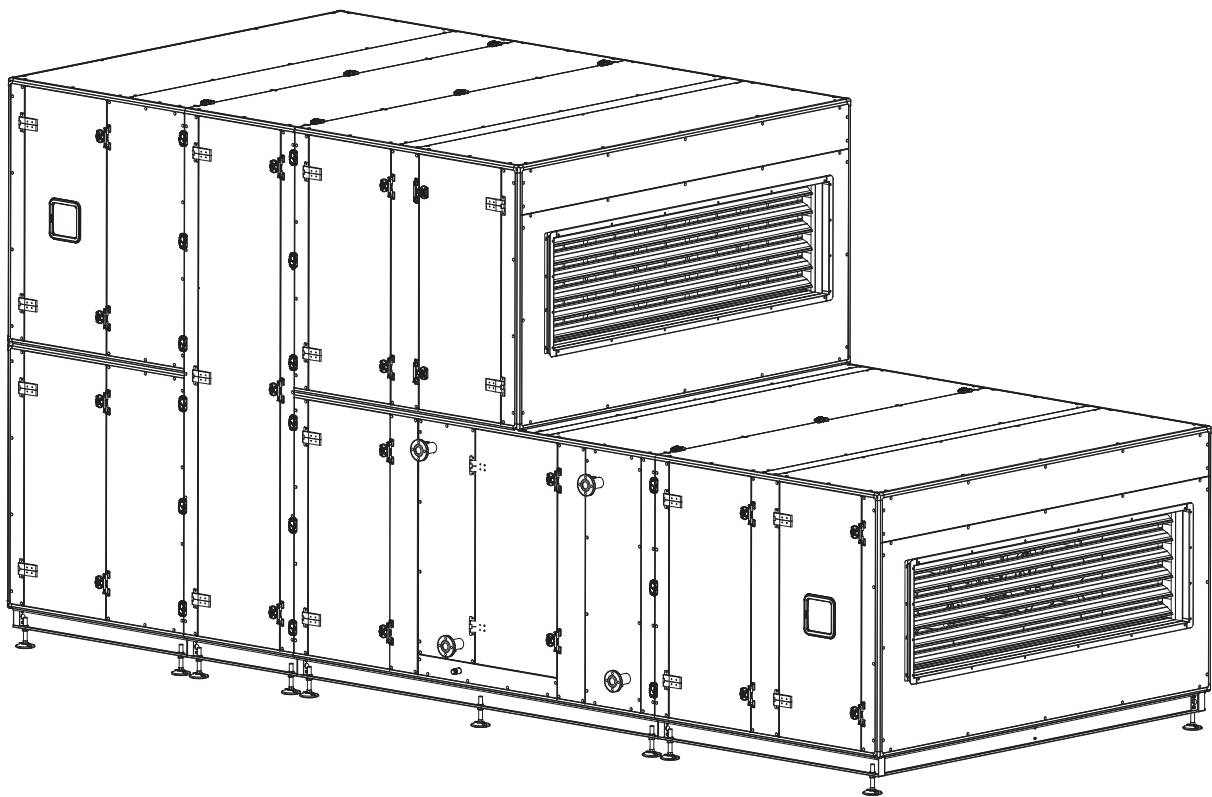


EVO-MODULAR

AIR HANDLING UNITS



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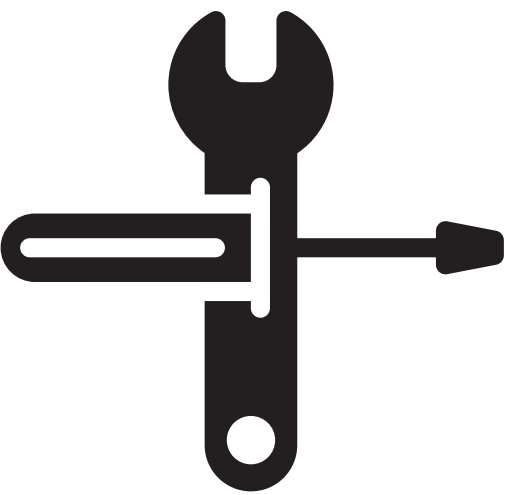
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General Information

Foreword

General

EVO-M air handling units (AHUs) have been designed and manufactured in accordance with the CE machine directive. In order to guarantee safe operation and use of the unit, please carefully read and observe the instructions in this document and pay special attention to the warnings that apply to this unit. Any modifications in the design and/ or installation of the AHU that are carried out without discussion with AERA and without advance written agreement will result in the loss of the right to any warranty claims and any claim for injury to personnel as a result of these modifications. All work must be carried out by sufficiently trained personnel.

Warnings and cautions

Warnings and Cautions appear at appropriate sections throughout this manual. Your personal safety and the proper operation of this machine require that you follow them carefully. The constructor assumes no liability for installations or servicing performed by unqualified personnel.

WARNING!: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices or for equipment or property-damage-only accidents.

Safety Considerations

To avoid death, injury, equipment or property damage, the following recommendations should be observed during equipment operation:

1. The units are suitable for ambient air temperature between -20°C and +60°C and for air flow temperature between -20°C and +40°C. Different conditions need written confirmation from the manufacturer.
2. Care should be taken by the user to prevent frost in coils. For ambient temperatures below 0°C make sure that water inside the cooling coil is removed during winter and a minimum of 25% Ethylene Glycol is added to heating water circuit.
3. Components - Some OEM products have specific manufacturer's service instruction documents. These are delivered with the Air Handling Unit. In this case, the indications in the OEM manual are valid and the service handbook in hand has only general or complementary character for the relating components.
4. Liquid and gas storage -Maximum working pressure for all coils is 15bar. In case of coil connections to higher working pressures, any warranty relating to coil tightness and personnel safety is excluded.
5. Tubing filled with mediums with very high or low working temperatures are to be insulated with suitable materials to avoid burn or scald injuries caused by contact.
6. As fire prevention, fire dampers are to be provided where ducts cross firebreaks. Local fire prevention code is to be observed carefully.
7. In case of external electrical heater usage, the operation of the heater and AHU must be interlocked and appropriate safety components are used in the electrical circuit.

To avoid death, injury, equipment or property damage, the following recommendations should be observed during maintenance and service visits:

1. The maximum allowable pressures for system leak testing on low and high pressure side are given in the chapter "Installation". Always provide a pressure regulator.
2. Disconnect the main power supply before any servicing on the unit.
3. The Air Handling Unit control system must guarantee that in case of breakdown or power interruption during maintenance or repair work, the unforeseen start-up of a shut off unit is impossible.
4. Service work on the refrigeration system and the electrical system should be carried out only by qualified and experienced personnel.
5. For inspection on the Air Handling Units and to avoid risks, the units surroundings are to be sufficiently lighted.
6. Heat exchangers filled with refrigerants must be serviced by specialized personnel. Waste disposal or recycling of dangerous refrigerants must be done in accordance with all international, national, and local regulations.
7. Where units are installed in areas with high temperature and/or high humidity, the risks of external condensation on the casing must be considered.

General Information

Reception

On arrival, inspect the unit before signing the delivery note.

In case of visible damage: The consignee (or the site representative) must specify any damage on the delivery note, legibly sign and date the delivery note, and the truck driver must countersign it. The consignee (or the site representative) must notify AERA. And send a copy of the delivery note. The customer (or the site representative) should send a registered letter to the last carrier within 3 days of delivery.

Warranty

Warranty is based on the general terms and conditions of the manufacturer. The warranty is void if the equipment is repaired or modified without the written approval of the manufacturer, if the operating limits are exceeded or if the control system or the electrical wiring is modified. Damage due to misuse, lack of maintenance or failure to comply with the manufacturer's instructions or recommendations is not covered by the warranty obligation. If the user does not conform to the rules of this manual, it may entail cancellation of warranty and liabilities by the manufacturer. Electrical motors are factory-tested and properly run when leaving the factory. Any wiring faults on motors will cause damage for which AERA cannot be held responsible.

- The control package (either bought from AERA as an accessory or sourced from a third party) must include frost protection routines and components to prevent freezing damage of internal components (coils, heat recovery devices, humidifiers, ...)
- Electrical connections may become un-tightened during transport. All electrical connections should be checked and re-tighten prior to commissioning. All electrical connections shall be made according to the wiring diagrams provided on the components or in provided documents. Warranty is not valid if electrical components are not connected properly.
- When the unit use a medium (water/ refrigerant) with a temperature below than +2°C, The unit controls should be designed in order to protect the exchanger against freezing. AERA cannot be held responsible for damages coming from freezing / de-freezing operation.
- The warranty does not cover overheating due to wrong use or improper control of electric heaters.
- Dismantling or changing the units and/or components without AERA approval or assistance will invalidate the warranty.
- EVO-M units have been manufactured according to the selections and drawings provided with the order: AERA cannot be held responsible for eventual non compliance to original specifications or specific requirements outside the order.
- In order to avoid fan motor overloading, the units shall be started with filters and other components fitted correctly, the ductwork connected to the units and the access doors closed.
- Make sure the units work at design (Air flow/Pressure) conditions. The sound levels of the units can vary a lot depending of the fan speed, the filter conditions or the actual duct pressure drops. Also, the given sound levels can be highly affected by the installation method, the peripheral components, the ductwork and the acoustic characteristics of the building/room.
- The units must be controlled in order not to exceed the maximum or minimum differential pressure drops on plate heat exchangers indicated in the technical data sheets. The efficiency of the exchanger may drop significantly in higher / lower air volumes and/or uneven air flows.

Maintenance Agreement

It is strongly recommended that you sign a maintenance contract with your local Service Agency. This contract provides regular maintenance of your installation by a specialist in our equipment. Regular maintenance ensures that any malfunction is detected and corrected in good time and minimizes the possibility that serious damage will occur. Finally, regular maintenance ensures the maximum operating life of your equipment. We would remind you that failure to respect these installation and maintenance instructions may result in immediate cancellation of the warranty.

Transport Installation

Storage and preventive maintenance

In case of external storage, units must be protected from adverse weather conditions. With internal and external storage, the unit must also be protected against everyday damage. To avoid defects on the bearings, the fans and the motors must be manually turned every month. If the units are not running for more than 18 months, the grease in the bearings must be changed. When possible, all electrical equipment and fan belts should be removed and stored separately in dry atmosphere. In case of long term storage, belts shall be removed in order to avoid stress on the bearings.

Off loading and handling

EVO-M units are supplied in section modules, or as a complete unit, in accordance with the relevant assembly drawings. Any necessary use of force during unloading or movement of the units must only be applied via the unit base frame or the shipping pallet.

The unit unloading and handling can be carried out easily with the use of a forklift or crane. For sections lighter than 1000 kg, the unit can be lifted from the transport lugsb delivered separately.

Figure 1 - Crane operation procedure

1. Do not stand on the units. If this is unavoidable ensure a more even weight distribution by the use of boards.
2. Use battens to prevent damage of the top and sides of the units.

The forks must only be applied under the unit base frame and not against it.

Note: The lift point should be as near as possible to the centre of gravity. The centre of gravity of each section is located at the centre of the unit length, with the exception of the fan sections for which the centre of gravity is located towards the motors (see Figures 2 and 3).

CAUTION! Never lift the units by the heat exchanger connections or by any other projections. Do not tilt the fan module to avoid possible impingement on the dampers.

Sections can be delivered provided of feet, pallets done by wooden blocks positioned on each corner, base frame, base frame base provide of fork holes.

In the case of section is provided of base frame without any fork holes or without feet, insert the fork of the lift below the section lifting it by a lever action. In this case, the bar must only bear against the base frame or profile (see Figure 2).

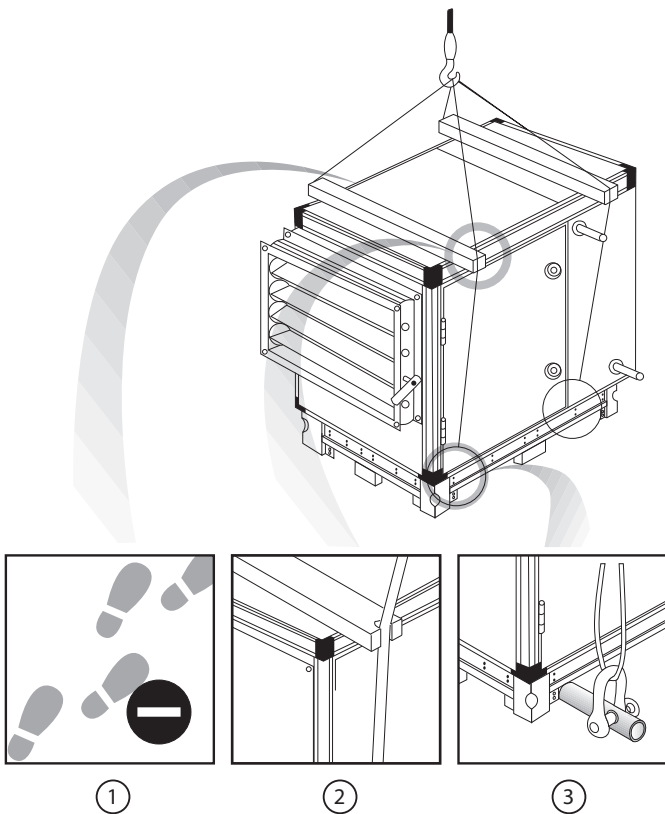


Figure 2

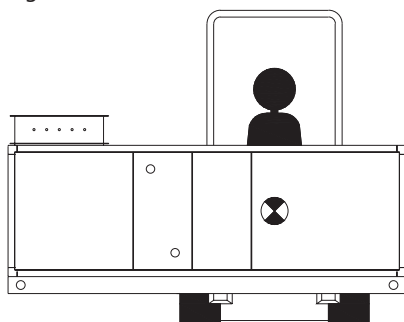
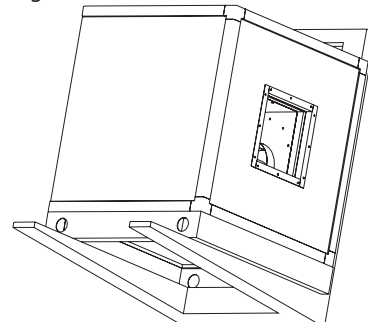


Figure 3



Transport Installation

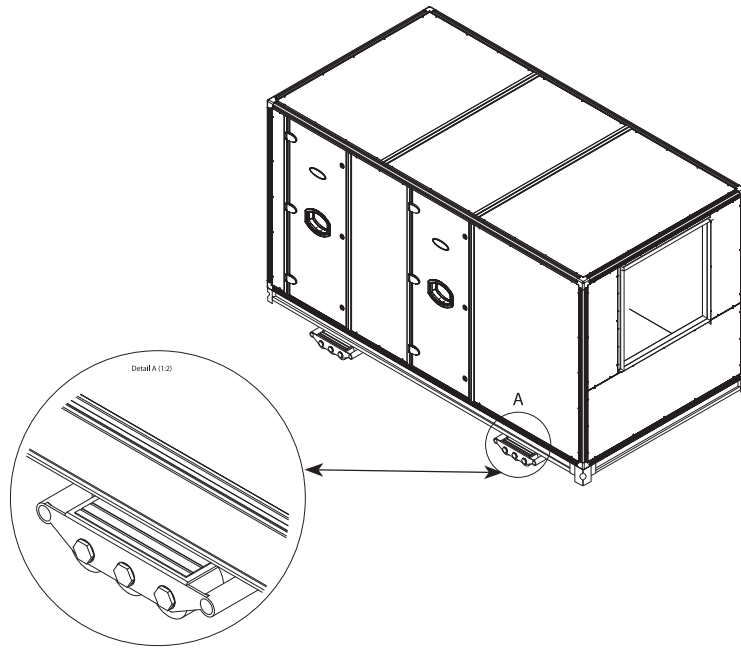
With larger units, the use of several forklift may be required.

When rigging the unit by crane, follow these guidelines:

1. If lifting holes are provided on the unit base frame, sling spreader bars (see Figure 1, part 3).
2. If lifting holes are not provided, see Figure 1 part 4
3. If, as option, lifting points (eye bolts) are provides, crane belts can be connected directly to them.
4. The minimum rated lifting capacity (vertical) of each sling and spreader bar should be no less than the shipping weight
5. The unit must be lifted with care, avoiding shock load by lifting the unit slowly and evenly.
6. All lifting points in one axis of the unit must be used when offloading and moving the unit.
7. Slings are to be provided by the rigger and attached to all lifting points.

CAUTION! Loading, unloading and removal of single sections have to be carried out by employing means able to support the unit weight indicated in the technical sheet. Ensure that the belts do not damage the top surface of the unit structure using proper devices.

Note: Units fitted with base frames may be moved on roller trolleys or tubular rollers (see Figure 4).



CAUTION!

Supporting and lifting under the cross beams or coils is prohibited. No horizontal transport devices must be placed under this frame section such as pallet lifters or the forks of fork lift trucks.

Installation and Assembly

Installation and Assembly



You will find information regarding the assembly and installation of the unit.

This may only be carried out by specialists with the necessary knowledge of relevant accident prevention regulations and other standard regulations relevant to health and safety in the workplace, based on their training and experience.



The unit should be installed in such a way that it is accessible only to technical personnel with the appropriate authorisation and training. The unit may only be assembled in accordance with the application shown in the technical information supplied with the unit.

The units must not be stacked with other components that are not part of the unit.

This is only permissible if the necessary load-bearing capacity has been specially incorporated into the units delivered from AERA

When connecting the duct it must be ensured that no foreign materials can enter the unit. If necessary, a suitable wire mesh guard can be installed by the third party at the opening on the discharge/intake side of the unit.



DAMAGE TO THE UNIT!

During installation of EVO-M units special care must be taken to ensure that no loads are applied to the floor panels. During assembly work suitable measures should be taken to ensure that any loads are spread across the bottom profiles (e.g. using grid walkways).

Installation

Installation location

The unit must be installed at a location that fulfils the following requirements:

- The substructure must be level and stable.
- The maximum deflection of the substructure may not exceed 4 mm per metre.
- In units where a condensate drain is installed, the height of the substructure must be at least the same as to the required siphon height (see siphon).
- Make sure that no damage to the installation location or the environment can be caused by loose components.
- In order to be able to remove fans, heat exchangers, droplet eliminators, etc. and also perform servicing and maintenance, a minimum clearance of one unit width must be maintained on the operating side.
- A minimum clearance of 600 mm between the rear of the unit and the wall must be maintained if the internal dividing joint connectors cannot be used due to the unit configuration.

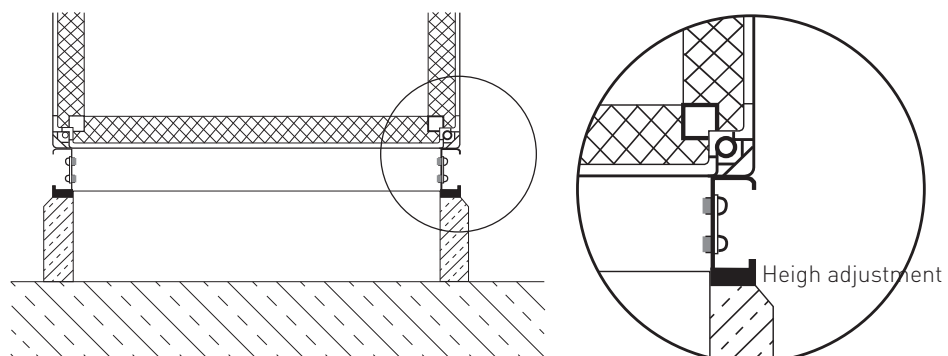
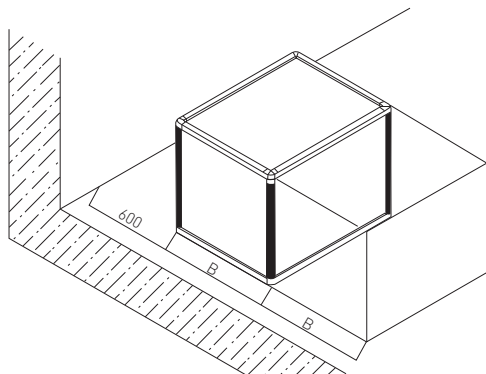


Figure 5: Installation location

Installation and Assembly



Minimum clearances

- In order to be able to remove fans, heat exchangers, droplet eliminators, etc. and also perform servicing and maintenance, a minimum clearance of one unit width must be maintained on the operating side.
- A minimum clearance of 600 mm between the rear of the unit and the wall must be maintained if the internal dividing joint connectors cannot be used due to the unit configuration.

Foundation construction for outdoor installation (weatherproof, roof frame)



NOTE!

EVO-M units for outside installation are not a substitution for roof! In compliance with prEN 13053 and VDI 3803 it is not allowed to use surfaces of weatherproof units to support parts of a building or in a similar way substitute a roof.

- Instructions for „Foundation construction for indoor installation“ on page 23 should be applied.
- If the unit has fresh air intake and discharge air make sure that the ducts are long enough so that the discharge air is not by-passed to fresh air intake.
- Choose an installation location where the fresh air intake will not be facing the main wind direction.
- In areas where there is a heavy amount of snowfall, the unit must be installed in a location where its operation will not be affected by snow. A suitable height for the subconstruction must be selected.
- If the unit is to be mounted on a roof, then the load-bearing capability of the roof and its supporting structure must be checked. Consult a structural engineer if necessary.
- The roof edge below the unit, as well as ducts and other roof openings must be performed waterproof by others.
- The roof frame must be insulated to prevent condensation. For information on installation, see „Preparing installation of roof“ on page 30.

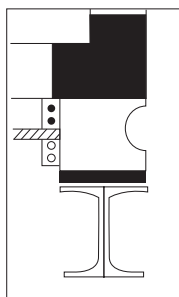


Figure 6: Foundation construction on steam beam by others

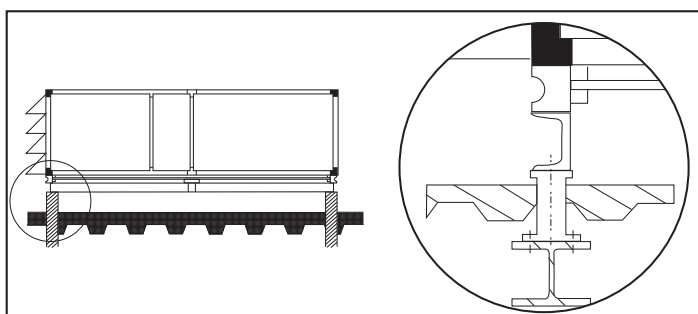


Figure 6-1: Foundation construction on steel supports by others

Installation and Assembly



NOTE

Particular care must be taken to ensure compliance with the precise dimensions of roof openings and to ensure that the foundation is level.

Structure-borne sound attenuation

In order to reduce the transfer of vibrations from the unit to the supporting structure, anti-vibration mounts and structure-borne sound attenuating mats must be installed.

- We recommend that the foundation is isolated from the unit using rubber plates, for example, where the unit is installed on level ground and no special structure-borne sound isolation requirements exist.
- We recommend the use of commercially available spring elements for ceiling mounting.
- For very special acoustic requirements please consult an acoustics engineer to select the most suitable structure-borne sound attenuation method.

Assembling the unit



NOTE

For detailed information, please refer only to the documentation enclosed with the unit. Data sheet, installation instructions, small parts and accessories supplied loose can be found in the unit part specified in the parts list.



DAMAGE TO THE UNIT!

Fittings/attachments etc. not provided by the manufacturer that could cause a leak must not be mounted on the walls or frame of the unit. The unit's operability must be maintained.

Installation and Assembly

Removing transportation lugs/device/locks

- All transportation lugs/devices/locks marked yellow on and in the unit must be removed prior to assembly.
- Remove the transportation locks on the fan.
- The transportation lugs on the roof must be removed.
- Remove the screws on the end panels and secure the supplied M8 x 70 screw.
- Remove the lug, screw and bushing at the dividing joint, then secure the supplied M8 x 30 screw.

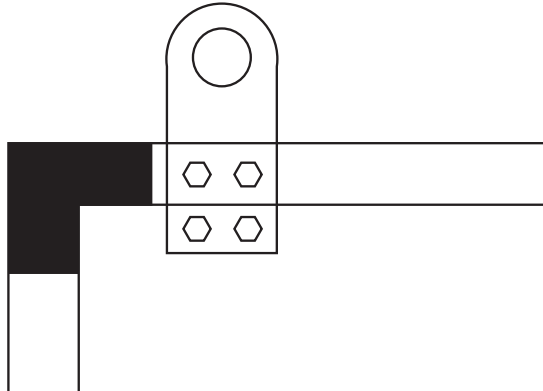


Figure 6-2: Transport lugs – roof, end wall and dividing joint



NOTE!

Because of danger of collision with transport lugs - externally mounted dampers/louvres, flexible connections are partially supplied loose. These components are field-mounted and sealed by others.



NOTE

Transportation lugs/device must not be used to suspend the units on a permanent basis. Transportation lugs/device may be used only once.

Installation and Assembly

Installation of individual modules

To assemble individual modules (dividing joint) proceed as follows:

- Do not forget to attach the sealing seal between the two modules while assembling the modules. Once you have connected the modules, make sure you stick the two modules with silicone.

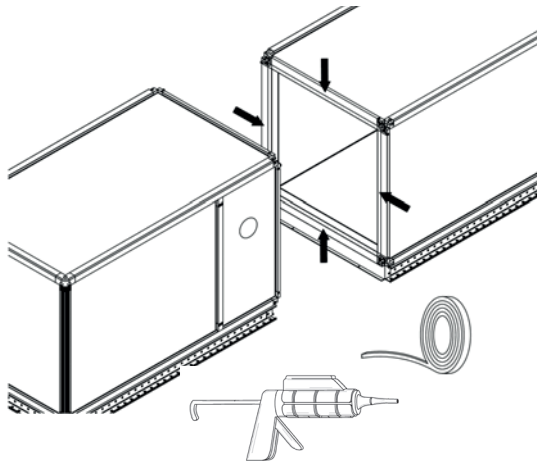


Figure 6-3: Installing individual modules



DAMAGE TO THE UNIT!

Do not attach tensioning belts/hoisting devices to heat exchanger connections, condensate drains and door handles or use these to pull or push the equipment!

- Position the unit parts as close to one another as possible prior to assembly. Only use the unit base frame to pull the individual components together. Units that do not have a base frame must be pulled together with tensioning belts. These must be positioned round the profiles in the base or roof area.

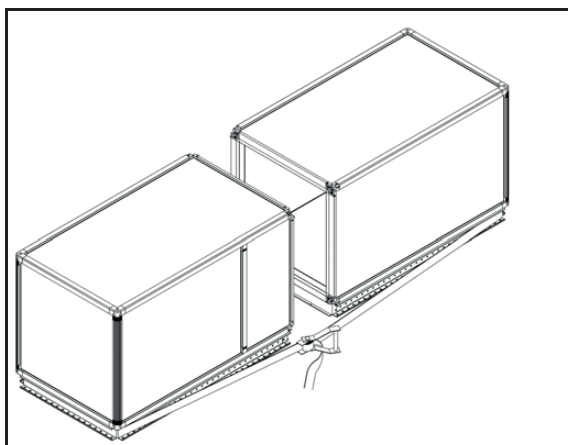


Figure 6-4: Unit with base frame

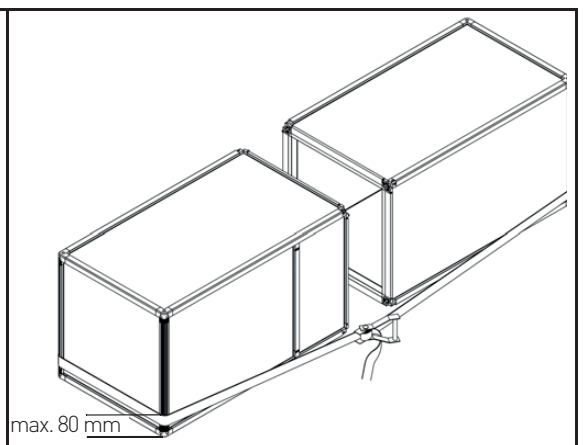


Figure 6-5: Unit without base frame

Installation and Assembly

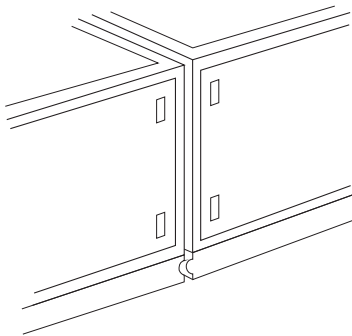


Fig. 6-6: Internal view

- If the rear of the unit is not accessible, screw the interior dividing joint connectors in the corner together.



NOTE

An additional dividing joint connector is provided in the middle of the profile (internally) where the internal unit width or height is 1240 mm or more – this must also be screwed tight.

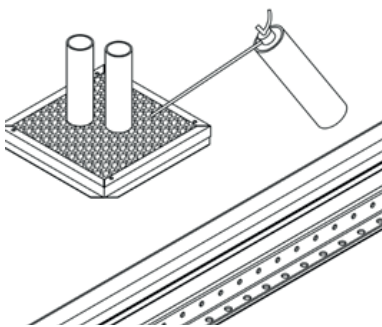


Figure 6-7: Pipe duct

- Seal pipe and cable ducts to prevent air leakage and condensation using Polyurethane foam, or similar insulation material (not included in EVO-M delivery scope).

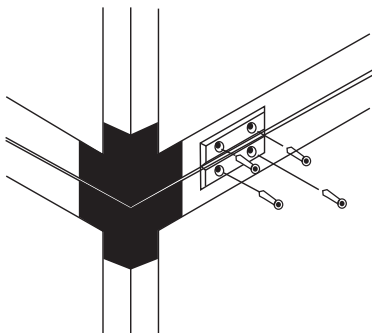


Figure 6-8: Connecting unit parts

Additional measure for double-deck/side by side units

- Connect both unit parts using the provided plates.

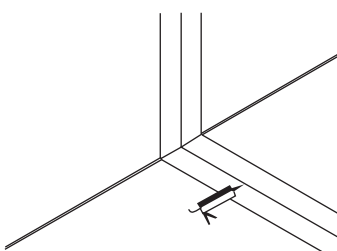


Figure 6-9: Dividing joints.

Additional measure for hygiene units

- Clean and seal all internal dividing joint grooves in the floor area. The sealant is included in the scope of delivery for hygiene units.

Installation of Components and Accessories

Installation of Components and Accessories



In line with the connection of heat exchangers, humidifiers etc., the coil connection may only be carried out by specialists with the necessary knowledge of relevant accident prevention regulations and other standard regulations relevant to health and safety in the workplace, based on their training and experience.



DAMAGE TO THE UNIT!

When mounting EVO-M units care must be taken to ensure that no loads are applied to the floor panels. During installation work suitable measures should be taken to ensure that any loads are spread across the bottom profiles (e.g. using grid walkways).

Prerequisites

- Check the unit for external damage and check whether it has been properly assembled and anchored.
- Check whether anti-vibration and structure-borne sound attenuating mats have been provided. This means that either:
 - the foundation has been isolated from the unit using rubber plates (for example) where the unit is installed on level ground and no special structure-borne sound isolation requirements exist;
 - or, in the case of ceiling mounting, commercially available spring elements have been used;
 - or, where very special acoustic requirements exist, an acoustics engineer has been consulted when selecting the most suitable structure-borne sound attenuation method.
- Before you start with the coil connection, check the following:
 - Drain valves must be installed at all low points in the water system to ensure that the water circuit can be fully drained in order to carry out maintenance or repairs.
 - A water drain with shut-off valve must be installed in order to drain the unit's water system.
 - Air vents must be installed at all the high points of the water system at easily accessible locations.
- Ensure that the piping system is flushed through until it is clean by others and a cleaning record compiled.

Installation of air control and air conveying components

In order to prevent the transmission of structure-borne sound, a tension-free connection between air ducts and the unit must be made using elastic connectors or structure-borne sound attenuators (also compare „Structure-borne sound attenuation“ on page 26).

If you are connecting air ducts to the units via flexible connectors, the installation length of the connectors must be less than their extended length.

Installation of air handling components with coil connection

Recommendations on water quality for heat exchangers that operate using low pressure hot water (LPHW) and chilled water:

A good water quality – e.g. salt and lime-free drinking water – increases the lifetime and efficiency of the heat exchanger.

- Check the limiting values shown in the table annually to prevent damage to the hydraulic system and its components. If necessary inhibitors must be added.

Installation of Components and Accessories

Note

These limiting values are only basic information about the water quality and do not form any basis for a guarantee!

Description	Symbol	Values	Effects in event of deviation	
Hydrogen ion concentration	pH	7.5 – 9	< 7 > 9	Corrosion Fouling
Calcium and magnesium content	Hardness (Ca/Mg)	4 – 8.5 °D	> 8.5	Fouling
Chloride ions	Cl ⁻	< 50 ppm		Corrosion
Iron ions	Fe ³⁺	< 0.5 ppm		Corrosion
Magnesium ions	Mg ²⁺	< 0.05 ppm		Corrosion
Carbon dioxide	CO ₂	< 10 ppm		Corrosion
Hydrogen sulphate	H ₂ S	< 50 ppb		Corrosion
Oxygen	O ₂	< 0.1 ppm		Corrosion
Chlorine	Cl ₂	< 0.5 ppm		Corrosion
Ammonia	NH ₃	< 0.5 ppm		Corrosion
Ratio of carbons/ sulphates	HCO ₃ ²⁻ /SO ₄ ²⁻	> 1	< 1	Corrosion

1/1.78 °D = 1 °Fr with 1 °Fr = 10 g CaCO₃/m³

ppm = parts per million (mg/l)

ppb = parts per billion (µg/l)

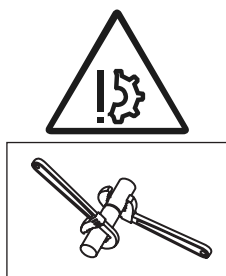
Installation of air handling components for cooling/heating

DAMAGE TO THE UNIT!

When connecting the heat exchanger, counter force must be applied using pliers to prevent damage.

The connections to the heat exchanger by others must always be tension-free.

Mechanical and static loads must not be applied to the connecting piece.



The heat exchanger must be connected in accordance with the counter flow principle (air and water heat exchanger flow in opposite directions).

- Protect the surfaces of the fins in the heat exchanger from damage.
- Connect pipe system by others to the water inlet and outlet. The inlet and outlet coil connections are marked using adhesive labels.
- Insulate pipes by others.

Installation of Components and Accessories

In addition, for air handling components that perform cooling function:

- Insulate coil connections and pipes once the installation has been carried out to prevent the formation of condensation water.
- ✓ Condensate water that is formed accumulates in the stainless steel condensate tray and is drained via a drain spigot mounted on the condensate tray.
- Install a siphon (see „Connecting siphon and water drains“ on page 41).

In addition, for units with fresh-air or mixed-air operation:



DAMAGE TO THE UNIT!

The heat exchanger in the unit must be protected from the formation of ice and freezing at ambient temperatures below the freezing point.
Use antifreeze in the water circuit if necessary.



NOTE

Glycol may be used providing that it does not exceed 50 % of the overall volume.
A higher quantity can cause operational faults.

Installation of evaporator/condenser components



ENVIRONMENTAL DAMAGE!

Dispose of any liquid spills (refrigerant) in an environmentally sustainable manner in accordance with the locally applicable laws and regulations.

- Open and use the service connections using only special tools and fittings.
- ✓ The units are filled with protective gas that audibly discharges when the connection caps are removed.

Installation of liquid-coupled heat exchangers

Compare „Installation of air handling components for cooling/heating“ on page 39.

Installation of Components and Accessories

Installation of humidifying equipment

Refer to the accompanying documentation for information on assembly and installation.

Also observe the German Drinking Water Act (Trinkwasserverordnung – TWVo).

Recommended “Guide values for the quality of water circulating in the spray humidifier (air washer)” (in accordance with: VDI 3803 “HVAC systems. Constructional and technical requirements”, October 2002, Appendix A, Table A1):

		Normal climatic requirements	IT rooms	Sterile rooms and cleanrooms
pH value		7 ... 8.5		
Total salt content	g/m ³	< 800	< 250	< 100
Electrical conductivity (at reference temperature 20 °C)	mS/m μS/cm	< 100 < 1000	< 30 < 300	< 12 < 120
Calcium (Ca ²⁺)	mol/m ³ g/m ³	> 0.5 > 20		- -
Carbonate hardness	°dH	< 4		-
Carbonate hardness with hardness stabilisation	°dH	< 20		-
Chloride (Cl ⁻)	mol/m ³ g/m ³	< 5 < 180	- -	- -
Sulphate (SO ₄ ²⁻)	mol/m ³ g/m ³	< 3 < 290	- -	- -
KMnO ₄ consumption	g/m ³	< 50	< 20	< 10
Germ count	organisms/ml	< 1000	< 100	< 10
Legionella bacteria	organisms/ml	< 1		

NOTE

We recommend that you repeat the water analysis when installing a water softening system. The total salt content must not exceed 250 g/m³. The electrical conductivity must not exceed 300 μS.

DAMAGE TO THE UNIT!

Honeycomb humidifiers must not be operated with fully desalinated water.

Connecting siphon and water drains

NOTE

The equipment must not be connected directly to the waste water system!

Fill the siphon with water before commissioning and also following longer periods of downtime.



Installation of Components and Accessories

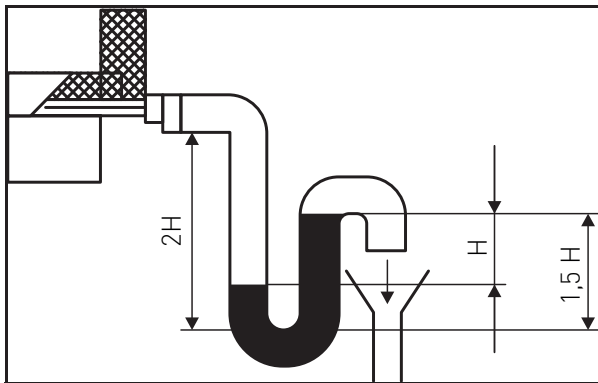


Figure 7: Siphon: overpressure in unit

The hydraulic seal in the siphon H must be greater than the maximum overpressure or underpressure (mm WC) in the unit (1 mm WC = 10 Pa).

The dimensioning is performed using the equation below:

$$H(\text{mmWC}) = \frac{\text{Unit over-/underpressure(Pa)}}{10}$$

The height difference between the water drain and hydraulic seal must also correspond to the dimension H (mm WC).

- Connect the siphon to the waste water system as shown in the illustration.



NOTE ON RISK OF FROST.

If there is a risk of frost, the discharge pipe must be insulated and kept warm using a heating cable, for example.

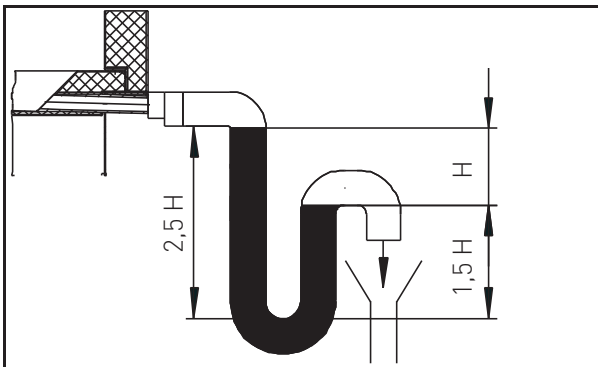


Figure 7-1: Siphon: underpressure in unit

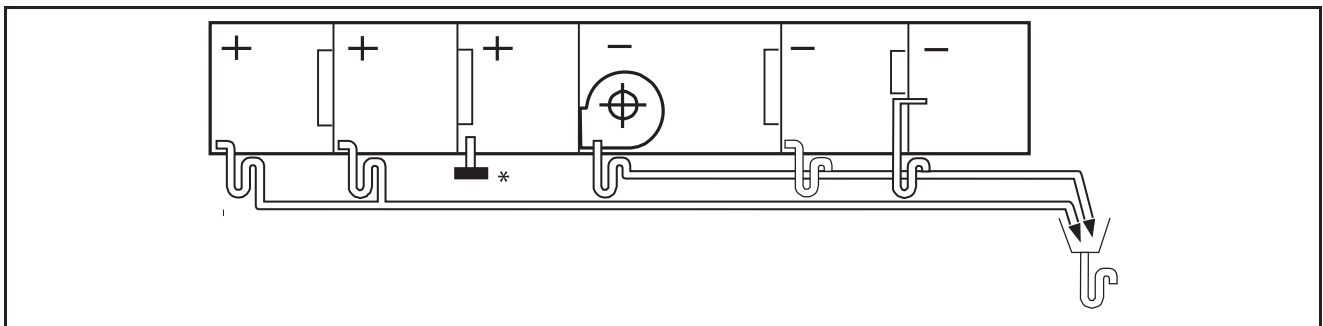


Figure 7-2: A siphon must be connected to each condensate drain or overflow pipe. Several discharge pipes must not be routed to one shared siphon (* drain blocked).



NOTE

Underpressure and overpressure siphons must be connected to separate collecting pipes (Refer to fig. 7-2).

Installation of accessories

Refer to the relevant documentation provided for descriptions of the assembly and installation of accessories or accessory parts by others.

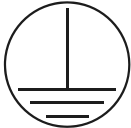
Electrical Connection



Electrical Connection

The electrical connection may only be carried out by specialists with the necessary knowledge of relevant accident prevention regulations and other standard regulations relevant to health and safety in the workplace, based on their training and experience.

Take protective measures!



During installation and connection of the unit, additional protective measures must be taken into account when setting up low voltage equipment in accordance with the EC directive and the regulations of the local utility provider. Ensure earthing/grounding and potential equalisation is provided for the unit and all connected components and individual units.

It must be ensured in a demonstrable way that all individual units are connected in a electroconductive manner. (Usually potential equalisation is provided using connection screws and bolts). The entire unit or system must be connected to the same potential.

Passive switch contacts in explosion protected units may only be used in intrinsically safe electric circuits.



ELECTRICAL HAZARD!

All power supply connections must be switched off and be voltage-free and secured against unintentional switching on. Earth and short-circuit them and cover over any neighbouring electrically conducting components or block them off. Failure to do so may lead to serious injury or death.



NOTE

The cable installation must be carried out in accordance with the enclosed wiring diagram of the unit and nationally applicable standards and guidelines. Only one separate mains power cable should be used. Never connect other units to this mains power cable.

Prerequisites

- Carry out a full visual inspection of the entire unit and installed components.
- Before you start with the electrical connection, check the following:
 - The characteristics of the mains power supply must satisfy EN 60204-1 regulations and the power requirements of the unit.
 - The size of the backup fuse must be determined by the specialist electrical technician responsible based on the unit's power rating.
 - The motors must be able to operate at their nominal capacity where the input voltage with nominal frequency is between 95 % and 105 % of the nominal voltage.

Cable routing and grommets by others

- The installation of cable grommets and the routing of cables near doors, panels with sash fasteners, panel connections and cover strips must be avoided.
- Screw connections and grommets must not cause any leaks.
- The connecting cables within the fan components must be long enough to allow the motor to be moved without difficulty (in order to re-tension the V-belt, for example).

Connecting the unit

Each subassembly with an electrical connection must be earthed separately.

Visual inspection of the mechanics

Electrical Connection

Motor protection

Motor protection with PTC resistor sensors

The AC motors contain between two and six PTC resistor sensors connected in series, depending on the motor size and type. The PTC resistor sensors are embedded in the windings of the motors in a way that optimises recording of the winding temperature. PTC resistor sensors are temperature-dependent semiconductor resistors.

When the maximum permissible winding temperature of 135 °C is reached, the resistance value increases rapidly. This response, combined with full motor protection electronics, causes the motors to switch off.

NOTE

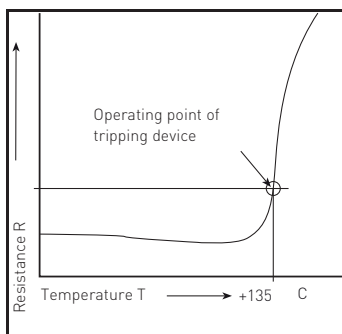
Unlike thermal contacts, PTC resistor sensors are not subject to wear. They provide a high degree of operating safety as they are shock-resistant, vacuum-resistant and not sensitive to pressure.

DAMAGE TO THE UNIT!

The separate sensor with external leads must not be connected to voltage as this would damage it beyond repair. Measuring voltages greater than 5 V are not permitted. Connect the sensor only to full motor protection tripping devices.

INDUCTION EFFECTS

We recommend the use of shielded cables (such as JY (st) Y, 2 x 2 x 0.5) to prevent the effects of induction on the PTC resistor measuring circuit. Connect the shielding on one side with the potential equalisation (PE).



Full motor protection electronics

For motor protection we recommend our EVO-M 912.MVS 1.0 full motor protection tripping devices. They have been specially harmonised with the PTC resistor sensors used in the motors. As operation of the full motor protection electronics is based on the closed-circuit current principle they are intrinsically safe. A locking shutdown after a fault and restart following power failure generally occur in conjunction with EVO-M 912.MVS 1.0 full motor protection tripping devices.

The electronic full motor protection tripping devices switch the motors off where the following occur:

- Overloading
- Ambient temperatures exceed permissible limits
- The rotor is locked
- Insufficient cooling
- Short circuit in winding
- Wire breakage and loose contacts in the measuring leads

Electrical Connection

Extended motor protection

In the case of a high start-up frequency, intermittent operation and switching rate, and to provide optimum protection against 2-phase running, we recommend that motors are protected by thermal overcurrent relays/motor circuit breakers, in addition to PTC resistors.

Shutdown after fault

In the event of a shutdown after a fault check whether this is due to one of the aforementioned causes.

Motor protection with thermal contact

Thermal contacts are temperature-dependent operation elements that automatically monitor the winding temperature of a motor. Compared to thermal tripping devices and motor circuit breakers, these devices provide more effective protection under the following circumstances when installed in the motor winding:

- Insufficient cooling
- Increased ambient temperature
- Extreme speed reduction during control and regulation operations
- Shutdown of the motor in the event of control voltage failure on the line side
- Faulty contacts and cable breakages in the control circuit.

The thermal contact opens when the permissible temperature of the winding is exceeded. This interrupts the control signal loop of a control unit, for example.

The fan protection drops out and disconnects the motor from the mains.

The motor protection is intrinsically safe.

Connecting electric motors

In order for the unit to operate properly it is important to connect it with a **righthand rotating field**.

- Check the rotating field if necessary with a rotating field meter.

DAMAGE TO THE UNIT!

Correct assignment of the phase sequence to the specified rotational direction must be checked before the motor is connected. If the wrong connection is made the motor/fan may be damaged.

The terminals of AC motors are labelled in such a way that the alphabetical sequence of the terminal designation U1, V1, W1 corresponds with the temporal sequence of the phases L1, L2, L3 (with clockwise rotation).

The rotational direction can be reversed by exchanging two connecting cables:

- Exchange the connecting cables, e.g. U1 and V1
- Y connection: Exchange the connecting cables, e.g. U1 and V1
- Δ connection: Exchange the connecting cables, e.g. U2 and V2
- Speed 1: Exchange the connecting cables, e.g. 1U and 1V
- Speed 2: Exchange the connecting cables, e.g. 2U and 2V
- Speed 3: Exchange the connecting cables, e.g. 3U and 3V

Single-phase electric motors with direct on-line starting:
Single-speed electric motors with Y/Δ starting:

Multi-speed electric motors:

Voltage fluctuations

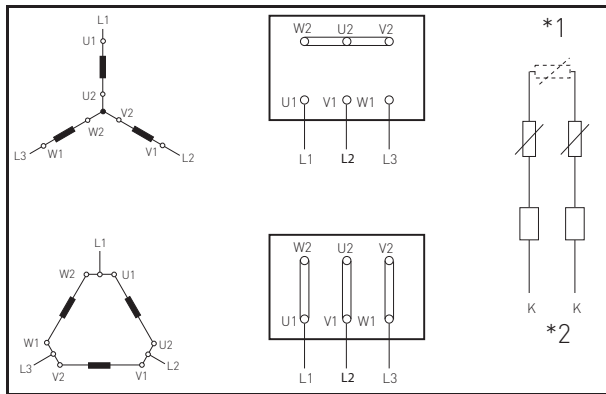
- Make sure that the supply voltage with mains frequency is between 95 % and 105 % of the rated voltage. Only then can the motors to operate at their rated output, otherwise they may be damaged.

To make the connection, proceed as follows:

- Connect the unit according to the wiring diagrams.



Electrical Connection



Single-speed motor: 1500 rpm, voltage interchangeable

Motor version:

– up to 2.2 kW: 3 x 230 V with Δ connection,

3 x 400 V with Y connection

– above 3 kW: 3 x 400 V with Δ connection,

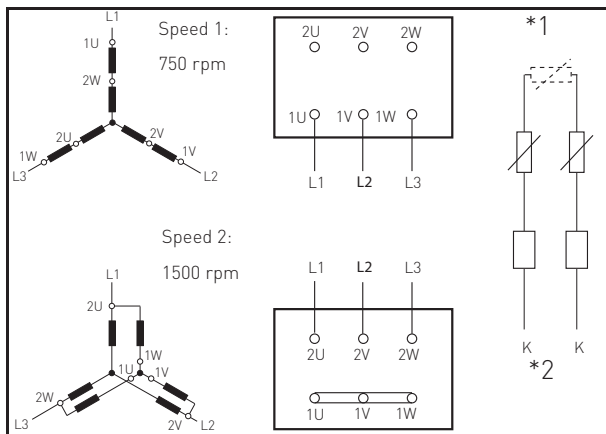
3 x 690 V with Y connection

2-3 PTC resistor sensors, depending on the size of the motor

Total resistance R_K (20 °C) approx. 200-300 Ω

*1 PTC resistor

*2 Full motor protection device



Two-speed motor: 750/1500 rpm Dahlander connection Y/YY

Motor version:

8/4 pole

pole interchangeable

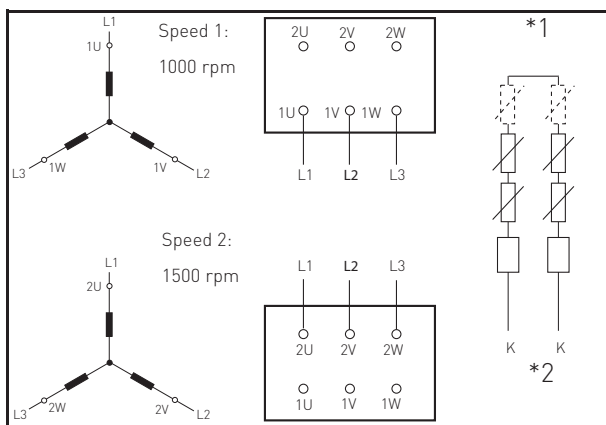
single winding with Dahlander connection Y/YY

2-3 PTC resistor sensors, depending on the size of the motor

Total resistance R_K (20°C) approx. 200-300 Ω

*1 PTC resistor

*2 Full motor protection device



Two-speed motor: 1000/1500 rpm separate winding Y/Y

Motor version:

6/4 pole

pole interchangeable

two separate windings Y/Y

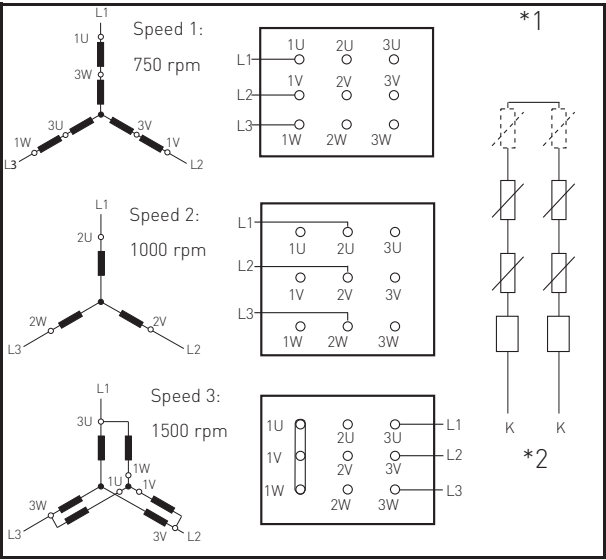
4-6 PTC resistor sensors, depending on the size of the motor

Total resistance R_K (20°C) approx. 400-600 Ω

*1 PTC resistor

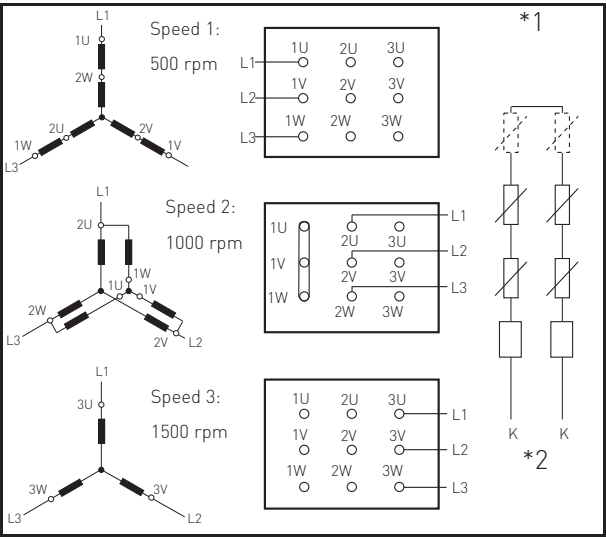
*2 Full motor protection device

Electrical Connection



Three-speed motor: 750/1000/1500 rpm Dahlander and separate winding Y/Y/YY

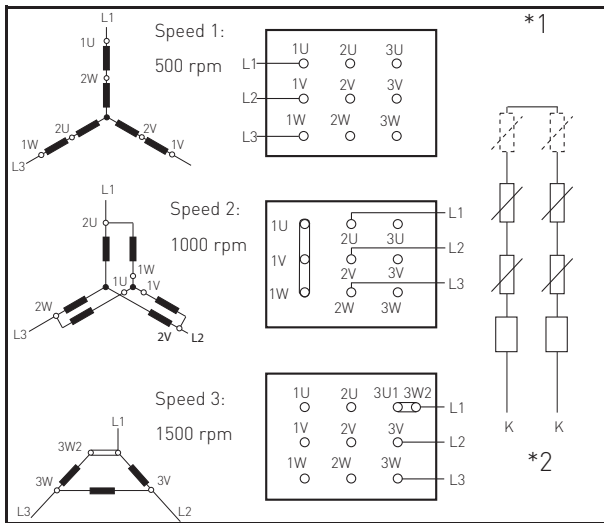
Motor version:
8/6/4 pole
pole interchangeable
Speed 1 and 3 with Y/YY Dahlander connection
Speed 2 with Y connection, separate winding
4-6 PTC resistor sensors, depending on the size of the motor
Total resistance RK (20 °C) approx. 400-600 Ω
*1 PTC resistor
*2 Full motor protection device



Three-speed motor: 500/1000/1500 rpm Dahlander and separate winding Y/Y/YY

Only with motors up to size 225, 33 kW
Motor version:
12/6/4 pole
pole interchangeable
Speed 1 and 2 with Y/YY Dahlander connection
Speed 3 with Y connection, separate winding
4-6 PTC resistor sensors, depending on the size of the motor
Total resistance RK (20 °C) approx. 400-600 Ω
*1 PTC resistor
*2 Full motor protection device

Electrical Connection



Three-speed motor: 500/1000/1500 rpm Dahlander and separate winding Y/YY/ Δ

Only with motors from size 250, 45 kW

Motor version:

12/6/4 pole

pole interchangeable

Speed 1 and 2 with Y/YY Dahlander connection

Speed 3 with Δ connection with Z terminal

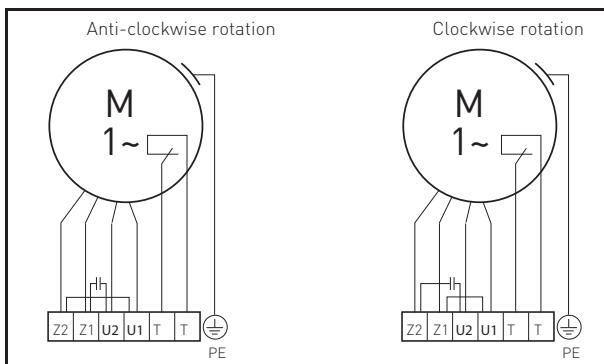
4-6 PTC resistor sensors, depending on the size of the motor

Total resistance R_K (20 °C) approx. 400-600 Ω

*1 PTC resistor

*2 Full motor protection device

230 V~ AC motor



230 V~ AC motor

Motor version:

1-speed motor, 1450 rpm

Supply voltage: 1 x 230 V~/ 50 Hz

Max. output: 1.75 kW

Motor connection: with operating capacitor

Motor protection: thermal contact

- Check the current consumption at all speeds and compare this with the information on the motor rating plate or the enclosed documentation.
- To check for symmetrical loading of the electric motor, all connecting cables must be measured at every speed. If the specified values are exceeded, or current consumption varies in the individual phases, the cause of this must be determined.

Frequency converter

Settings are performed and adjusted during commissioning.

Service switch

A lockable service switch must be installed near the fan section access door.

The wiring for service switches installed at the manufacturer's is led to the motor.

Installation and connection of the servo actuator

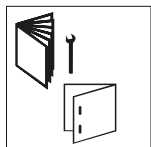
- If a EVO-M servo actuator is pre-installed at the manufacturer's, connect this in accordance with the servo actuator data sheet.
- If other servo actuators are used, use the accompanying documentation.

Additional electrical components

- Connect additional electrical components in accordance with the relevant documentation/wiring diagram provided.

Commissioning and Maintenance

Commissioning and Maintenance



NOTE

Data sheet and assembly instructions can be found on the inside of the equipment where this label appears. These documents must be removed prior to commissioning.

Several subassemblies and components must be commissioned separately. The relevant steps are listed in the following chapter.



ELECTRICAL HAZARD!

The following applies for all maintenance and cleaning work: the doors of the unit may only be opened if the unit has been switched off and cannot be accidentally switched back on.



DANGER DUE TO EXPLOSION RISK AREA!

Particular attention must be paid to safety information and (electrical) installation information for units operating in explosion risk areas. Noncompliance with these regulations may lead to explosions that could cause severe injury to persons and major damage to property!



DANGER FROM ROTATING UNIT PARTS!

The fans do not come to a standstill immediately when the unit has been powered down. You should therefore wait for at least 5 minutes until the fans have come to a standstill before starting maintenance and repair work.



DAMAGE TO THE UNIT!

When mounting EVO-M units care must be taken to ensure that no loads are applied to the floor panels. During installation and maintenance work, suitable measures should be taken to ensure that any load is spread across the bottom profiles (e.g. using grid walkways).

The maintenance intervals specified apply for air with normal levels of contamination. The maintenance intervals must be reduced accordingly for air with particularly high levels of contamination.

Maintenance intervals



NOTE

Cleaning should be carried out more regularly if the air contains oil as the sealing materials are only resistant to oil for a limited period. Only use alcohol-based disinfectants.

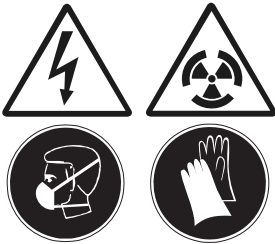
PERSONAL PROTECTION

A mask and protective gloves must be worn when carrying out cleaning and specific maintenance tasks at the unit.



Commissioning and Maintenance

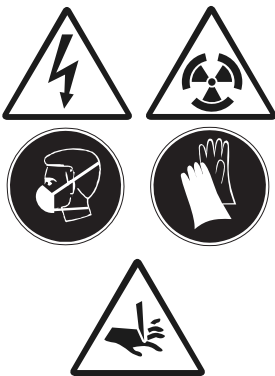
Basic cleaning and maintenance tasks



**ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!
OBSERVE PERSONAL PROTECTION MEASURES.**

In doing so, be sure to observe the safety information on page 24.

- Remove excess dirt by wiping it off using a dry cloth or, if necessary, an industrial vacuum cleaner.
- Remove dirt that accumulates due to the constructional installation of additional accessory parts.
- Other types of soiling: remove with a dry cloth, and wash off using a little water with added alkaline cleaning agent if necessary.
- Do not use abrasive cloths or tools that may scratch or scrape the protective surface during cleaning as this will cause irreparable damage.
- Treat galvanised parts with preservative spray.
- Apply lubricant spray to all moving parts, such as door levers and hinges – dampers excluded!
- Clean the seals on the inspection doors and check for leaks.
It is recommended that seals are treated with a moisture-repellent preservative.
- Check electrical connections.
- Check earthing.



Basic information regarding the cleaning of fins

**ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!
OBSERVE PERSONAL PROTECTION MEASURES.**

In doing so, be sure to observe the safety information on page 24.

DANGER FROM SHARP EDGES!

There is a danger that the thin fins will inflict cuts during cleaning.

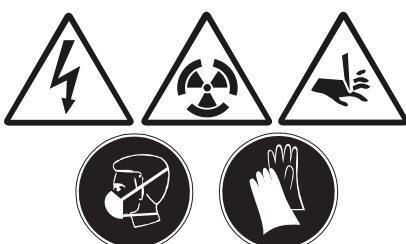
The fin package must be cleaned to ensure that the heat exchanger continues to operate at full capacity. This can be carried out using a brush (not wire brush) or an industrial vacuum cleaner. Do not use hard or sharp cleaning tools!

Copper or aluminium fins may be blown out against the direction of the airflow using compressed air, or sprayed with water at low pressure for cleaning.

Steel galvanised heat exchangers or heat exchangers with reinforced fins may also be cleaned using steam jet cleaning appliances.

Maintenance interval checklist

The maintenance intervals as defined in European guidelines and standards (e.g. VDI 6022) must be observed.



ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

Be sure to observe the safety information on page 24 and page 25 when carrying out the maintenance work described below.

Commissioning and Maintenance

Unit part	Interval (months)	Task	✓
Units for installation indoors	1 month	• Clean and refill existing siphons.	
	3 months	• Check casing for damage/firm seating.	
		• Check/renew seals on all service openings.	
		• Check panels for damage and corrosion, renew corrosion protection and check function of door safety catch (on discharge side).	
		• Hygiene inspection (we recommend the maintenance steps and intervals specified in VDI 6022!): Check built-in parts for contamination and clean as necessary; carry out wipe disinfection; check sealing materials for microorganisms and fungi, clean/replace as necessary.	
Units for installation outdoors (roof units, weatherproof)		• Carry out tasks listed at “Units for installation indoors”.	
	12 months	• Check tightness of unit roof.	
		• Check side walls and cover strips, reseal as necessary.	
		• Check base frame and base frame skirt.	
		• Clean external weather grille for fresh air and extract air.	
Belt driven fan unit	3 months	• Check fan/motor mountings, also check for soiling, damage and corrosion.	
		• Check that anti vibration mounts are functioning correctly.	
		• Check that belt guards are functioning correctly, clean as necessary.	
		• Check impeller for imbalance.	
		• Check tension of V-belt and check for wear; re-tension or renew as necessary – for description see page 59 and following pages.	
		• Check fan/motor for bearing noise, replace bearings as necessary.	
		• Observe recommended lubrication interval for fan bearings without lifetime lubrication (see Table 8-3 on page 61).	
Direct driven fan unit	3 months	• Check motors for soiling, damage and corrosion, also check mountings.	
		• Check motors for bearing noise, replace bearings as necessary.	
		• Check impeller (particularly welded seams) for cracks; replace bearings if necessary.	

Commissioning and Maintenance

Unit part	Interval (months)	Task	✓
Basic requirements for all filters	3 months	• Check filter for soiling, damage and odours.	
		• Clean filter section.	
	6 months	• Check whether the maximum permissible pressure differential (see Guideline RLT 01, for example) or pressure differential specified by manufacturer has been exceeded; if so, replace the filter.	
	at least every 6-9 months	• Hygiene inspection (we recommend the maintenance steps and intervals specified in VDI 6022!): Even if the filter shows no visible signs of contamination, fungi and micro-organisms may grow through the filter during long-term use (in air with low dust content).	
Bag/panel/ fine-dust filters	continuous measurement replace every 3 months	• Replace the filter when the maximum pressure differential is reached.	
Activated carbon filter (cartridges)	6 months	• Replace the filter if the activated carbon is saturated.	
		• Check that filter mounting plates with activated carbon cartridges are firmly seated. In order not to reduce the service life of the costly activated carbon filter, make sure that the pre- and fine-filtering stages are intact.	
Grease filter	every 3-6 months	• Wash out filter cells in cleaning bath.	
Other filters	Refer to the relevant documentation provided for information on maintenance.		
Heater section (LPHW)	12 months	• Check for tightness and for possible contamination on the air side.	
		• If there is a risk of frost, also check the safety devices regularly, or take appropriate precautionary measures such as draining the equipment or adding antifreeze.	
		• Check that pipe connections and mountings are secure.	
		• Clean air side as necessary (blow through heat exchanger using compressed air or low pressure water).	
		• Bleed.	
Heater section (steam)	12 months	• Carry out tasks specified under "Heater section (LPHW)" .	
		• Check that the steam inlet and condensate outlet are functioning correctly.	
		• Check control functions as necessary.	
Electric heater section	12 months	• Dry clean on air side.	
Direct (gas) fired heater section	Refer to the relevant documentation provided for information on maintenance.		

Commissioning and Maintenance

Unit part	Interval (months)	Task	✓
Cooler with/without droplet eliminator	12 months	• Check for tightness and for possible contamination on the air side.	
		• If there is a risk of frost, also check the safety devices regularly, or take appropriate precautionary measures such as draining the equipment or adding antifreeze.	
		• Check that pipe connections and mountings are secure.	
		• Clean air side as necessary (blow through heat exchanger using compressed air or low pressure water).	
		• Bleed.	
		• Clean condensate tray/drain.	
		• Check siphon, top up as necessary.	
		• Clean droplet eliminator with descaling spray.	
	Before each winter season	• Drain cooler coil before the start of winter if necessary.	
Evaporator/condenser	12 months	• Clean and check evaporator/condenser.	
		• Make sure that all refrigeration components in direct evaporators (refrigerating machine, direct evaporator, distribution manifold, refrigerant lines, etc.) are working efficiently.	
Heat pipe	12 months	• Clean the heat transfer fins.	
		• Clean condensate tray/drain.	
		• Check siphon, top up as necessary.	
		• Where a heat pipe with bypass is used, check the air control and shut-off dampers.	
Liquidcoupled heat exchangers	12 months	• Carry out tasks specified under "Cooler with/without droplet eliminator" (interval – 12 months).	
Plate heat exchanger	12 months	• Carry out cleaning depending on the type of contamination in the plate block.	
		• Check the function of the bypass damper as necessary.	
		Wet cleaning may only be carried out if a tray has been installed!	
		• Remove oil and fat deposits.	

Commissioning and Maintenance

Unit part	Interval (months)	Task	✓
Rotary heat exchanger	3 months	• Check tension of drive belt, re-tension as necessary.	
	12 months	• Clean heat exchanger fins – wet cleaning may only be carried out if a tray has been installed – never clean the heat exchanger fins with high pressure water or steam.	
		• Clean chamber.	
		• Check efficiency of damper where an energy recovery system with bypass configuration is used.	
		• Check peripheral seal, adjust as required.	
Dampers and shut-off dampers	6 months	• Check alignment of motor.	
		• Vacuum clean dampers (blow out), never apply grease!	
		• Detach the drive from the dampers and check dampers for ease of movement.	
Sound attenuator	6 months	• Check that the drive (damper actuator) reaches its end positions.	
		• Check the sound attenuating chamber and sound insulating splitters for contamination, clean as necessary.	

Units in general

Commissioning of units for installation indoors

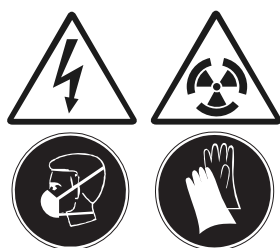
The following commissioning steps must be carried out:

- Carefully check the entire casing and parts such as
 - Doors and service openings
 - Handles and levers
 - Connections with foam rubber seals
 - Inspection windows
 - Panels
 for damage and firm seating.
- Remove protective film, if present.
- Remove all transportation locks.
- Make sure that there are no loose items inside the unit.
- Check that the unit is airtight.
- Clean the unit as described under „Basic cleaning and maintenance tasks“ on page 52.

Maintenance of units for installation indoors

ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!
OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24.



Commissioning and Maintenance



NOTE

If the air contains oil or aggressive substances, cleaning should be carried out more regularly as the sealing materials are only resistant to oil for a limited period.

The following maintenance steps must be carried out:

- Carefully check the entire casing and parts such as
 - Doors and service openings
 - Seals
 - Handles and levers
 - Connections with foam rubber seals
 - Inspection windows
 - Panelsfor damage and firm seating.

Doors and service openings

- Check seal, renew if necessary.
- Check that door safety catch (on discharge side) is functioning correctly.

Panels

- Check for damage and corrosion.
- Renew or apply corrosion protection (paint), impregnate, etc., as necessary.

Siphon

- Clean and refill existing siphons.

Hygiene inspection

- Check built-in parts for contamination, clean as necessary.
- Carry out wipe disinfection (disinfectant must not be aggressive towards the materials used, only use alcohol-based disinfectant).
- Check the sealing materials for micro-organisms and fungi. Clean or replace the sealing materials as required.

Commissioning of units for installation outdoors (roof units, weatherproof)

The following commissioning steps must be carried out:

- You should initially perform all steps described under „Commissioning of units for installation indoors“ on page 56.
- Check the weatherproof seals (see „Foundation construction for outdoor installation (weatherproof, roof frame)“ on page 25).

Observe current guidelines and standards! We recommend the maintenance steps and intervals specified in VDI 6022

Commissioning and Maintenance

Maintenance of units for installation outdoors (roof units, weatherproof)

The following maintenance steps must be carried out:

- You should initially perform all steps described under „Maintenance of units for installation indoors“ on page 29.
- Check tightness of unit roof.
- Check side walls and cover strips, reseal with single-component sealing compound as necessary.
- Clean external weather grille for fresh air and extract air once a year.

Hygiene inspection

- Check built-in parts for contamination, clean as necessary.
- Carry out wipe disinfection (disinfectant must not be aggressive towards the materials used, only use alcohol-based disinfectant).
- Check the sealing materials for micro-organisms and fungi. Clean or replace the sealing materials as required.

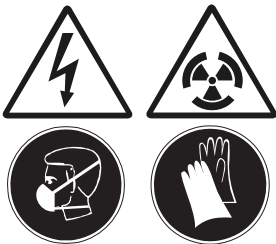
Observe current guidelines and standards! We recommend the maintenance steps and intervals specified in VDI 6022

Fan unit and drives

Commissioning of belt-driven fan unit

ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!
OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24.



DAMAGE TO UNIT

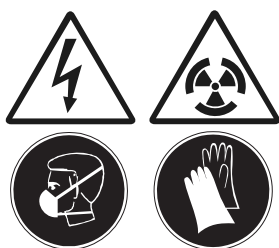
Do not start up the fan against closed dampers.

The following commissioning steps must be carried out:

- As a general rule the entire casing and all parts must be checked for damage and firm seating.
- Remove transportation locks.
- Check tension and alignment of belt.
- Check the rotational direction of the fan at all speeds.
- Measure the power consumption of the motor. The rated current of the motor according to the plate must not be exceeded under any operating conditions.
- Make sure motor protection device is working effectively.
- If using a motor with separated air supply, make sure that the air intake grille and air duct are clean. The full cross-section of the air duct must be unobstructed.
- Check that all functional system components (air control and shut-off dampers, fire protection dampers, volume controls) are ready for operation and open them.

Commissioning and Maintenance

Maintenance of belt-driven fan unit



ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!
OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 51.



DAMAGE TO UNIT

When the fan is at a standstill and the unit heater control valve (water, steam or refrigerant) is open, temperatures occur inside the unit that are roughly equivalent to the inlet temperature of the heating medium (normally around 90 °C). This causes damage through deformation of plastic parts (particularly to plastic droplet eliminators, humidifier honeycombs etc.).

Furthermore, fan and motor bearings with permanent lubrication may be damaged at temperatures above 80 °C. Many electric built-in components (frequency inverters etc.) may only be operated at temperatures up to a maximum of 40 °C – see also the relevant manufacturer's instructions.

The following maintenance and inspection steps must be carried out:

- Check that fans are securely mounted.
- Check fans for soiling, damage and corrosion.
- Check that anti vibration mounts are functioning correctly.
- Check that belt guards are functioning correctly, clean as necessary.
- Check impeller for imbalance.

Re-tensioning/renewing V-belt

Initial check:

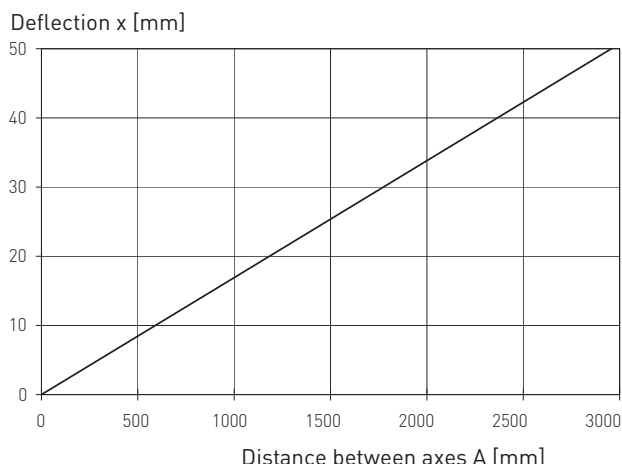
Carry out the initial check after approximately 50 operating hours.

Regular checks:

The subsequent checks depend on the operational load.

- For normal operation (roughly 8 hrs a day), perform check every 3 months.
- Define shorter intervals between checks where the number of operating hours is greater.

Belt profiles	Diameter of small disk (mm)	Force F (N/belt)
SPZ	70 – 85	13 – 19
	86 – 155	15 – 23
	116 – 150	19 – 27
	151 – 200	25 – 24
	201 – 250	29 – 38
SPA	112 – 150	25 – 34
	151 – 200	29 – 38
	201 – 250	35 – 44
	251 – 300	40 – 50
SPB	180 – 224	40 – 52
	225 – 300	46 – 60
	301 – 400	55 – 76
	401 – 500	67 – 90



Commissioning and Maintenance



DAMAGE TO UNIT AND NOTE

Always reduce the distance between the axes to the point where the V-belt can be placed in the grooves without using force. The application of force during installation using tyre levers, screwdrivers or similar tools is not permitted.

If the V-belt pulleys have multiple grooves, all V-belts must be replaced. A set of belts must not be made up of V-belts by different manufacturers. V-belts do not require a great deal of care or maintenance. Belt wax and belt spray must not be used.

- Check the tension of the V-belt and check for wear; re-tension or renew as required.

To retension the V-belt via the pivoting motor base or to renew it proceed as follows:

- Slacken the lock nuts on the adjusting bolts.
- Renew V-belt if necessary.
- Check/adjust pulley alignment (Fig. 8-1).
- Tension V-belt (adjust using measuring device, if possible, calculate using frequency method (Fig. 8-1)).
- Tighten lock nuts.

The deflection of the belt is approximately 5-20 mm when a load of $P = 20-30 \text{ N}$ is applied, depending on the distance between the axes (see Fig. 8-1).

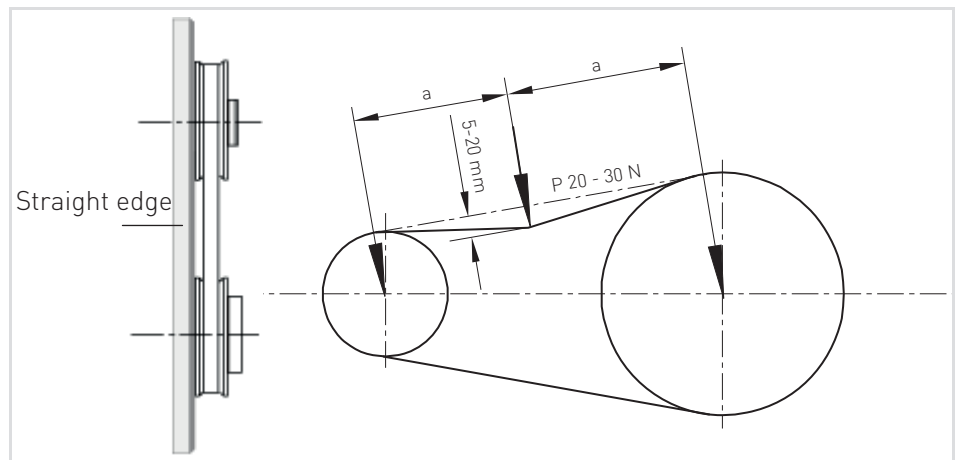


Figure 8-1: Pulley alignment and V-belt tensioning

Displacement or removal of V-belt pulleys

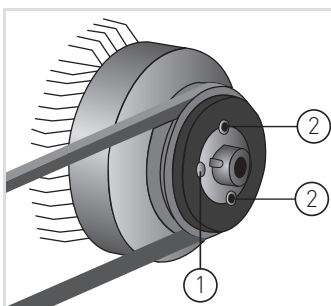


Figure 8-2:

- Slacken V-belt, refer to “Re-tensioning/renewing V-belt” on page 59, then:
- Remove V-belt.
- Release and unscrew both hexagon-socket screws (2).
- Screw a hexagon-socket screw into the empty threaded hole (1) and turn to loosen both pulley and sleeve.
- Pull the pulley unit off the motor shaft (fan shaft) and remove.

Commissioning and Maintenance

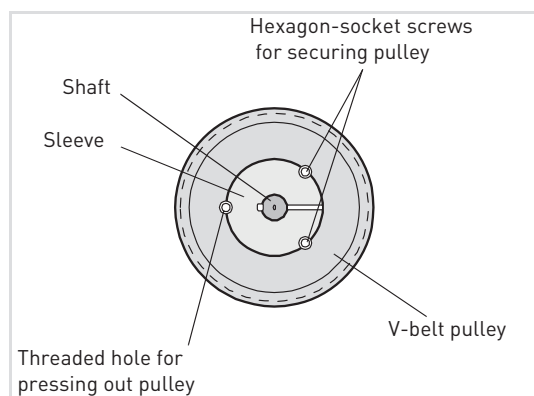


Fig. 8-3: Installing the V-belt pulley

To install the V-belt pulley, proceed as follows:

- Position the pulley and sleeve so that they engage with one another. Align both holes and screw in screws without tightening.
- Slide the pulley and sleeve along the shaft until it is as close as possible to the motor or fan (to keep leverage small) and align. (Alignment: refer to "Re-tensioning/ renewing V-belt" on page 59.)
- Tighten the hexagon-socket screws evenly.

- Please observe the maximum tightening torques of the hexagon-socket screws during installation:

Sleeve no.	1008	1108	1210	1610	1615	2012	2517	3020	3030	3525	3535
Max. tightening torque (Nm)	5.6	5.6	20	20	20	32	50	90	90	115	115

Tab. 8-4: Maximum tightening torques

- Check electric motors for soiling, damage and corrosion, also check mountings.
- Check motor and fan for bearing noise, replace bearing if necessary.
- Observe recommended lubrication intervals for fan bearings without lifelong lubrication (see Tab. 8-4). Please refer to the manufacturer's operation manual for the relevant lubrication intervals

Fan	Manufacturer					
	Comefri				Nicotra - Gebhardt	
	TLZ THLZ VTZ	TLZ-T THLZT VTZ-T	NTHZ-B NTHZ-R	NTHZ T1 NTHZ T2 NTHZ T2L	AT ADH - RDH	RLO
160						
180						
200		N				
250		N				
280		N				
315		N		N		
355		N		N		
400		N		N		N
450		N		N		N
500		N		N		N
560		N		N		N
630		N		N		N
710		N		N		N
800	N	N	N	N		N
900	N	N	N	N		N
1000	N	N	N	N		N
1120	N	N	N	N		N
1250	N	N	N	N		N

N = can be relubricated

Tab. 8-5: Lubrication intervals for non-lifelong lubricated fan bearings

Commissioning and Maintenance

Commissioning of direct driven fan unit



ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!

In doing so, be sure to observe the safety information on page 24.

- Remove any installation residues and foreign substances that may be present in the impeller and intake area.
- Check whether the motor protection has been set up correctly (also see enclosed project documentation and/or „Motor protection“ on page 18).
- With Y/Δ starting, set up the motor protection device for 58% of the rated current if the phase current flows through it – i.e. motor protection device must be installed between motor terminals U1, V1, W1, and not upstream of the switchgear in the supply feeder.

Maintenance of direct driven fan unit



ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!

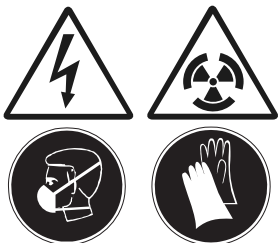
In doing so, be sure to observe the safety information on page 24.

The following maintenance steps must be carried out:

- Check electric motors for soiling, damage and corrosion, also check mountings.
- Check electric motors for bearing noise, have bearings replaced by specialist personnel if required.
- Check impeller (particularly welded seams) for cracks; have bearing replaced by specialist personnel if necessary.

Filter units

Commissioning of filter unit



ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!

OBSERVE PERSONAL PROTECTION MEASURES.

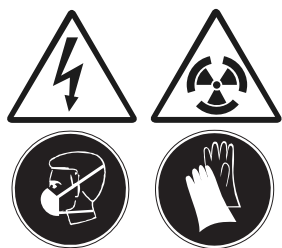
In doing so, be sure to observe the safety information on page 24.

The following commissioning steps must be carried out:

- Check filter unit and installed filter for damage.
- Check that the filter unit is correctly seated in the mounting frame.
- Clean the filter unit and system parts in the airflow direction upstream of the filter to remove installation dust, if required.
- The air handling unit and air ducts must be cleaned again before installing class F9 filters and higher.
- Bring the fan into operation then mark and record the initial pressure differential on the display unit (if installed).

Commissioning and Maintenance

Basic maintenance work to be carried out on all filters



**ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!
OBSERVE PERSONAL PROTECTION MEASURES.**

In doing so, be sure to observe the safety information on page 24.



DANGER DUE TO COMBUSTIBLE SUBSTANCES!

The filter material may be combustible and may easily catch fire. With used filters, the danger due to fire may be more acute depending on the substances filtered. Keep filters away from open fire!



NOTE

We recommend that you never operate the system without a filter – always keep a set of spare filters in reserve. Be sure to avoid damaging the surface of the filter as this may cause the filter to break down during operation which means that the filter class can no longer be guaranteed.



ENVIRONMENTAL DAMAGE!

Heavily contaminated filters are a danger to health and may adversely affect production processes. Depending on the substances filtered, contaminated filters may need to be treated as special waste and therefore disposed of professionally and in an environmentally sustainable manner in accordance with applicable guidelines and legislation.

As a general rule, all filters must be checked at regular intervals according to the operating conditions and renewed if necessary. The following maintenance steps must be carried out:

- Check filter for soiling, damage and odours.
- Clean filter section.
- Check whether the maximum permissible pressure differential (see Guideline RLT 01, for example) or pressure differential specified by manufacturer has been exceeded; if so, replace the filter.

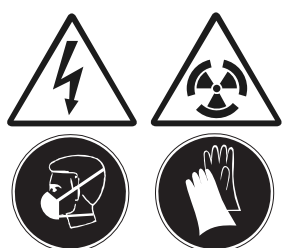
Hygiene inspection

Observe current guidelines and standards! We recommend the maintenance steps and intervals specified in VDI 6022

Even if the filter shows no visible signs of contamination, fungi and microorganisms may grow through the filter during long-term use (in air with low dust content).

- The filter must be changed regularly (at least every 6-9 months), even if contamination is barely visible.

Maintenance of bag filters/panel filters/fine-dust filters



**ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!
OBSERVE PERSONAL PROTECTION MEASURES.**

In doing so, be sure to observe the safety information on page 24.

Commissioning and Maintenance

The following maintenance steps must be carried out:

- Check filter and filter frame for soiling, corrosion and damage, renew as necessary.

The final pressure differential of the bag filter varies and can be obtained from the relevant technical data (see filter type plate).

- Replace the filter when the maximum pressure differential is reached.

Replacement of filter medium

- Open the service door/panels with sash fasteners when the system is inactive.
- Open the locking springs at the top and bottom guides or open the quick-release filter frame.
- Pull out filter frame.
- Renew damaged/contaminated filter.
- Push in filter frame. Make sure the seating is airtight!
- Close the locking springs at the top and bottom guides or close the quick-release filter frame.
- Bag filters may only be installed in an upright position!
- Close service door/panels with sash fasteners.

Maintenance of activated carbon filter



ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!

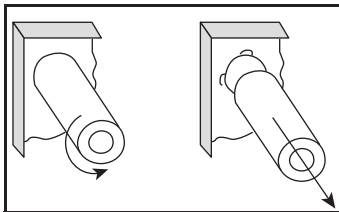
In doing so, be sure to observe the safety information on page 24.

The following maintenance steps must be carried out:

- If the activated carbon is saturated (when the planned number of operating hours has elapsed), replace the filter. In order to monitor the level of saturation in the filter, the cartridge can be weighed to determine the increase in weight and marked accordingly, then weighed again after a specific time period.
- Check that filter mounting plates with activated carbon cartridges are firmly seated. In order not to reduce the service life of the costly activated carbon filter, make sure that the pre- and fine-filtering stages are intact.

Changing activated carbon filters (cartridges)

- Switch off the system.



The cartridges are secured with special bolts (bayonet fitting).

- Turn the filter cartridges in the direction of the arrow and remove from the frame.
- Also replace the preliminary filter when changing the activated carbon filter.
- Dispose of the filters in accordance with the applicable regional regulations.

Commissioning and Maintenance

Maintenance of grease filter

In doing so, be sure to observe the safety information on page 24.



ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!

In doing so, be sure to observe the safety information on page 24.

To carry out the maintenance, proceed as follows:

The filter cells are made of aluminium wire weave and each air filter cell is equipped with an integrated grease collecting tray.

- Wash out filter cells every 3-6 months in a cleaning bath and clean grease collecting tray.

Maintenance of HEPA filter

Refer to the relevant documentation provided for information on maintenance.

Maintenance of all other filters

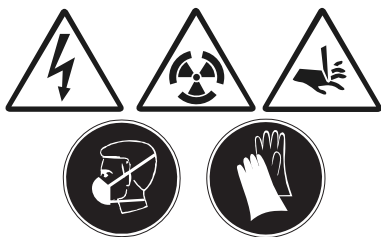
Refer to the relevant documentation provided for information on maintenance.

Heater section

Commissioning of heater section (LPHW)

ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24 and page 25.



Prerequisite:

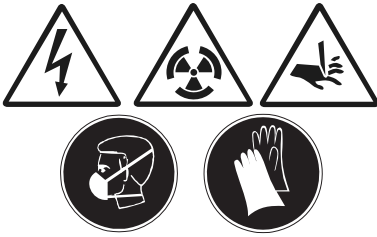
Commissioning:

The following commissioning steps must be carried out:

- Check that the configuration of the water inlet and outlet connections is correct.
- Counter flow principle with water inlet on the air outlet side.
- Check that shut-off devices and other fixtures have been installed correctly.
- Open air vents if automatic air vents have not been installed.
- Fill the system starting at the lowest point to prevent air cushions and water surges.
- Slightly open air vents and wait until water has filled the heat exchanger.
- Fully open air vents.
- Close air vents; if the levels are different: close air vents gradually until the water discharged is free of air.
- Switch on primary and secondary pump, check rotational direction and operate the system for a fairly long time.
- Reverse the position of the control valves (three-way valves).
- Perform another check by opening the air vents again.
- Check for tightness.
- Regulate the operation of the frost sensor to prevent over-conditioning.

Commissioning and Maintenance

Maintenance of heater section (LPHW)



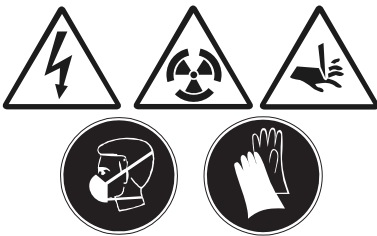
ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24 and page 25.

The following maintenance steps must be carried out:

- Check for tightness and for possible contamination on the air side.
- If there is a risk of frost, also check the safety devices regularly, or take appropriate precautionary measures such as draining the equipment or adding antifreeze.
- Check that pipe connections and mountings are secure.
- Clean air side as necessary (blow through heat exchanger using compressed air or low pressure water).
- Bleed.

Commissioning of heater section (steam)



ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24 and page 25.



DANGER OF SCALDING!

Hot steam will escape if the air vents are opened!

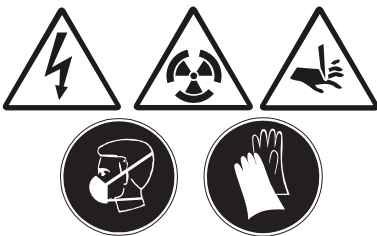
There is a danger of scalding. Open air vents carefully.

Always take suitable precautions before carrying out work.

The following commissioning steps must be carried out:

- Open drain valves and air vents.
- Open steam valves slightly then wait until steam emerges from the drain valves and air vents.
- Close drain valves and air vents.

Maintenance of heater section (steam)



ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24 and page 25.



DANGER OF SCALDING!

Hot steam will escape if the air vents are opened!

There is a danger of scalding. Open air vents carefully. Always take suitable precautions before carrying out work.

Commissioning and Maintenance

The following maintenance steps must be carried out:

- Check for tightness and for possible contamination on the air side.
- If there is a risk of frost, also check the safety devices regularly, or take appropriate precautionary measures such as draining the equipment or adding antifreeze.
- Check that pipe connections and mountings are secure.
- Clean air side as necessary (blow through heat exchanger using compressed air or low pressure water).
- Check that the steam inlet and condensate outlet are functioning correctly.
- Bleed.
- Check closed-loop control functions as necessary.

Commissioning of electric heater section



ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!

In doing so, be sure to observe the safety information on page 24.

- The heater coil may only be switched on if the minimum volume of air required for operation of the heater coil is flowing through it.
- Make sure that the fan runs on for at least 3 minutes once the heater coil has been switched off.

Maintenance of electric heater section



ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!

In doing so, be sure to observe the safety information on page 24.

- Dry clean on air side

Commissioning of direct (gas) fired heater section

Refer to the relevant documentation provided for information on commissioning.

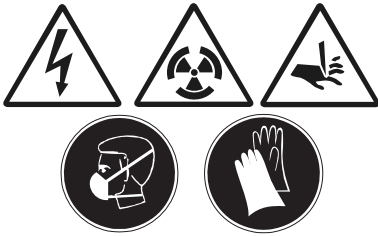
Maintenance of direct (gas) fired heater section

Refer to the relevant documentation provided for information on maintenance.

Commissioning and Maintenance

Cooler section

Commissioning of cooler with/without droplet eliminator



ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24 and page 25.

The following commissioning steps must be carried out:

- Clean condensate tray and condensate drain.
- Fill siphon with water, see „Connecting siphon and water drains“ on page 16; the water trap for the siphon must always correspond to the overpressure/ underpressure of the unit as a minimum requirement.

With droplet eliminator

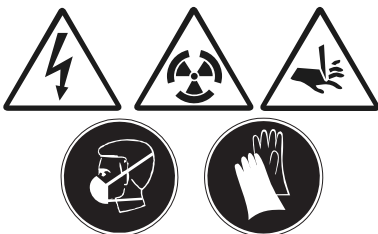
The performance of the droplet eliminator (DE) becomes fully effective once the separating agent is volatized following a start-up phase of approximately 4 weeks.

- Clean the droplet eliminator by rinsing it with water if necessary.
- Dust with lime if necessary.

If performance of droplet eliminator is not completely effective:

- Verify that the installation position of the droplet eliminator is correct.
- Check the velocity of air passing through the droplet eliminator.
standard DE $w_{\max}=3.8$ m/s
TA 100 High-performance $w_{\max}=5.8$ m/s

Maintenance of cooler with/without droplet eliminator



ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24 and page 25.

The following maintenance steps must be carried out:

- Check for tightness and for possible contamination on the air side.
- If there is a risk of frost, also check the safety devices regularly, or take appropriate precautionary measures such as draining the equipment or adding antifreeze.
- Check that pipe connections and mountings are secure.
- Clean air side as necessary (blow through heat exchanger using compressed air or low pressure water).
- Bleed.
- Clean condensate tray and condensate drain.
- Check siphon, top up as necessary.
- Clean droplet eliminator with descaling spray.

Commissioning and Maintenance

Further measures before the cold season

- Drain cooler coil before the start of winter if necessary. As the system pipes in this case have relatively small diameters, it must always be assumed that some water will remain in the unit following normal drainage. For safety reasons, the system must also be blown through with compressed air to remove any remaining water.

Evaporator/condenser

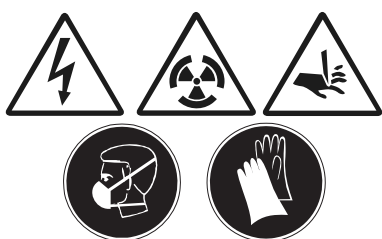


NOTE

The following tasks and any necessary repair work may only be carried out by refrigeration engineering specialists!

Be sure to observe regulations regarding refrigerants!

Commissioning of evaporator/condenser



ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24 and page 25.



DAMAGE TO THE UNIT!

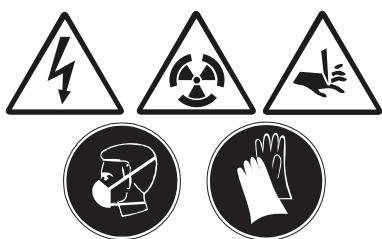
Make sure that the evaporator or condenser is never exposed to ambient temperatures higher than 60 °C (due to shutdown of the fan and/or water temperatures (heater coil) > 60 °C).

The following commissioning steps must be carried out:

- A protective gas charge must be available when making the connections.
- Check that the configuration of the water inlet and outlet connections is correct.
- Check that the shut-off devices and other fixtures have been correctly installed; counter flow principle with medium inlet on the air outlet side.
- Check that pipe connections and mountings are secure.
- Fill the refrigeration circuit with the medium for which the system was designed.
- Check tightness of system.
- Check that the safety valves are functioning correctly.
- Check the maximum temperature and pressure when the system is in operation (particularly when using R410A refrigerant)

Saturation temperature = 60 °C/Bursting pressure: 38 bar.

Maintenance of evaporator/condenser



ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24 and page 25.

Commissioning and Maintenance

Direct evaporator

The following maintenance steps must be carried out:

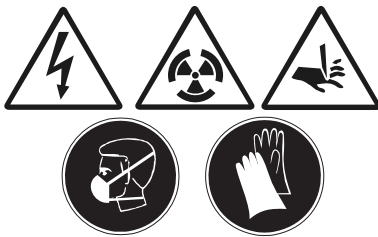
- Clean and check evaporator/condenser as described at „Maintenance of heater section (LPHW)“ on page 66.
- Make sure that all refrigeration components in direct evaporators (refrigerating machine, direct evaporator, distribution manifold, refrigerant lines, etc.) are working efficiently.

Heat pipe

Commissioning of heat pipe

ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24 and page 25.



The following must be checked during commissioning:

Upright heat pipe:

The warm air flow (exhaust air) must be at the bottom and the cold air flow (fresh air) must be at the top.

Heat pipe installed horizontally with fixed incline:

The warm air flow (exhaust air) must be at the bottom and the cold air flow (fresh air) must be at the top.

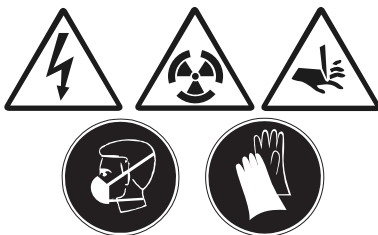
Upright or horizontal with bypass damper control:

For commissioning see „Commissioning of dampers and shut-off dampers“ on page 47.

Maintenance of heat pipe

ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24 and page 25.



The following maintenance steps must be carried out:

- Clean heat transfer fins regularly:
 - by blowing out the fins using compressed air against the direction of the air flow or
 - by spraying the fins using low pressure water only!
- Clean condensate tray and condensate drain.
- Check siphon, top up as necessary.
- If a heat pipe with bypass is used, the air control and shut-off dampers must be checked in accordance with the maintenance instructions (also see „Maintenance of dampers and shut-off dampers“ on page 47).

Commissioning and Maintenance

Liquid-coupled heat exchanger

Commissioning of liquid-coupled heat exchanger

See „Commissioning of heater section (LPHW)“ on page 65.

Maintenance of liquid-coupled heat exchanger

See „Maintenance of heater section (LPHW)“ on page 66.

Plate heat exchanger

Commissioning of plate heat exchanger



ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!

In doing so, be sure to observe the safety information on page 24.

- Check efficiency of damper where an energy recovery system with bypass configuration is used (also see „Maintenance of dampers and shut-off dampers“ on page 47).
- Check the function of the bypass damper as necessary.

Maintenance of plate heat exchanger



ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!

In doing so, be sure to observe the safety information on page 24.

The plate heat exchanger operates independently of any external, mechanical or electrical actuators, it has no moving parts and its service life is limited only by the effects of corrosion.

The following maintenance steps must be carried out:

- Carry out the cleaning depending on the type of contamination in the plate block. Remove dry dust and fibres at the exchanger inlet using a hair broom and blow out.
- Check the function of the bypass damper as necessary.
- Wet cleaning may only be carried out if a tray has been installed!
- Remove oil and fat deposits using hot water and fat-dissolving detergents.

Oil and fat
(kitchen exhaust air)

Commissioning and Maintenance

Routing of airflow in plate heat exchangers

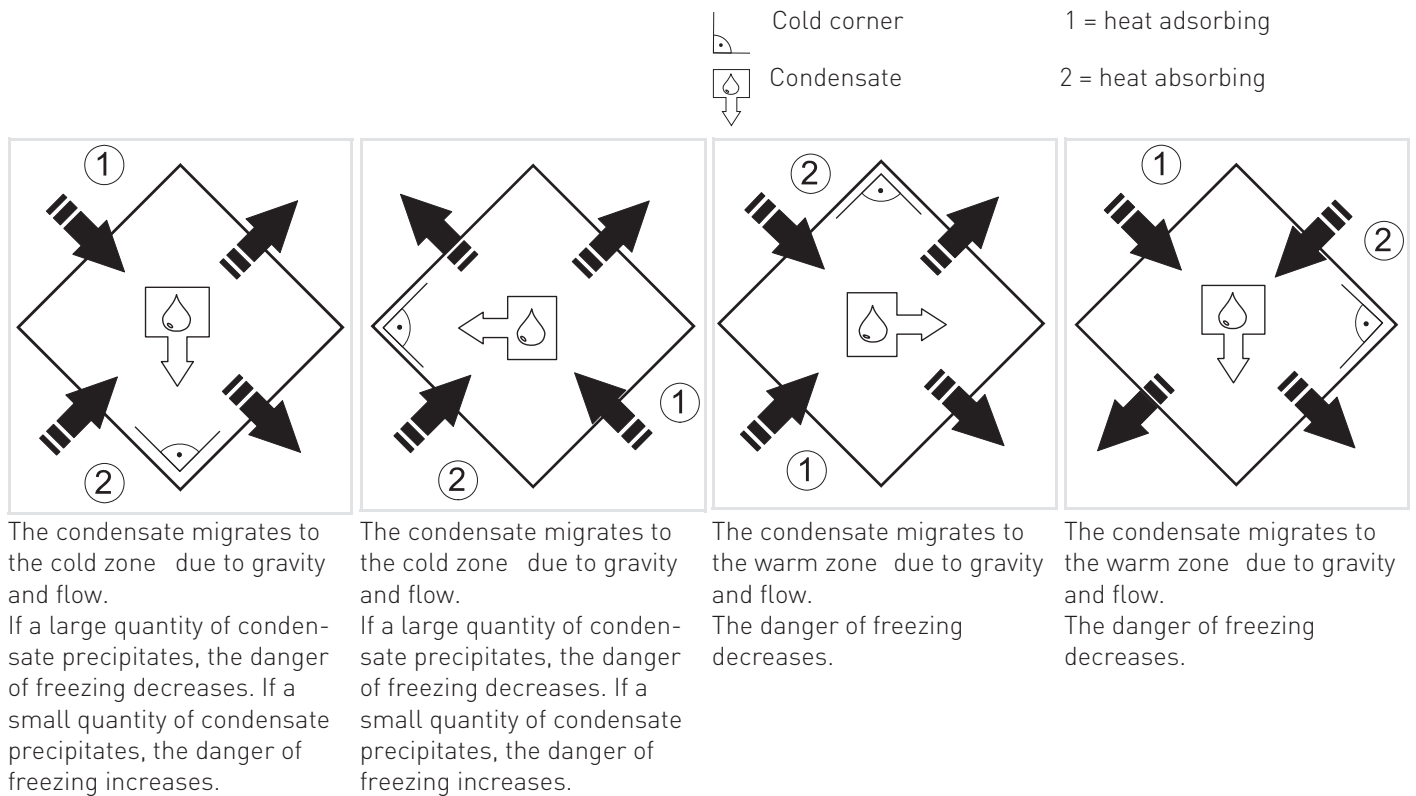
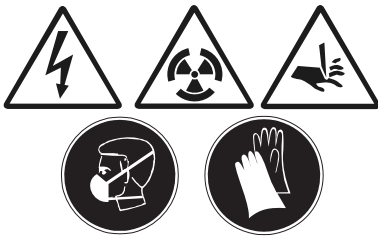


Fig. 8-6: Routing of airflow in plate heat exchangers

Commissioning and Maintenance

Rotary heat exchanger

Commissioning of rotary heat exchanger



ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

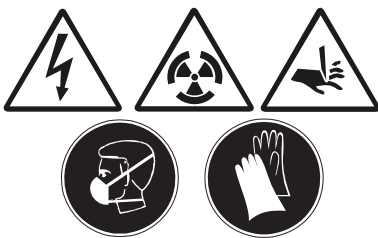
In doing so, be sure to observe the safety information on page 24 and page 25.

The following commissioning steps must be carried out:

- Check tension of drive belt, re-tension as necessary.
- Check rotary direction.
- Check position of flushing devices.
- Check seating of seals
- Check peripheral seal, adjust as required.
- Check alignment of motor.
- Check efficiency of damper where an energy recovery system with bypass configuration is used (also see „Maintenance of dampers and shut-off dampers“ on page 47).

Maintenance of rotary heat exchanger

The following maintenance steps must be carried out:



ELECTRICAL HAZARD, DANGER FROM ROTATING UNIT PARTS AND SHARP EDGES! OBSERVE PERSONAL PROTECTION MEASURES.

In doing so, be sure to observe the safety information on page 24 and page 25.

- Vacuum clean heat exchanger fins regularly with a vacuum cleaner (wet cleaning only permitted if a tray has been installed)
 - never clean the heat exchanger fins with high pressure water or steam.
- Clean chamber.
- Check efficiency of damper where an energy recovery system with bypass configuration is used (also see „Maintenance of dampers and shut-off dampers“ on page 47).
- Check peripheral seal, adjust as required.
- Check tension of drive belt, re-tension as necessary.
- Check alignment of motor.

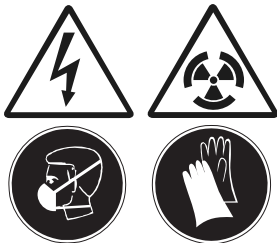
Humidifier unit

Refer to the separate documentation for information on commissioning and maintenance.

Commissioning and Maintenance

Dampers and shut-off dampers

Commissioning of dampers and shut-off dampers



For actuators

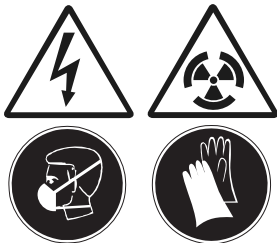
**ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!
OBSERVE PERSONAL PROTECTION MEASURES.**

In doing so, be sure to observe the safety information on page 24.

The following commissioning steps must be carried out:

- If several dampers are linked together, ensure that the linkage is seated correctly and check for ease of movement.
- Check that all screw connections and joints are firmly seated.
- Adjust the linkage so that a rotation angle of 90° is guaranteed, and so that the dampers reach their end position when closed (observe tightening torques).
- Check that the drive (damper actuator) reaches its end position.

Maintenance of dampers and shut-off dampers



**ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!
OBSERVE PERSONAL PROTECTION MEASURES.**

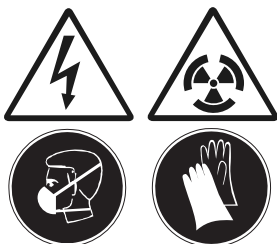
In doing so, be sure to observe the safety information on page 24.

The following maintenance steps must be carried out:

- Vacuum clean dampers (blow out), never apply grease!
- Detach the drive from the dampers and check dampers for ease of movement.
- Check that the drive (damper actuator) reaches its end positions.

Sound attenuator

Maintenance of sound attenuators



**ELECTRICAL HAZARD AND DANGER FROM ROTATING UNIT PARTS!
OBSERVE PERSONAL PROTECTION MEASURES.**

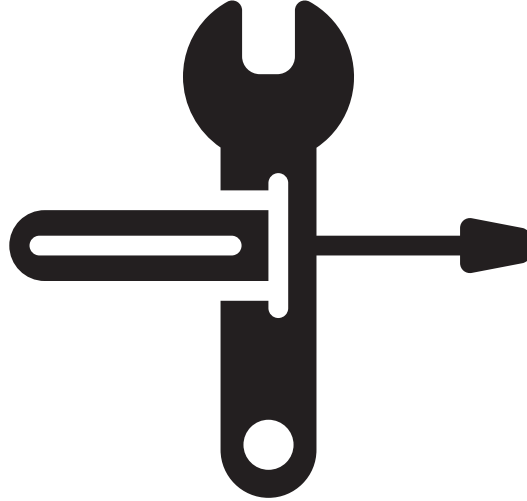
In doing so, be sure to observe the safety information on page 24.

The following maintenance steps must be carried out:

- Check the sound attenuator chamber and sound insulating splitters for contamination, clean as necessary using a vacuum cleaner.

EVO-MODULAR

AIR HANDLING UNITS



AERA AIR CONDITIONING & VENTILATION TECH.

Sales Office ■ Varyap Meridian, Grand Tower A Blok No:89 Ataşehir İSTANBUL

TEL +90 216 504 76 86 FAX +90 216 504 76 90

Factory ■ 3. Cadde No:13 Pancar OSB, Torbalı - İzmir

TEL +90 232 799 0 111 FAX +90 232 799 01 14

R&D Center ■ 10032 sokak No:2/1 B:210 Bilimpark İTOB, Menderes İZMİR

aera.com.tr

