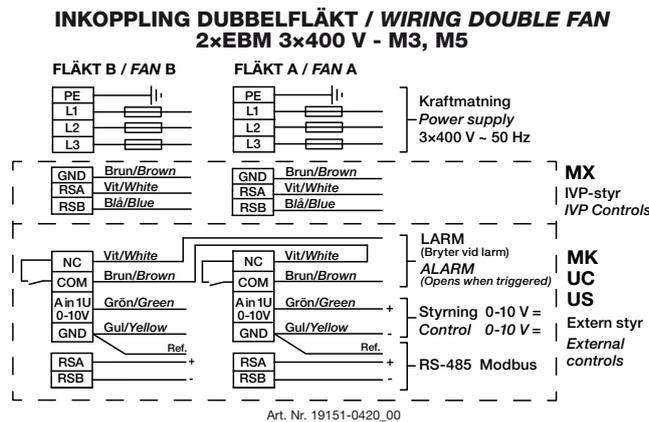
Size 100



**INKOPPLING / WIRING**  
**EBM 3x400 V - P6**

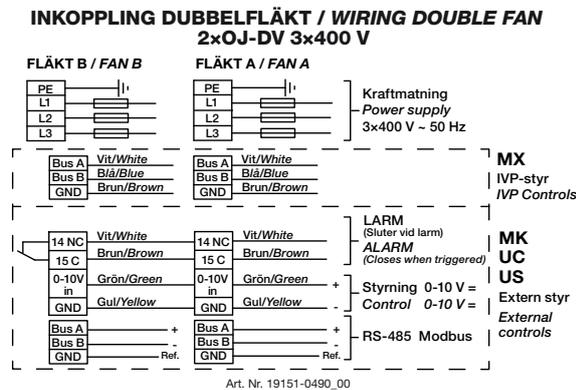
**ELFF EBM EC dual fans**  
**2 x 3x400 V 1.74-5.7 kW**  
**fan impeller 2 x 045-056**

Size 400-980



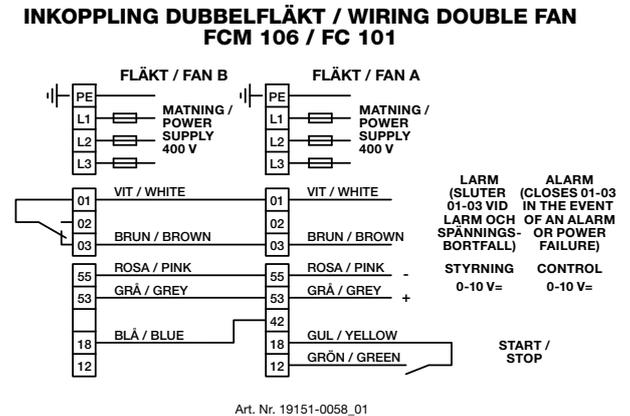
**ELFF DOMEL PFJ1 dual fans**  
**2 x 3x400 V 4.3-6.5 kW**  
**fan impeller 2 x 063-071**

Size 740-1540



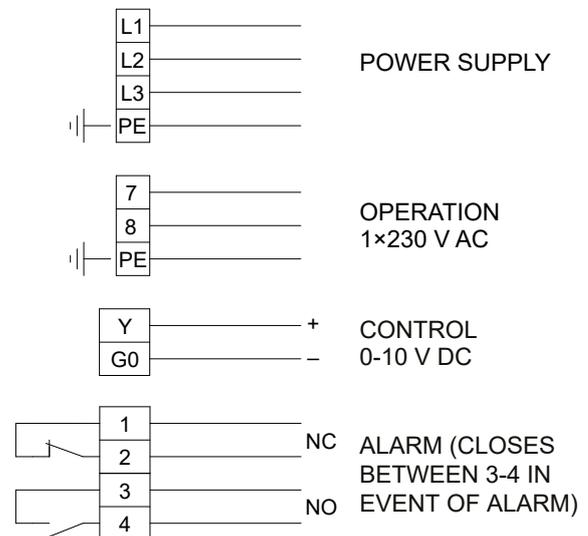
**ELFF Danfoss PSM1 dual fans**  
**2 x 3x400 V 11-15 kW**  
**fan impeller 2 x 080**

Size 1540



**Air heater electric (code ESET-EV, ESET-EV, ELEE\*)**

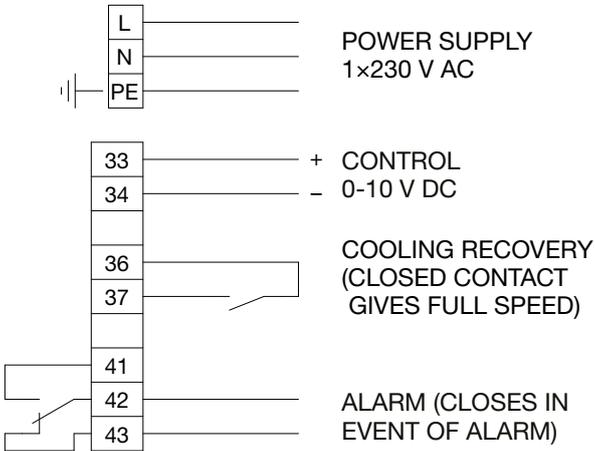
For power supply, refer to Order Unique Documentation at [docs.ivprodukt.com](http://docs.ivprodukt.com) (Technical Data).



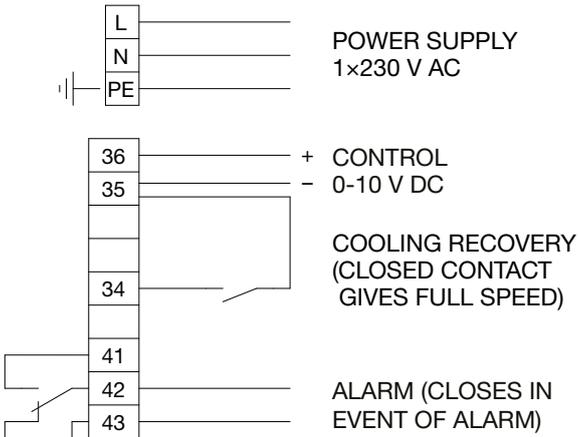
\*With integrated control equipment (code ELEE-xxx-HS)

### Rotary heat exchanger (code EXR)

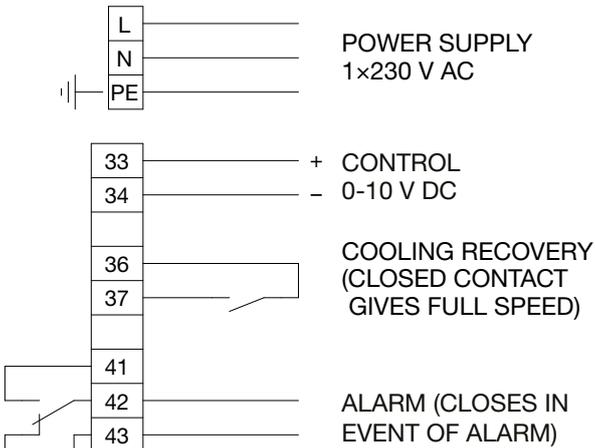
#### Size 060-150 Emotron EMX-P10



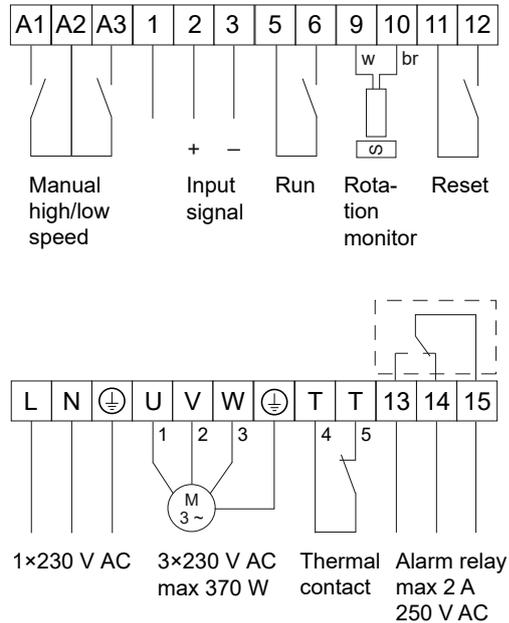
#### Size 190-400 Emotron EMX-B



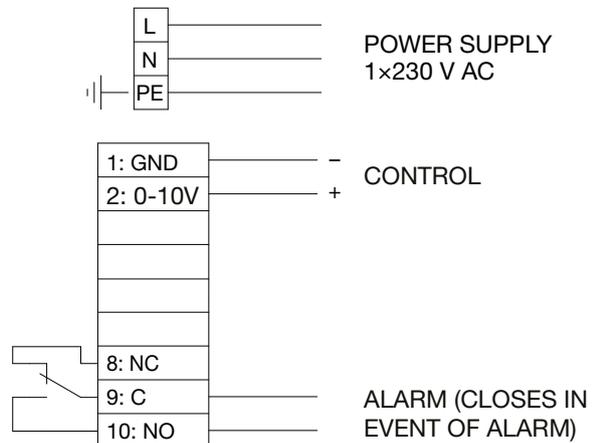
#### Size 480-600 Emotron EMX-R



#### Size 980 IBC control



#### Size 060-980 OJ Electronics



## 5 Operation

### 5.1 Hygiene inspection

Envistar Flex conforms to guidelines in VDI 6022 Part 1: Hygiene and Hygiene Inspections of HVAC Systems.

For this to apply, a hygiene inspection of the system must be carried out and the system must be cleaned thoroughly as needed before start-up.

For units (code MK, US,UC):

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**NB!**

**Pressure surges on filters and air ducts must be prevented through the design of the duct system and the settings/configuration of the control system (e.g. gradual start of fans, open damper when the fans are in operation).**

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### 5.2 Actions in case of standstill

According to guidelines for hygienic design VDI 6022 Part 1:

In case of prolonged standstill in air treatment systems (more than 48 hours), it should be ensured that no moist areas can be found downstream of the cooling coils or humidifier.

In order to avoid the accumulation of moisture – turn off the cooling coils and humidifier in good time and ventilate the air ducts dry (gradual shut-down). Also, be sure to set up or program the required functions in the building's automation/control system for automatic dry blowing of air coolers and downstream sections.

## 5.3 Commissioning

Commissioning of the unit must be carried out by competent personnel in accordance with the Commissioning Procedure:

- For Envistar Flex, refer to Commissioning Checklist for air handling units, which can be downloaded from [ivprodukt.docfactory.com](http://ivprodukt.docfactory.com).
- For commissioning of the EcoCooler cooling unit (code ECO, ECX), refer to separate Operation and Maintenance Instructions, as well as EcoCooler, Commissioning Record, which can be downloaded from [docs.ivprodukt.com](http://docs.ivprodukt.com).
- For commissioning of the ThermoCooler HP cooling unit (code TCH), refer to separate Operation and Maintenance Instructions, as well as ThermoCooler HP, Commissioning Record, which can be downloaded from [docs.ivprodukt.com](http://docs.ivprodukt.com).

The commissioning procedure applies to units that are supplied with control equipment (code MX).

The validity of the product warranty is conditional on the system having been commissioned correctly. Working on the cooling unit/reversible heat pump during the warranty period without the approval of IV Produkt shall render the warranty void.

Prior to commissioning, the contractor must:

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**NB:**

**Wiring of connections and other electrical work may only be carried out by a qualified electrician or by service personnel recommended by IV Produkt.**

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1. Connect the unit to the power supply via a lockable safety switch.
2. Connect the heating/cooling coil.
3. Connect all ducts.



**WARNING!**

**Rotating fan impeller. The unit must not be energised until all ducts have been connected.**

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## 6 Maintenance instructions

### 6.1 Service schedule

The service schedule comprises actions and service intervals for functional sections that can be part of the air handling unit. The unit consists of one or more of these functional sections. The relevant parts are shown in the order document Technical Data.

Make copies of the service schedule for future use before you fill in servicing data for the first time.

For hygiene inspections according to guideline VDI 6022, see separate VDI 6022 Checklist for Operation and Maintenance, Hygiene checks at [ivprodukt.docfactory.com](http://ivprodukt.docfactory.com).

Service year 20..... - ..... or unit no. ....					Service performed * (date and signature)			
Functional section	Code	Recommended action (insp.)	Page ref.	12 mths	24 mths	36 mths	48 mths	
 <b>Filter supply air, extract air</b>	ELEF	Check pressure drop Change filter if necessary	19	signature	signature	signature	signature	
 <b>Rotary heat exchanger</b>	EXR	Visual inspection Check press. balance Check diff. pressure Control rotor speed Clean if necessary	23	signature	signature	signature	signature	
 <b>Counter-flow/plate heat exchanger</b>	EXM/EXP	Visual inspection Clean if necessary Check function	27	signature	signature	signature	signature	
 <b>Run-around coil unit</b>	EXL	Visual inspection Check drainage Clean if necessary Check function	30	signature	signature	signature	signature	
 <b>Air heater water</b>	EMT-VV, MIE-CL/ELEV, ESET-TV, MIE-CL/ELTV	Visual inspection Clean if necessary Check function	32	signature	signature	signature	signature	
 <b>Air heater electric</b>	ESET-EV, MIE-CL/ELEE	Visual inspection Clean if necessary Check function	34	signature	signature	signature	signature	
 <b>Air cooler water/DX</b>	ESET-VK, MIE-CL/ELBC, MIE-CL/ELBD	Visual inspection Check drainage Clean if necessary Check function	35	signature	signature	signature	signature	
 <b>Fan unit</b>	ENF	Visual inspection Clean if necessary Check the air flow	36	signature	signature	signature	signature	
 <b>Damper</b>	EMT-01, ESET-TR	Visual inspection Clean if necessary Check tightness	39	signature	signature	signature	signature	
 <b>Outdoor intake section with damper</b>	MIE-IU	Visual inspection Clean if necessary Check tightness	40	signature	signature	signature	signature	

\*More frequent servicing may be required in certain environments. Replace the filter if the pressure drop across the filter exceeds the specified final pressure drop.

## Continuation Service schedule

Service year 20..... - ..... or unit no. ....				Service performed * (date and signature)			
Functional section	Code	Recommended action (insp.)	Page ref.	12 mths	24 mths	36 mths	48 mths
 Outdoor exhaust air section with damper	EAU	Visual inspection Clean if necessary Check tightness	41	signature	signature	signature	signature
 Recirculating unit section with damper	EBE	Visual inspection Clean if necessary Check tightness	42	signature	signature	signature	signature
 Sound attenuator	EMT-02, MIE-KL	Visual inspection Clean if necessary	43	signature	signature	signature	signature
 Cooling/heating pump	TCH	Refer to separate Operation and Maintenance Instructions	–	signature	signature	signature	signature
 Cooling unit, EcoCooler	ECO, ECX	Refer to separate Operation and Maintenance Instructions	–	signature	signature	signature	signature

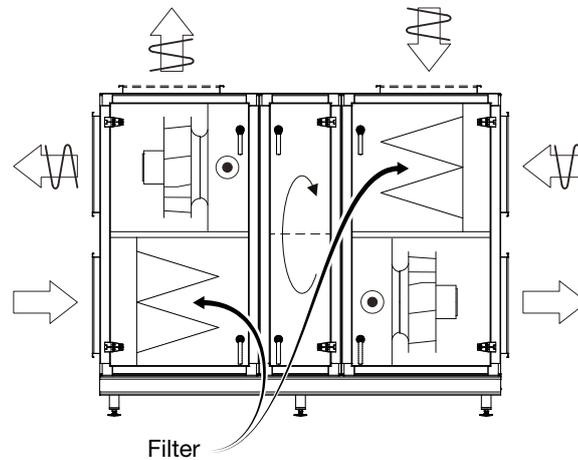
\*More frequent servicing may be required in certain environments.

## Home Concept model

Service year 20..... - ..... for unit no. ....				Service performed * (date and signature)			
Functional section	Code	Recommended action (insp.)	Page ref.	12 mths	24 mths	36 mths	48 mths
				date	date	date	date
 Carbon filter in filter cabinet	ELCF	Inspection indication Replace if necessary	20	signature	signature	signature	signature
 Filter bypass	ENFT-10	Visual inspection Clean if necessary Check tightness	44	signature	signature	signature	signature

\*More frequent servicing may be required in certain environments.

## 6.2 Filter (code ELEF)



The air filters in an air handling unit are designed to prevent dust and other impurities from entering the building. They should also protect sensitive components inside the unit, e.g. water coils and heat exchangers, from exposure to impurities.

The dust separation efficiency varies considerably between various filter types. The dust collecting efficiency also varies substantially. It is therefore important to use filters of the same quality and capacity when you change them.

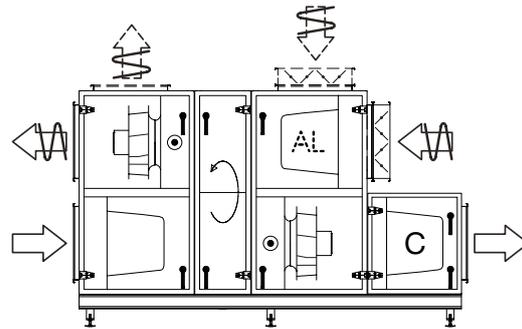
*According to guidelines for hygienic design VDI 6022 Part 1: The supply air filter must be class ePM1-50% (F7) or have a higher filtration efficiency.*

The filters are designed for one-time use. If they become fouled, the unit will lose capacity. The filters should therefore be changed if the pressure drop across them exceeds the specified final pressure drop. It is important to stop the unit before changing filters to prevent dust from coming loose and being drawn into the unit. The inside surfaces of the filter sections should therefore also be cleaned when the filters are changed.

## Filter for the Home Concept (code ECF) version

The filter cabinet is an optional extra for the Home Concept version and can be used for

- aluminium filter on the extract air side
- carbon filter on the supply air side



AL - aluminium filter, C - carbon filter, Black Ridge

The aluminium filter is intended for use where the extract air contains grease particles to avoid grease being sucked into the unit. The filter is a knitted flat-type filter. The aluminium filter can be cleaned using hot water and a mild detergent.

The carbon filter (code ELCF) can be used in rotary units (rotary heat exchanger) to remove odours in the form of organic and odorous gases/vapours. The carbon filters are fitted to the supply air side.

The carbon filters are Black Ridge filters, constructed as compact and highly efficient, molecular filters. The filters are designed for one-time use and the filter is combustible in its entirety.

### Lifespan and filter control Carbon filter

The function and lifespan of the carbon filters depends on the volume of air that passes through and on the molecular density of odorous substances. This means that the time intervals for filter replacement can vary from unit to unit depending on operation mode and the volume of odorous substances in the air.

Units delivered with control equipment (code MX) are equipped with the filter control function – FLC (Filter Lifetime Control). FLC indicates when it is time to replace the carbon filter. Indication is through an alarm on the hand-held terminal display.

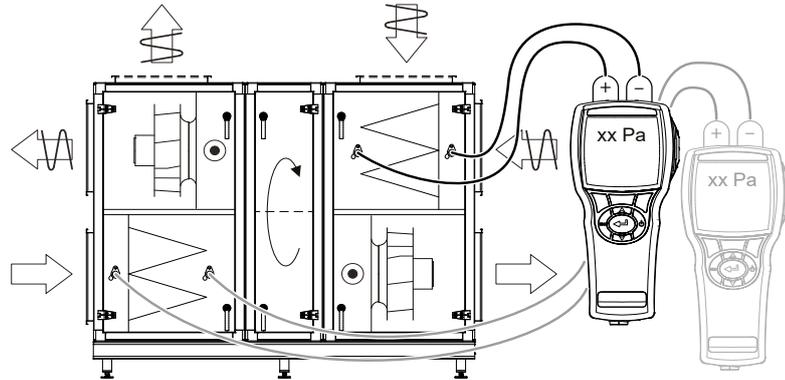
FLC calculates the volume of air passing through the carbon filters and triggers the alarm for filter replacement when the preset value has been reached. The volume of air passing through is measured in mega cubic metres (Mm<sup>3</sup>). The function does not take into account the odour content of the air, which means that the indication should be regarded as a recommendation for checking the filter function. If no odours pass through, there is no need to replace the filter.

Preset FLC values, as per the table below, are based on max. air flow over 12 months of full-time operation. If required, the value can be lowered in order to: - change to more frequent filter replacement intervals for max. air flow - retain the filter replacement interval of 12 months for lower air flows.

To change the value, see separate Climatix control documentation.

## Inspection

Check the pressure drops across the filters (not carbon filter Black Ridge in Home Conceptversion). Pressure drop is measured with a manometer connected to measurement outlets. The measurement outlets are connected to each side of the filter.



If the filter has reached its specified final pressure drop, it should be changed. The final pressure drop is specified on the filter section decal (filled in when the air handling unit is put into operation). Also carry out a visual inspection of the filter for damage and deposits.

### FILTERDATA

Nominellt luftflöde  m<sup>3</sup>/s  
 Nominal air flow.....  m<sup>3</sup>/h  
 Antal filter                    Mått  
 Number of filters.....Dimensions.....  
 .....  
 .....  
 Filterklass/Filter Class.....  
 Begynnelsestryckfall  
 Initial Pressure Drop.....Pa  
 Sluttryckfall  
 Final Pressure Drop.....Pa

Art. Nr: 19121-1101\_02SV

## Filter data

For filter data, refer to [Filter Overview](#) under Documentation at [ivprodukt.docfactory.com](http://ivprodukt.docfactory.com). Actual filters are shown in the unit specification in this document and under Order Unique Documentation at [docs.ivprodukt.com](http://docs.ivprodukt.com) (Technical Data and Spare Parts List).

## Filter replacement

1. Shut down the unit via the service switch in the control equipment, safety switch in the 0 position.

---

**NB:**

**The safety switch is not designed for starting/stopping the unit. Always use the service switch in the control equipment to start and shut down the unit.**

---

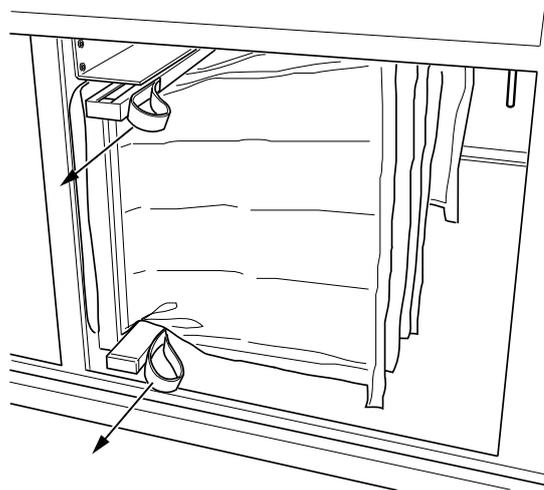
2. Wait until the fans have stopped, then open the inspection door.

**WARNING!**

**Positive pressure inside the unit, risk of personal injury. Allow the pressure to drop before you open the inspection doors.**

---

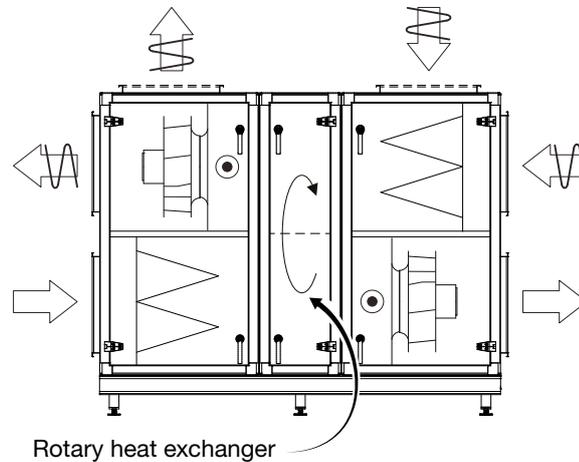
3. Release the eccentric rails.



*Example eccentric rails*

4. Remove the old filter by pulling it towards you. Discarded filters should be disposed of correctly. The carbon filters are combustible in their entirety.
5. Clean the filter cabinets.
6. Install the new filter, press in the eccentric rails to engage them and close the inspection door.
7. Reset the FLC filter control function via the Climatix display, refer to separate Climatix control documentation. (Only applicable to the Home Concept version of the unit with carbon filter and control equipment (MX).)
8. Start the unit.

### 6.3 Rotary heat exchanger (code EXR)



The purpose of the recovery unit is to recover heat from the extract air and transfer this heat to the supply air in order to minimise energy use.

Faults in recovery unit functionality result in reduced heat recovery efficiency and increased energy use and means that the design supply air temperature cannot be obtained when the outdoor temperature is low.

A conceivable reason for reduced recovery efficiency may be that the rotor rotates too slowly because the drive belt is slipping. The rotor speed should not be lower than 8 rpm during full energy recovery.

It is not usual for the rotor passages to become fouled with dust, since the rotor is normally self-cleaning. However, this might occur if the dust is of a sticky nature.

A reduction of the extract air flow, e.g. due to fouling of the extract air filter, entails reduced heat recovery efficiency.

Units in the Home Concept design are equipped with a function to control the pressure balance of the rotor to ensure the correct leakage function and purging function. For units supplied with control equipment, the function is connected and activated at the factory. For units without control equipment, this function must be connected to the unit.

### Inspection

1. Shut down the unit via the service switch in the control equipment, safety switch in the 0 position.

---

**NB:**

**The safety switch is not designed for starting/stopping the unit. Always use the service switch in the control equipment to start and shut down the unit.**

---

2. Wait until the fans have stopped, then open the inspection door.



**WARNING!**

**Positive pressure inside the unit, risk of personal injury. Allow the pressure to drop before you open the inspection doors.**

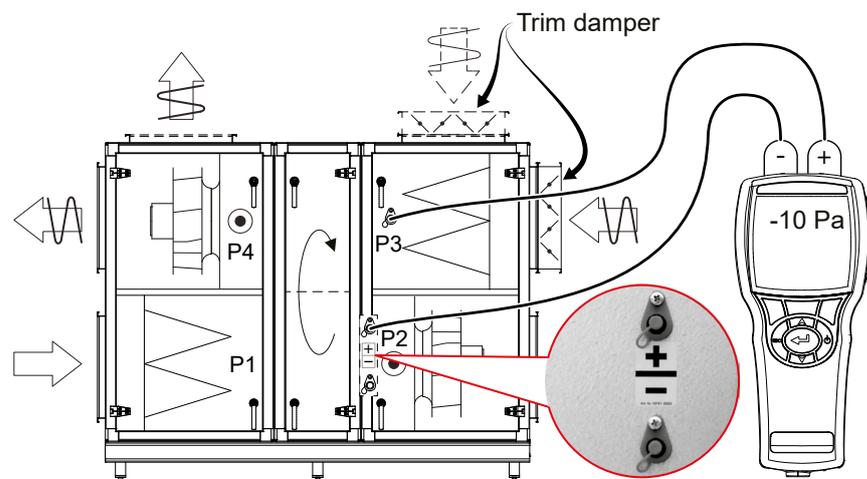
3. Check that the rotor rotates easily. If it is sluggish, you might have to adjust the bristled sealing strip.
4. Check that the rotor's bristled sealing strip seals against the side plates and that it is not worn. The bristled sealing strip is subject to wear and can be adjusted or replaced if the need arises.
5. Check that the drive belt is properly tensioned and does not slip. If it slips, it will have to be shortened. The rotor speed should not be lower than 8 rpm during full energy recovery.
6. Check that the drive belt is intact and clean.
7. Check that the rotor's inlet surfaces are not covered with dust or other impurities. NB: Avoid touching the rotor inlet and outlet surfaces with your hands or tools.
8. Check the pressure balance:

For design Home Concept, the trim damper ETET/TR regulates the pressure balance automatically against the set value in the controller unit. Check that the measured pressure balance between measurement tappings P2 and P3 corresponds to the set pressure balance setpoint in the controller unit (-10 Pa).

Example:

Measurement outlets for P2: Downstream supply air fan (SF) generates negative pressure in relation to the atmospheric pressure (atm), e.g. -100 Pa

Measurement outlets for P3: Downstream extract air fan (EF) and trim damper generate greater negative pressure than at P2, e.g. -110 Pa.

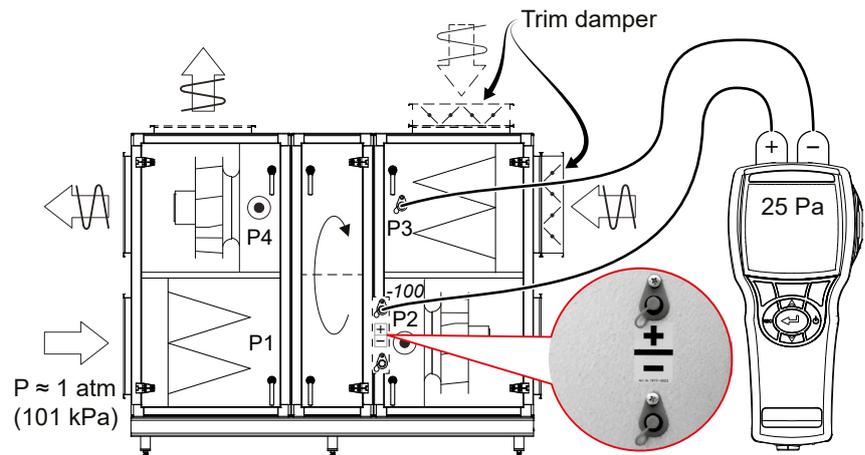


For the standard version: To ensure correct function of the purging sector, the negative pressure at P3 should be greater than the negative pressure at P2 (min. diff. 25 Pa). Otherwise an ETET-TR trim damper can be used on the extract air side in order to throttle in the correct pressure balance.

Example:

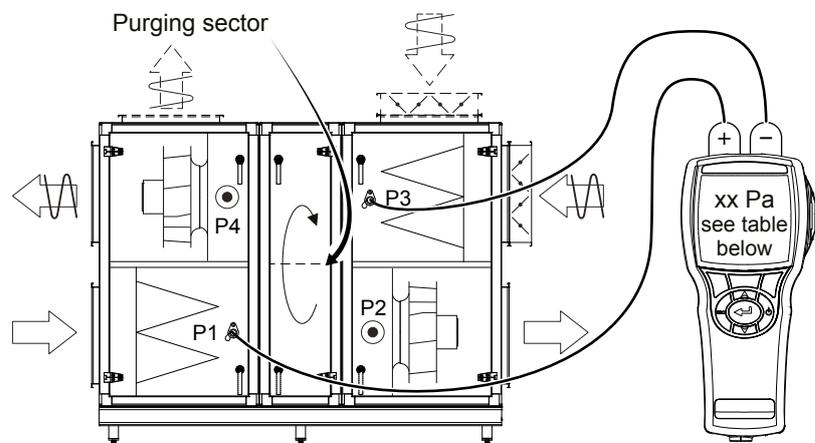
Measurement outlets for P2: Downstream supply air fan (SF) generates negative pressure in relation to the atmospheric pressure (atm), e.g. -100 Pa

Measurement outlets for P3: Downstream extract air fan (EF) and any trim damper generate greater negative pressure than at P2, e.g. -125 Pa.



9. Check the differential pressure across the rotor. The purging sector is factory-installed, set to the maximum open position. Depending on the unit's pressure difference across the rotor, the purging sector may need adjustment. An incorrect setting may impair the efficiency. Inspection and adjustment should be carried out as follows:

- Measure and write down the differential pressure between the outdoor air (P1) and the extract air (P3).

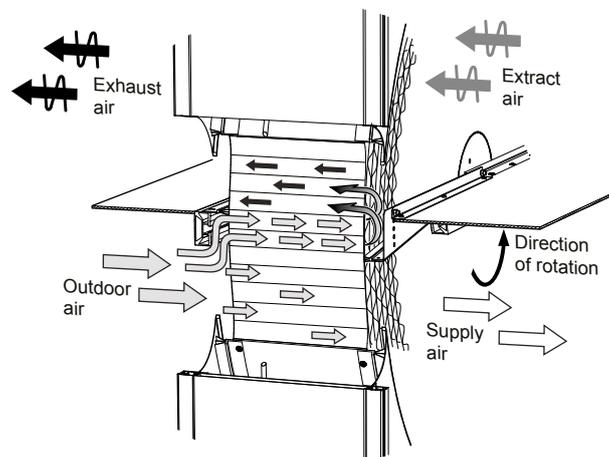


- Read the recommended setting (adjustment hole in the purging sector) from the table below.

	Rotor variant	Adjustment hole in the purging sector				
		5 open*	4	3	2	1 closed
Diff. pressure between P1 and P3 (Pa)	NO, NE, HY, HE, EX	< 200	200 – 400	400–600	> 600	–
	NP, NX, HP	< 300	300–500	500–700	> 700	–

\*maximum open purge sector, preset position from the factory

- Adjust the purging sector if the need arises. The illustration shows the purging sector set to the maximum open position.



Schematic diagram - sizes and model may vary.

## Cleaning

- Remove dust by carefully vacuum cleaning using a soft brush.
- If the rotor surfaces are severely fouled by greasy dust, spray the rotor with water mixed with a dishwashing detergent that will not corrode aluminium. Alternatively, use detergent designed for heat exchangers, e.g. Re-Coilex (see below).
- Compressed air at low pressure (max. 6 bar) can be used for blowing the surfaces clean. To avoid damage, the nozzle should not be held any closer to the rotor than 5–10 mm.

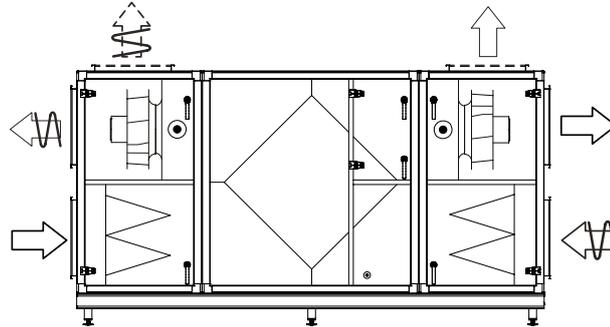
A hygroscopic rotor variant can absorb particles which in some cases give off odours. To prevent odours arising, exercise run the hygroscopic rotor using the integrated control function. If an odour persists, we recommend cleaning the rotor with a mild, alkaline detergent.

For cleaning it is recommended that the purge sector is fully open and the rotational speed is 8 rpm as this assists with the suction of the detergent. Post-rinsing is not normally required.

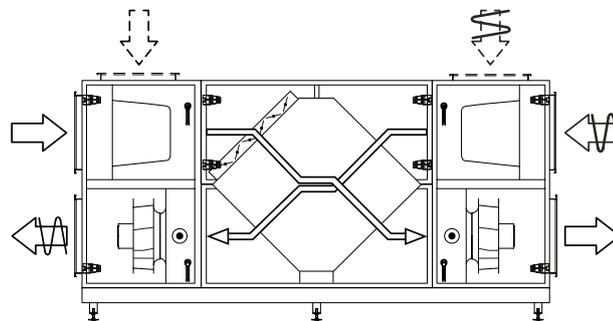
## Lubrication

The bearings and drive motor are permanently lubricated and do not require additional lubrication.

## 6.4 Plate heat exchanger (code EXP)



*Crossflow plate heat exchanger, EXP*



*Counterflow flow plate heat exchanger, EXM*

The purpose of the plate heat exchanger is to recover heat from the extract air and transfer this heat to the supply air in order to minimise energy use.

Faults in plate heat exchanger functionality result in reduced heat recovery efficiency and increased energy use and means that the design supply air temperature cannot be obtained when the outdoor temperature is low.

Possible reasons for reduced recovery efficiency could be the fouling of the heat-exchanging surfaces (fins) or that the bypass damper is not closing completely.

A reduction of the extract air flow, e.g. due to fouling of the extract air filter, entails reduced heat recovery efficiency.

If operation problems arise due to ice build-up on the extract air side, the function of the frost protection equipment should be checked.

## Inspection

1. Shut down the unit via the service switch in the control equipment, safety switch in the 0 position.

---

**NB:**

**The safety switch is not designed for starting/stopping the unit. Always use the service switch in the control equipment to start and shut down the unit.**

---

2. Wait until the fans have stopped, then open the inspection door.

**WARNING!**

**Positive pressure inside the unit, risk of personal injury. Allow the pressure to drop before you open the inspection doors.**

---

3. Inspect the fins for fouling.
4. Perform a visual inspection of the dampers and damper motors on frost protection equipment.
5. Check that the bypass damper is tightly shut when defrosting is not taking place.
6. Check the waste outlet and water trap function. A water trap without a non-return valve should be filled with water.

## Cleaning

The plate heat exchanger is designed to prevent dirt and deposits from coming into contact with the heat transfer surfaces. Most of the particles in the air simply pass through the plate heat exchanger. The main risk for fouling of the counter-flow exchanger comes from slow-moving substances that condense on the surfaces, and also from fibres from tumble dryers, for instance.

The recommended way to clean the plate heat exchanger is by vacuuming, compressed air blowing, and flushing with hot water (if necessary, add some mild detergent that is not corrosive to aluminium). Also clean the drip tray, bottom plate, drain and water trap.

---

**NB:**

**High pressure flushing must not be directed at the fins. Be careful in order to ensure that the fins do not become deformed or break.**

---

At operating temperatures below 0 °C, the plate heat exchanger must be dry before commissioning.

### **Functional description, defrost and bypass function (ODS) (EXMM-XP/NP)**

Under certain operating conditions, frost and ice may build-up on the extract air side of the plate heat exchanger. In order to optimise heat recovery, there is a built-in defrost function. This is based on the principle that the defrost function is engaged when the pressure drop over the extract air side of the counter-flow exchange exceeds a certain value.

Defrosting takes place through the regulation of dampers on the outdoor air side of the counter-flow exchanger. The dampers have separate damper motors that are controlled by a defrost program. Damper control means that there are a number of different combinations of damper positions, for instance that one of the dampers can be partly open while another is closed and the third damper is fully open.

During full heat recovery, the dampers must be fully open and the bypass damper must be closed.

When the unit is switched off, all dampers must be closed.

When there is a risk of frost, the dampers can be in different positions.

The defrost and bypass function is preset at the factory and any adjustments may only be performed by IV Produkt.

### **Functional description, frosting function (BYP) (EXMM-NP, EXPP-NO/NP/XP)**

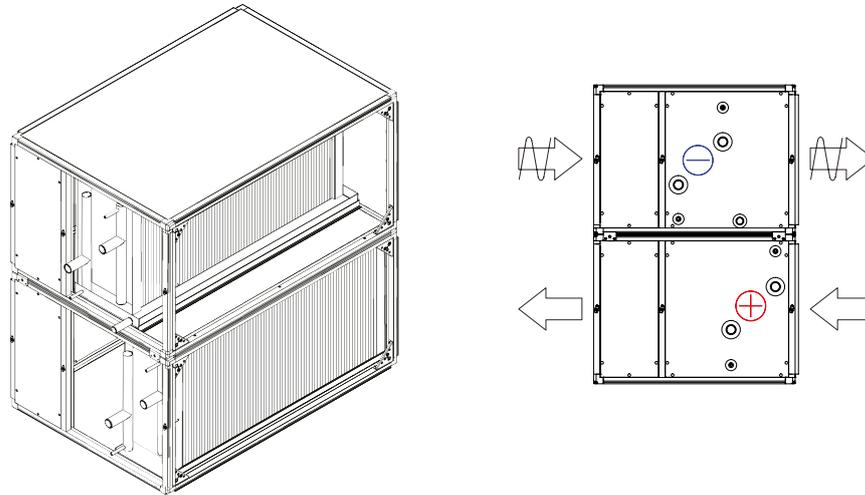
Under certain operating conditions, frost and ice may build-up on the extract air side of the plate heat exchanger. In order to optimise heat recovery, and avoid freezing, there is a built-in frosting function. The principle is based on the frosting function starting when the temperature of the exhaust air side's coldest surface falls below a certain value.

The freezing process is prevented by reducing heat recovery gradually through regulating dampers on the heat exchanger's exhaust air side. The heat recovery damper closes and the bypass damper opens. In this way, the exhaust air temperature is increased and freezing is avoided.

During full heat recovery and when the unit is switched off, the dampers should be fully open (bypass damper closed).

The frosting and bypass functions are preset at the factory and any adjustments may only be performed by IV Produkt.

## 6.5 Run-around coil unit (code EXL)



The run-around coil unit is used to recover heat from the extract air and transfer this heat to the supply air for reduced energy use. The run-around coil unit consists of the extract air coil with drip tray and the supply air coil (heating coil) mounted in the casing.

Moisture precipitation in the extract air's heat recovery coil entails a risk of freezing and possibly frost/ice forming. This freezing is counteracted by installing and connecting a freezing sensor that controls the valve actuator (liquid flow) in the extract air coil.

The coils will have impaired capacity if dust forms a coating on the coil surfaces. Not only does this impair the heat transfer capacity of the coil, it also increases the pressure drop on the air side. Even if the ventilation system is fitted with high quality filters, as time passes dust deposits will form on the front edges of the coil fins (at the inlet side). To utilise its full capacity, the coils must be well vented. The pipework should be vented by opening the bleeder screws in pipe connections and/or an air vessel.

### Inspection

Check:

1. The coil fins to detect possible mechanical deformity
2. That the coils are not leaking
3. The drip tray and drain with water trap (clean if necessary)
4. That the water trap (without non-return valve) is filled with water.

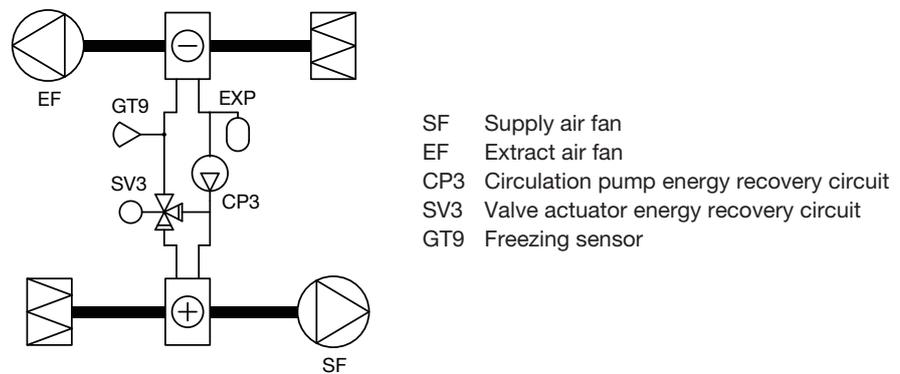
## Cleaning

If the fins on the coils are dirty, vacuum them from the inlet side. Alternatively, you can blow them clean with compressed air from the outlet side. If they are particularly dirty, clean them with hot water mixed with dishwashing detergent (that will not corrode aluminium).

## Bleeding

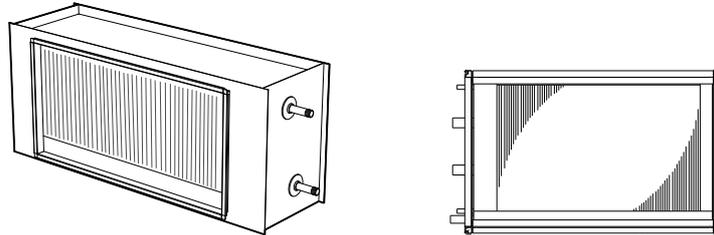
Bleed the heating coil and the pipework if needed. Bleeder screws are on top of the coils or on the pipe connections.

## Function



Check that the circulation pump is running in the correct direction and that the valve changes to opening/closing when the setpoints/conditions are changed.

## 6.6 Air heater water (code EMT-VV, MIE-CL/ELEV)



*Air heater water (code EMT-EV) and Air heater water (code MIE-CL/ELEV)*

The heating coil consists of a number of copper tubes with aluminium fins pressed on them. The coil will have impaired capacity if dust forms a coating on the coil surfaces. Not only does this impair the heat transfer capacity of the coil, it also increases the pressure drop on the air side.

Even if the ventilation system is fitted with high quality filters, as time passes dust deposits will form on the front edges of the coil fins (at the inlet side). To utilise its full capacity, the coil must be well vented. The pipework should be vented by opening the bleeder screws in pipe connections and/or an air vessel.

### Inspection

Check:

1. The coil fins to detect possible mechanical deformity
2. That the water coil is not leaking.

### Cleaning

If the fins on the coils are dirty, vacuum them from the inlet side. Alternatively, you can blow them clean with compressed air from the outlet side. If they are particularly dirty, clean them with hot water mixed with dishwashing detergent (that will not corrode aluminium).

### Bleeding

Bleed the heating coil and the pipework if needed. Bleeder screws are on top of the coil or on the tube connections.

### Function

Check that the coil is radiating heat. This can be done by temporarily increasing the temperature setting (setpoint).

### **Additional maintenance for ThermoGuard (code ESET-TV, MIE-CL/ELTV)**

1. The ThermoGuard coil must be fitted with a safety valve, the function of which should be checked regularly (at least once a year). If you see that the valve is leaking, this is normally due to impurities from the pipe system that have accumulated on the valve seat.  
In normal cases, it is sufficient to carefully turn the valve knob and in this way “flush” the valve seat clean. If the safety valve continues to leak, you will have to replace it with a new one of the same type and with the same opening pressure.
2. Any shut-off valves on the supply or return lines may not be closed if freezing temperatures are likely.
3. If a ThermoGuard coil has frozen, let it thaw completely before restarting operation. If the heat recovery unit is installed upstream of the coil, it is often sufficient to run heat recovery to thaw the coil. If this does not work, some other external heating source will have to be used for thawing the water coil.

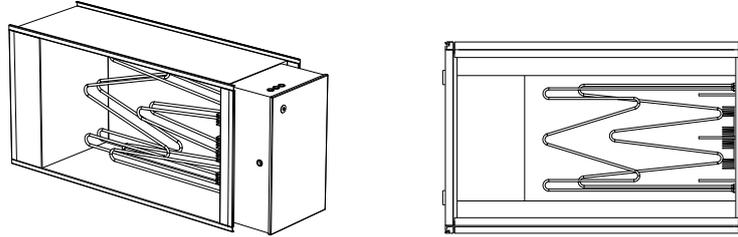
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**NB!**

**To ensure correct ThermoGuard coil function, the entire coil must be allowed to thaw before returning it to full operation. Make sure that water is circulating in the entire coil when you start it up.**

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## 6.7 Air heater electric (code ESET-EV, MIE-EL/ELEE)



*Air heater electric (code ESET-EV) and air heater electric (code MIE-EL/ELEE)*

The heating coil consists of “unsheathed” electric heating rods. A substantial accumulation of dust or other impurities on the heating rods will cause them to overheat. This could shorten their service life. This might also entail an odour of burnt dust and, in the worse case, the risk of fire. Overheated electric heating rods may become deformed or loosen from their suspension fasteners and heat the air unevenly.

### Inspection

Check that the electric heating rods are correctly positioned and that they are not deformed in any way.

### Cleaning

Vacuum or wipe surfaces with a moist cloth to remove any dust or impurities.

### Function

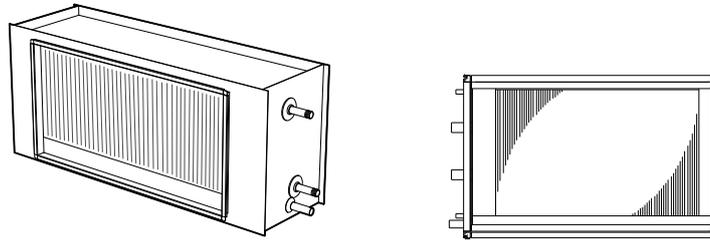
1. Simulate reduced required output by temporarily lowering the temperature setting (setpoint), so that all the electric output steps (contactors) switch out.
2. Then sharply increase the setpoint setting and check that the electric output steps switch in.
3. Restore the temperature setting.
4. Stop the air handling unit (NB: Do not break the circuit with the safety switch). All the electric output steps should switch out (i.e. the contactors in the OFF position). Stopping the unit may be delayed approx. 2–5 minutes to allow the fans to cool the heat energy stored in the air heater.

The electric heater is equipped with dual temperature limiters. The one that re-sets itself automatically should be set to 70°C.

The overheat protection with manual reset interrupts operation when the heater reaches approx. 120°C and is located on the cover panel on the side of the heater. **Determine the cause of overheating and take corrective action before you reset the protection device.**

Please note that the risk of overheating increases as the air flow through the unit decreases. The air speed should not be lower than 1.5 m/s.

## 6.8 Air cooler water (code ESET-VK, ESET-DX, MIE-CL/ELBC, MIE-CL/ELBD)



*Air cooler (code ESET-VK, ESET-DX) and air cooler (code MIE-CL/ELBC, MIE-CL/ELBD)*

The cooling coil consists of a number of copper tubes with aluminium fins pressed onto them. The coil will have impaired capacity if dust forms a coating on the coil surfaces.

Not only does this impair the heat transfer capacity of the coil, it also increases the pressure drop on the air side.

Even if the ventilation system is fitted with high quality filters, as time passes dust deposits will form on the front edges of the coil fins (at the inlet side). A drip tray with drain is located under the cooling coil for collecting and removing evaporation water, and in some cases there is a droplet eliminator downstream of the cooling coil which prevents drops of water accompanying the air stream.

### Inspection

Check:

1. The coil fins to detect possible mechanical deformity
2. That the water coil is not leaking
3. That cooling energy is uniformly distributed across the coil surfaces (in operation)
4. The drip tray and drain with water trap (clean if necessary)
5. That the water trap without non-return valve is filled with water.

### Cleaning

If the fins on the coil are dirty, vacuum clean from the inlet side. Alternatively, you can blow them clean with compressed air from the outlet side. If they are severely fouled, you can clean them with warm water mixed with dishwashing detergent that will not corrode aluminium. For more information, refer to [Cooling coil, cleaning](#) under Documentation at [ivprodukt.docfactory.com](http://ivprodukt.docfactory.com).

### Bleeding (NB: ESET-VK and MIE-CL/ELBC only)

Bleed the water coil and the pipework if needed. Bleeder screws are on top of the coil or on the tube connections.

### Function

Check that the coil is emitting cooling energy. This can be done by temporarily lowering the temperature setting (setpoint). Note that cooling is blocked when the outdoor temperature drops below the set value for cooling start.

## 6.9 Fan unit (code ELFF)

The purpose of the fans is to transport air through the system, i.e. the fan must overcome the flow resistance in air terminals, air ducts and the unit.

The fan speed is regulated to provide correct air flow. If the fans generate a lower air flow, this will impair the function of the ventilation system.

- If the supply air flow is too low, the system will be out of balance, causing poor room climate.
- If the extract air flow is too low, the ventilation capacity will be unsatisfactory. Imbalance may also force moist air out into the building structure. One reason why the fans are generating too little air flow may be that impurities have collected on the fan impeller blades.
- If a centrifugal fan is rotating in the wrong direction, the air flow will still go the right way, but with a considerable reduction in capacity. Check the direction of rotation.



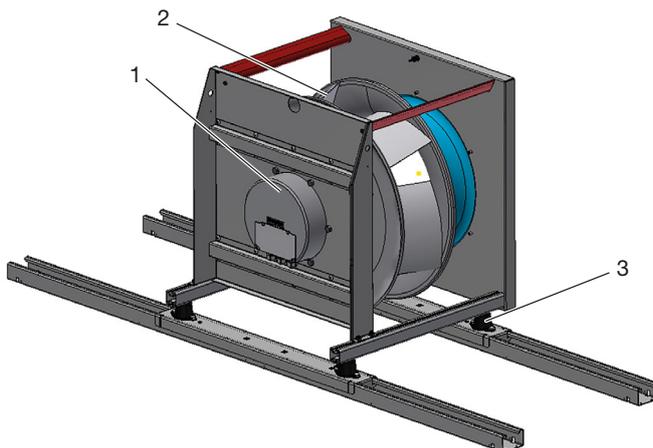
**WARNING!**

**High voltage and rotating fan impeller, risk of personal injury. Working on/servicing the unit – Shut down the unit via the service switch in the control equipment, then turn the safety switch to the 0 position and lock it.**



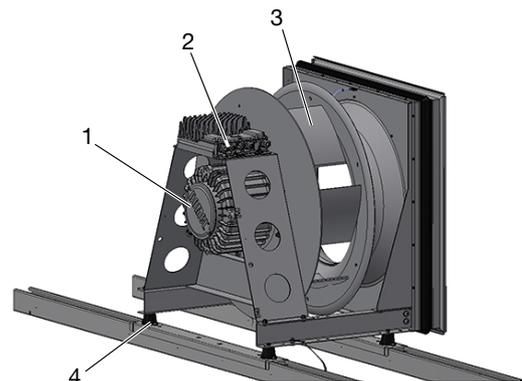
**WARNING!**

**Rotating fan impeller, risk of personal injury. Shut down the unit via the service switch in the control equipment, then turn the safety switch to the 0 position and lock it. Wait at least 3 minutes before opening inspection doors.**



*Fan unit, size 060–400*

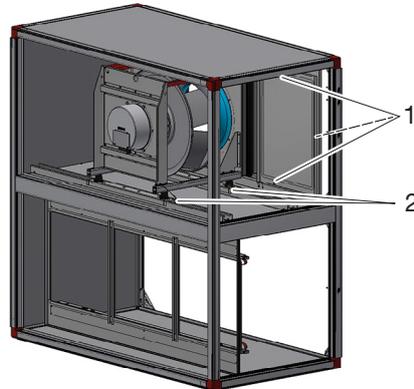
1. EC motor with control unit
2. Fan impeller
3. Vibration damper



*Fan unit size 480–1540*

1. Motor
2. Control unit
3. Fan impeller
4. Anti-vibration mounting

## Inspection



*Example of fan unit*

### 1. Prepare access:

#### Size 060–400:

The fans are mounted on rails. Remove one end of the fan assembly's earth braid. Loosen the screws (position 1) and the pins/screws (position 2) and pull out the fan units (fan and motor are mounted on rails).

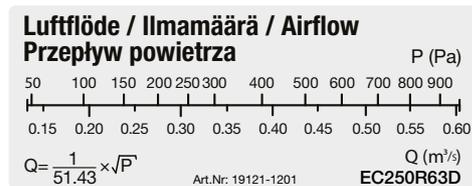
#### Size 480-1540:

The fans are permanently mounted to rails. Access normally occurs through the inspection door/doors. Fans mounted on rails can be pulled out if necessary. Remove one end of the fan assembly's earth braid. Loosen the screws (position 1) and the pins/screws (position 2) and pull out the fan units. NB: For dual fans, the screws securing the double plates must be loosened.

2. Check that the fan impeller rotates easily, is in balance and does not vibrate. Also check that the fan impeller is clean from any accumulation of particles. Imbalance may be due to a coating or damage to the fan impeller blades.
3. Listen to the sound from the motor bearings. If the bearings are in good condition, you will hear a slight purring sound. A scraping or pounding sound may mean that the bearings are damaged and service is then required.
4. Check that the fan impellers are firmly mounted and that they overlap the inlet cones.
5. The fan impeller and motor are mounted on a support fitted with rubber anti-vibration mountings. Check that the anti-vibration mountings are securely mounted and are intact.
6. Check the mounting screws as well as the suspension devices and support.
7. Check that the gaskets on the connection plates around the connection openings are intact and firmly fitted.

8. Check that the measurement tubes are securely fitted on each measurement outlet.
9. Remount the fan units.
10. Check the air flows by:
  - reading the flow display on the Climatix display unit for units with control equipment (code MX).
  - measuring  $\Delta p$  in the connections (measurement outlets) for flow measurement +/- for units without control equipment (code UC, MK, US).

Use the unit's air flow label and see which flow corresponds to the measured  $\Delta p$ .



Example of air flow label

## Cleaning

1. Follow items 1-7 under *Inspection*.
2. Wipe the fan impeller blades to remove any coatings. Use an environmentally friendly degreasing agent.
3. The external surfaces of the motor must be kept clean from dust, dirt and oil. Clean with a dry cloth. If they are severely fouled, use an environmentally friendly degreasing agent. The motor is likely to overheat inside if thick layers of dirt prevent air from entering the motor to cool the stator structure.
4. Vacuum clean the air handling unit so that particles will not be blown out into the duct system.
5. Clean the other parts in the same way as the fan impellers. Check that the inlet cones are securely mounted.
6. Remount the fan units.

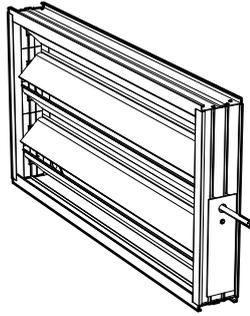
## Resetting the overheat protection (For ELFF with code -EC01-)

1. Cut the power supply to the fan motor.
2. Wait at least 20 seconds after the fan impeller has stopped rotating.
3. Close the power supply to the fan motor.

## 6.10 Dampers (code ESET-TR, EMT-01)

Dampers may have different functions and be positioned in different places.

- EMT-01 shut-off/ regulated damper
- ESET-TR trim damper with manual control



*Examples of dampers*

The purpose of the dampers is to regulate the air flow. Faulty function gives rise to disturbances that may result in serious problems.

- If the damper opens completely this reduces the air flow.
- If the damper seals properly (leaks) this will result in increased energy use.
- If the trim damper for the rotor purging function is not working or is not correctly adjusted, possible odours in the extract air are likely to be transferred via the rotor to the supply air.
- If the damper is placed on the outdoor air side and does not close completely when the unit stops, the heating coil is likely to freeze.

### Inspection

1. Check the function of the damper actuator.
2. Check the dampers for tightness when they are closed. If they are not sealed, adjust the damper actuator to make the dampers tight (does not apply to trim dampers).
3. Check the sealing strips.
4. If the damper is not working, check that there are no screws penetrating the drive mechanism/damper blades to interfere with damper function.

### Cleaning

Clean the damper blades with a cloth. If they are severely fouled, an environmentally friendly degreasing agent can be used.

## 6.11 Outdoor intake section with shut-off damper (code MIE-IU)



Outdoor intake section with shut-off damper is equipped with intake louvre and drainage.

### Inspection

1. Check the function of the damper actuator.
2. Check the dampers for tightness when they are closed. If they are not sealed, adjust the damper actuator to make the damper tight.
3. Check the sealing strips.
4. If the damper is not working, check that there are no screws penetrating the drive mechanism/damper blades to interfere with damper function.
5. Check the function of the drainage.

### Cleaning

Clean the damper blades with a cloth. If they are severely fouled, an environmentally friendly degreasing agent can be used.

## 6.12 Outdoor exhaust air section with shut-off damper (code EAU)



Outdoor exhaust air section is used to reduce the risk of short-circuiting between outdoor air and exhaust air.

### Inspection

1. Check the function of the damper actuator.
2. Check the dampers for tightness when they are closed. If they are not sealed, adjust the damper actuator to make the damper tight.
3. Check the sealing strips.
4. If the damper is not working, check that there are no screws penetrating the drive mechanism/damper blades to interfere with damper function.

### Cleaning

Clean the damper blades with a cloth. If they are severely fouled, an environmentally friendly degreasing agent can be used.

## 6.13 Recirculating unit with shut-off/regulated damper (code EBE)



The recirculating unit with shut-off/regulated damper is used to recirculate air in conjunction with heating premises at night.

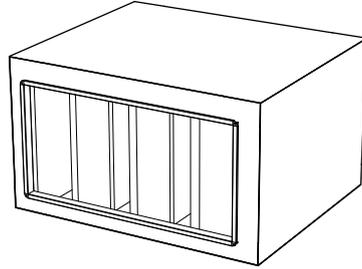
### Inspection

1. Check the function of the damper actuator.
2. Check the dampers for tightness when they are closed. If they are not sealed, adjust the damper actuator to make the damper tight.
3. Check the sealing strips.
4. If the damper is not working, check that there are no screws penetrating the drive mechanism/damper blades to interfere with damper function.

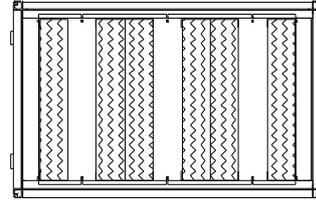
### Cleaning

Clean the damper blades with a cloth. If they are severely fouled, an environmentally friendly degreasing agent can be used.

## 6.14 Sound attenuators (code EMT-02, MIE-KL)



*Sound attenuator (code EMT-02)*



*Sound attenuator (code MIE-KL)*

The function of the sound attenuator is to reduce the sound level in the system.

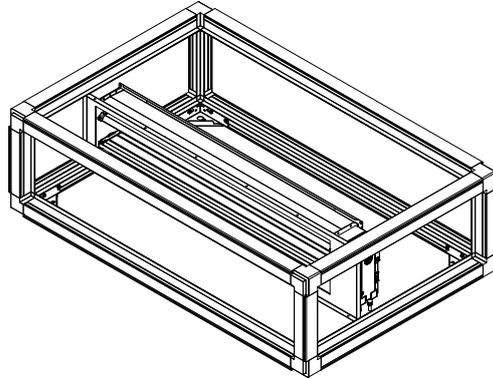
### Inspection

Check that the baffle elements are intact and have clean surfaces. Take action if necessary.

### Cleaning

Vacuum and/or wipe all surfaces with a damp cloth. If more intense cleaning is needed, do so with rotating nylon brushes.

## 6.15 Filter bypass (code ENFT-10)



*Filter bypass (code ENF)*

The purpose of the filter bypass is to reroute the air flow in the event of a fire. Faulty function gives rise to disturbances that may result in serious problems.

### Inspection

1. Check the function of the damper actuator.
2. Check that damper tightens when closed. If they are not sealed, adjust the damper actuator to make the damper tight.
3. Check the sealing strips.
4. If the damper is not working, check that there are no screws penetrating the drive mechanism/damper blades to interfere with damper function.

### Cleaning

Vacuum and/or wipe all surfaces with a damp cloth. If more intense cleaning is needed, do so with rotating nylon brushes.



*Air handling with focus on LCC*

## **You are welcome to contact us**

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