

Maintain for future use!



## RAC-equipment

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## 1. General

### 1.1. Intended use

The unit supplied by Huber & Ranner GmbH may only be used for the treatment of air. This includes filtering, heating, cooling, humidifying, dehumidifying and conveying air. Huber & Ranner GmbH expressly excludes any other use.



Intended use also includes constant observance of these assembly, operating and maintenance instructions!

### Technical data

Please refer to the unit card for the technical data.

For technical queries, please contact our Service department.  
Phone: 0049(0)8531/705-45

Email: [service@huber-ranner.com](mailto:service@huber-ranner.com)

### 1.2. Hazards



**Do not open or enter the unit during operation!**

Wait for all rotating parts to come to a standstill.

#### Mechanical hazards

- Risk of crushing hands or fingers on suction side doors.
- Slamming of the doors when arranged on the pressure side.
- Faulty switching of dampers (overpressure or underpressure) can lead to the destruction of parts of the unit.
- Crushing of fingers when moving air control and shut-off dampers.
- Never put hands near rotating parts such as the fan, belt drive, heat recovery rotors, etc.
- Loose or non-fitting clothing near suction openings and belt drives can lead to life-threatening injuries!

#### Hazards due to electrical energy

- Risk of short circuits, when connecting electrical parts.

- Due to high voltage and high amperage, only work when disconnected from the power supply.
- Due to static charging of the housing, pay attention to earthing.
- All cables must be checked for installation damage before being put into operation.
- Risk of explosion when conveying explosive air (see Section 8: Ex-protection).

#### Hazard due to vibrations

Each drive has a critical speed range.

Operation in resonance areas may cause mechanical damage to the fan unit.

The resonance range of speed-controlled drives must be determined, bridged and documented during commissioning.

#### Danger due to operating materials

- **Refrigerants from direct evaporator or condenser must not escape into the environment.**  
In case of fire, toxic fumes and smoke (flammable materials) may be produced which must not be inhaled.
- Avoid physical contact with brine when filling, venting and emptying. Risk of poisoning and chemical burns! Observe manufacturer's information.
- Compressor oil may cause allergic reactions if touched or swallowed. Avoid physical contact.
- When cleaning the units, make sure that no concentrated dust from the filters and components is inhaled, as allergens, fungi and bacteria may be present.



#### Danger due to thermal influences

- Risk of burns from pipes.
- Hazardous operating media are electric heaters, steam humidifiers and hot water.
- Cold fire hazard due to cold parts (e.g. cold water pipes, refrigerant pipes) and cold components (e.g. radiator, suction chamber).

For more detailed hazards and their protective measures, please refer to the hazard analysis.



## 2. Safety

### 2.1. Safety provisions

The air-conditioning unit is built according to the recognised rules of technology and the current safety regulations. Nevertheless, improper or non-intended use may result in danger to life and limb of the user or third parties or impairment of the unit and other material assets.

The unit may only be operated in a technically perfect condition and in accordance with its intended use and in a safety and hazard-conscious manner. Faults that may affect safety must be rectified immediately.



Assembly work and commissioning may only be carried out by trained specialist personnel. Failure to carry out maintenance will invalidate the manufacturer's warranty. The basis for the warranty is also the conclusion of a maintenance contract with a qualified specialist company and proof of maintenance by means of records.

The pressure equipment installed in the unit is subject to periodic inspections by a qualified refrigeration specialist company in accordance with the German Ordinance on Industrial Safety and Health (BetrSichV).



The operating instructions must be read carefully by fitters, commissioning and operating personnel before assembly and commissioning. Only by observing these operating instructions can faults be avoided and trouble-free operation be guaranteed.

Unauthorised or unapproved conversions and modifications to the unit will invalidate the manufacturer's warranty.

The unit is part of a ventilation system and may only be operated after the entire system has been installed.

### 2.2. Information signs and their use



This symbol indicates an immediate danger. Failure to observe this information may result in injury to persons and damage to the unit.



"Environmental symbol" identifies the areas that will result in environmental impact if not complied with.

### 2.3. Safety instructions

To avoid overheating damage to the unit, only operate the steam heat exchanger when the fan is running. When using temperature limiters, it must be taken into account that the temperature monitor is set approx. 5K lower than the safety temperature limiter.

The approved pressure rating of heat exchangers and their piping must not be exceeded.

The accessibility of the safety-relevant components must be guaranteed throughout the entire service life.

The electrical connection and maintenance of electrical parts may only be carried out by a qualified electrician. VDE 100/DIN 57100 apply here in particular.

During initial connection and later inspection, the connection screws of the electrical connections must be tightened.

Special regulations, such as building authority guidelines on fire protection requirements for ventilation systems, are mandatory and must therefore be observed.



Refrigerant (odourless and tasteless) displaces atmospheric oxygen and can cause suffocation. In the event of a refrigerant leak, only enter the machine room with heavy breathing equipment.



When disposing of refrigerants, environmental protection regulations must be observed.

**For requirements for units in potentially explosive atmospheres, please refer to Section 8!**

### 3. Storage and transport

#### 3.1. Storage, intermediate storage

The components must be cleaned before storage: drilling chips in particular must be removed.

The units, components, assemblies and accessories must be protected from weather, moisture, dust and damage during storage. The open sides and the unit openings must be sealed with film to protect against soiling.

Please note that film covers that lie directly on galvanised sheets can cause damage to the zinc surface (white rust) within a day due to the condensation water that develops. Films should be avoided as far as possible for covering the units.



If assembly / commissioning does not take place immediately after delivery (max. standing time without operation approx. 3 months), all operating equipment (motors, pumps, fans, etc.) must be treated in the same way as for decommissioning. The components must be checked regularly for proper functioning.

Always store the components on a level surface with a secure footing. They must not be stored tilted, upside down or stacked on top of each other. The components should be placed on pallets or on squared timbers at each corner and, for spans over 2.0 m, additionally in the middle.



No foreign parts/small parts may be stored in or on the components. Moving parts such as the fan, rotary heat exchanger, doors, etc. must be secured against unintentional movement. The components must not be stored in the danger zone of other machines.

#### 3.2. Construction site transport

##### Transport in general

When the unit parts are delivered, they must be immediately inspected for transport damage and, if applicable, marked on the delivery note. Damage that is not noted cannot be taken into account.

Remove or secure any loose parts in or on the transport units. Do not climb onto the units without being secured and do not place anything on the units. The unit parts must not be transported or pushed on their sides or upside down. If a unit part is tilted for special reasons, then only on the open side, never on the side with covers and doors. Moving parts (e.g. fan, rotor) must never be tilted as the shaft must always be horizontal.

The unit parts may only be moved and positioned with suitable transport tools. Check the weight of the components beforehand. Secure transport routes. It is forbidden to move under the load.



During transportation, pay special attention to all register connections, protruding parts such as door handles, electrical attachments and openings in the floor area in order to prevent damage.

Only transport system parts with the doors closed.

Before transportation, the component must be checked for damage.

##### Transportation with forklift truck

The component to be transported must rest continuously on the forks. Forks must be at least 100 mm longer than the width of the unit. Forks that are too short cause damage to the base plates. The centre of gravity must be between the forks, towards the forklift side, to avoid tipping of the components. Here, the attached notes on the danger of tipping over must be observed.





On the truck, the unit parts must be carefully lifted with tyre irons so that the forklift truck can drive in.



The maximum load capacity of the forklift truck must not be exceeded when transporting the modules. If the unit is equipped with a sheet metal base frame, the fork carrying width of the forklift truck must be at least 1310 mm in order to be able to use the transport openings provided.

#### Transportation with crane

Only cranes, load lifting devices, slings etc. that are suitable and approved for this purpose may be used to transport the unit parts. Hangers, lifting slings or other lifting tools must not damage the component.



For crane transportation, the crane eyes provided for this purpose are permissible up to max. 1700kg/delivery unit (max. suspension angle of 60°), or crane eyes and lifting beam (vertical load) up to max. 2500kg/delivery unit. When using lifting slings / round slings without a base frame (max. 3500kg/delivery unit) or with a base frame (max. 5000kg/delivery unit), ensure symmetrical load distribution to prevent slipping or tipping. The (partially) supplied base frame eyelets are to be used. Check the crane eyelets are mechanically secured. Loosened crane eyelets must be screwed down as far as they will go.

After setting up the units, please return the crane eyelets to our factory, except for the crane eyelets of roof units. The crane eyelets located on the roof must not be removed, otherwise the leak-tightness of the roof is not guaranteed.

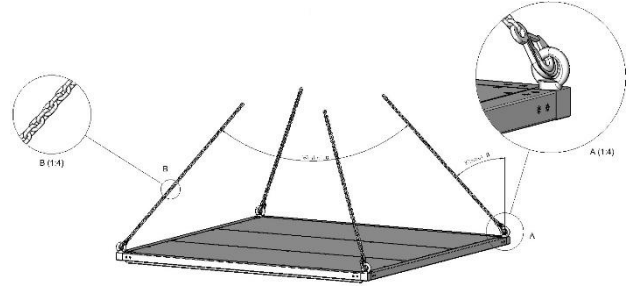
For all other crane eyelet holes, the supplied cover plugs must be fitted. Even with 2-storey units, the plugs must be fixed to the lower parts of the unit.

Huber & Ranner GmbH  
Gewerbering 15  
94060 Pocking

When transporting by crane, a suspension angle of  $\beta=60^\circ$  ( $\alpha=120^\circ$ ) to the vertical must not be exceeded. Alternatively, lifting beams

can be used. The load must be distributed symmetrically to the centre of gravity in order to exclude slipping or tipping.

All safety provisions according to UVV BGV D6 Cranes and BGR 500 Chapter 2.8 apply.



Lifting off the truck or ground must be done slowly and carefully. Jerky movements must be avoided.

#### Transportation with pallet truck

The component should also rest continuously on the forks when transporting with a pallet truck. If the unit is larger than the pallet truck, a second pallet truck/forklift must be used for transport at the same time.



#### Transportation on iron rails / timbers

It must be ensured that the unit profile always rests on the transport devices.

The contact surface of the transport equipment must not cause damage to the unit.

#### Container transport

An additional transport protection is required for all fans to ensure safety during container transport.

This may only be removed after installation has been completed.

## Transport TB-2 aluminium construction

### Transport with sheet metal base frame:

The circular openings in connection with the transport pipes are provided for crane transport. The transport openings are located on the operating and rear sides of the modules. In order to avoid tilting during transportation with narrow modules, the openings here are offset to the front sides. The transport pipes are pre-assembled and supplied in sufficient quantities for the entire system.



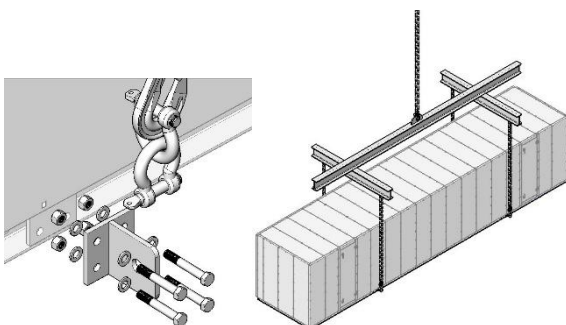
For crane transport, the pipes must be guided through the openings on both sides. The previously removed M10 threaded rod must then be screwed tight again. The threaded rods prevent the load straps, lifting straps, round slings etc. from slipping off during the lifting process. Protrusion of the pipes approx. 100mm on both sides. Only the supplied pipes may be used for crane transport. In the case of weatherproof modules with a rain roof, spacers (squared timbers or similar) must be fitted between the module and the slings to prevent damage.



Maximum permissible weight load per module 2500 kg.

### Transport with U-shaped steel base frame

For crane transportation, retaining plates are welded to the sides of the U-steel base frame, to which the transport holders shown are bolted. With this variant, the transport straps may only be loaded vertically. Once the modules have been installed, the holders can be removed.

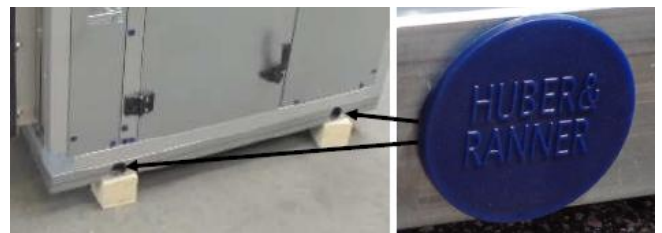


Maximum permissible weight load per module 5000 kg (light version) or 8000 kg (heavy version)

Once the unit has been installed, the crane eye brackets are to be returned to Huber & Ranner.

### Transportation with intermediate base frame

For modules installed on top of each other, an intermediate base frame (square 60x60mm) is used. The transport pipes supplied must also be used here. Both the base frame and the intermediate base frame must be closed with the blue cover plugs (figure) included in the scope of delivery after installation.



Intermediate base frames that are in the air flow must also be sealed on the inside with the blue cover plugs.

### Transportation with forklift

For transport with a forklift, use the forklift cutouts. The module to be transported must rest continuously on the forks. The forks of the forklift must be at least 100mm longer than the module width in order not to damage the base plate.



### Special transport for split modules

Split modules, e.g. rotor (max. weight 600kg), which structurally cannot be equipped with either a base frame or an intermediate base frame, can be transported with eyebolts (M8). Here, a special screw is screwed into the plastic corner in the upper part where the eyebolt is screwed in. These screws may only be subjected to horizontal loads. The use of a lifting beam is mandatory. Lifting with slings is not permitted.



Split modules over 600kg are to be transported with the help of lifting slings.

Sliding the modules over the floor is not permitted.

## 4. Assembly

### 4.1. Foundation / base frame

Before placing the housing modules, the foundations and base frames must be checked for stability and tight screw connections. The support surface must be flat. Tolerance to the horizontal max. 0.5%. Deflection of steel construction max. 1 / 1000 of the beam length. Uneven surfaces cause doors to tilt, which may lead to leaks and rubbing on the profile. The installation surface must be level to ensure that the heat exchangers and troughs installed with a slope can be drained.

Before being put in place, the foundations and base frames must be cleaned and free of ice.

Place the units on a level and firm foundation. Uneven areas must be evened out with appropriate underlays.

The foundation area should correspond to the size of the unit. If a strip foundation (concrete or steel beam) is used, the unit must rest on the outer unit frame. The minimum support width is 55mm. In the case of strip foundations from a device width of 2.0 m, cross beams or longitudinal beams are also required at the start and end of the device and at the component separation points.

For units with base frames, distance support points should be placed between the unit and the foundation with a max. distance of 1.2 m. For divided base frames, supports must be provided at the divisions.

For units without a base frame, a continuous support must be ensured.

The max. equipment floor load of 100 kg/m<sup>2</sup> must be observed.

When determining the height of the foundation, the necessary siphon height must be taken into account.



The doors must move freely, the installation elements must be able to be removed and the component connections must be perfectly sealed if the components are to be precisely aligned.

The units must be protected from construction dust and dirt as well as from damage until commissioning!

For units that stand side by side, the foundation in the middle area must also support the base frame!

### 4.2. Unit installation

Accessibility for repair and service work must be guaranteed.

In particular, it must be ensured that there are no obstructions in the area of the pull-out for all pull-out components after the ventilation system has been installed.

In addition, the pivot area of the doors must be kept free, and no obstacles, such as lines or pipes, may be laid in front of removable panels.

The unit must be precisely aligned horizontally and vertically by placing blocks underneath it.

Dirt (especially drilling chips) introduced during transport, installation and assembly must always be removed as soon as possible.

We also recommend cleaning the interior before commissioning.

### Outdoor installation

When using a roof connection frame, make sure that this is insulated, as condensation can occur.

**The air conditioning unit in weatherproof design is not a replacement for a roof!**



The external joints of the components must be grouted with the enclosed permanently elastic and weatherproof sealing compound. When installing the modules on top of each other with an intermediate base frame, the intermediate base frame must also be neatly sealed with the weatherproof sealing at all joints and at the connections to the modules.

For roof-mounted units (weatherproof version), a rain canopy made of sheet metal is also supplied.

The installation of the rain canopy is usually already carried out at the factory. For larger units, on-site installation may be necessary. The parts required for this are to be completely screwed and sealed on site.



The unit roof is only partially walkable. If accessing the unit roof is unavoidable, care must be taken to avoid any damage to it. It is recommended to cover the areas that need to be walked on with broad load distribution panels to ensure even load distribution. The roof of VAC units is not designed to support additional roof loads. VAC units are not intended to serve as supporting structures for other installations (e.g., ventilation ducts, maintenance platforms, cable trays, etc.).



When sealing, proceed as follows:

Stick the sealing tape to the flange of the rain canopy, grout with permanently elastic sealing compound and cover with the loosely supplied profiles. The cover profile is then screwed to the flange of the rain canopy.

If paintwork was damaged during assembly, it must be touched up.

Depending on the wind load, the air conditioning unit is safe and structure-borne noise is decoupled when connected to the substructure.

### 4.3. Structure-borne sound decoupling

The units must be installed in such a way that they are decoupled from structure-borne sound.

#### To the foundation

In order to achieve structure-borne sound and vibration damping, an appropriate underlay (e.g. elastomer strips) must be laid between the unit base frame and the foundation on site, whereby the manufacturer's specifications must be observed. In general, the units should be underlaid on the front sides, the component centres and, from a component length of approx. 1.2 m, also on the long sides.

#### To the duct

The units are to be installed decoupled from the duct network.



For hygienic units, the decoupled duct connections must not have any grooves or indentations.

### 4.4. Equipotential bonding / earthing

All electrically non-conductive connection points must be bridged with equipotential bonding, e.g. flexible connections, fan-motor unit. The entire unit must be earthed.

Sufficient lightning protection must be provided for outdoor installation.

### 4.5. Frost protection

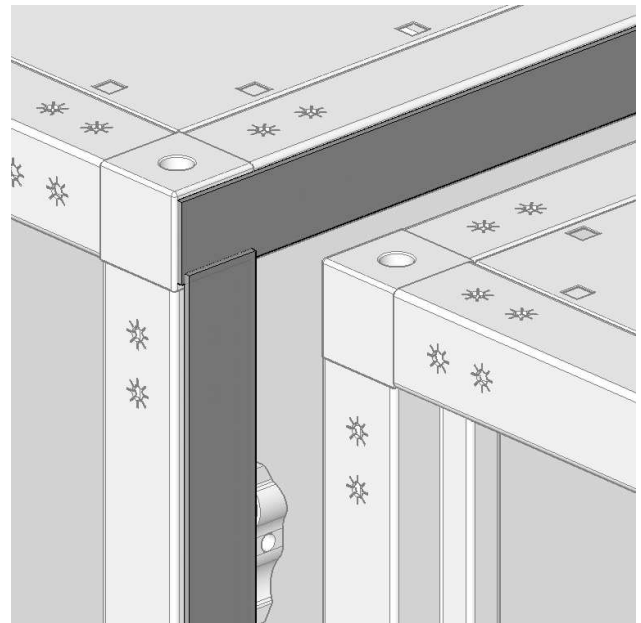
The frost protection capillary tube must be braced evenly over the entire heat exchanger surface at the air outlet of the heat exchanger.

The frost protection capillary tube must not be kinked or damaged in the process.



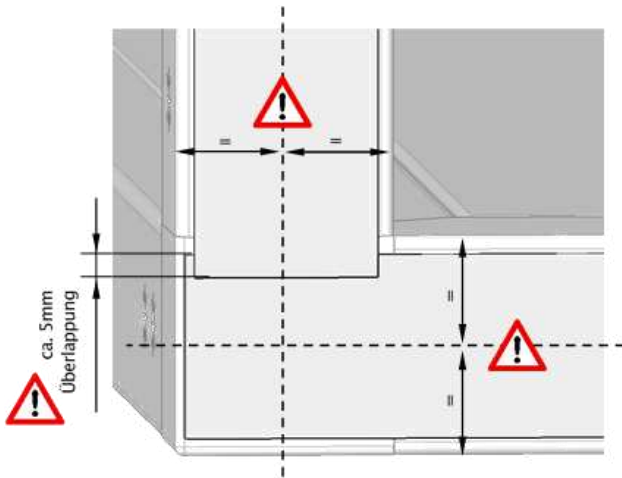
### 4.6. Unit connection

The assembly material is enclosed. It is located in the marked unit modules.



To connect the unit parts, the following work must be carried out:

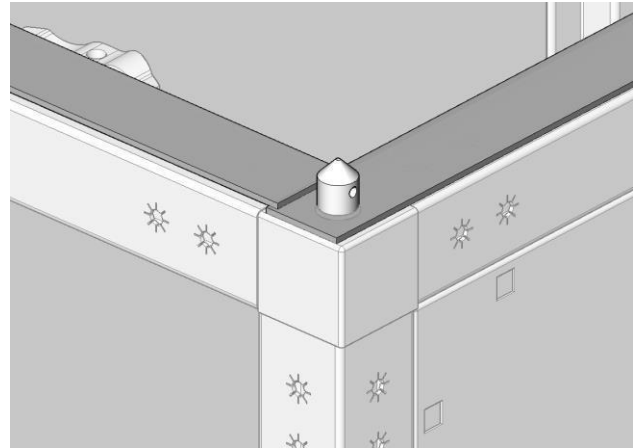
- Stick the self-adhesive seal onto the profile frame in 2 strips per separating point on one part of the unit.



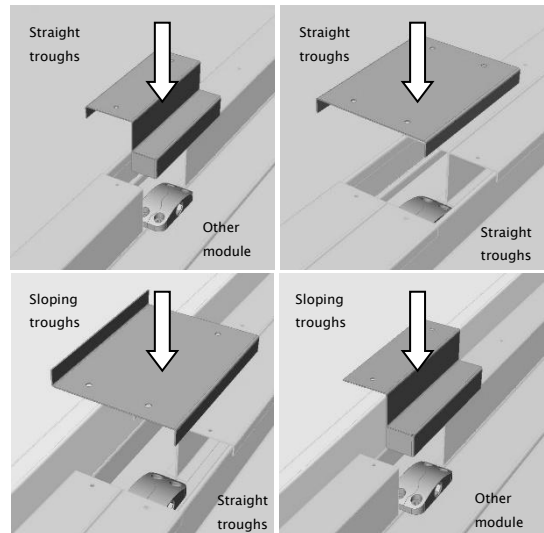
- All seals must be glued in the **centre** of the profile **and overlap by approx. 5 mm (bottom or top)**.
- **Please note the different procedure for the scrubber housing. See chapter 4.13.**
- Push the unit parts together with a winch until they lie exactly against each other.
- **Do not use the screws to pull the unit parts together. Danger of deformation!**
- Then fix with screws. On the units, connect the unit parts with the fasteners provided.



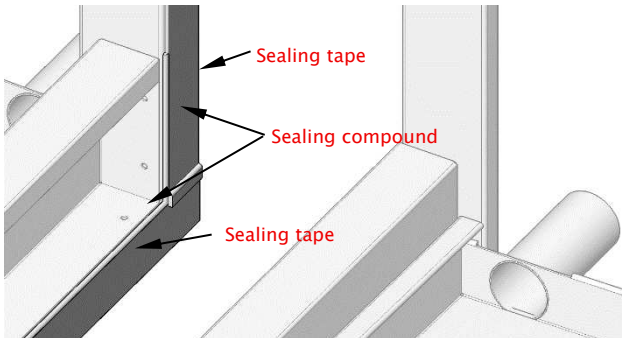
- For large unit depths, the modules must be connected with additional central screw connections.
- For units in split design, guide bolts have been developed as assembly aids for better centring of the upper modules. These guide bolts are screwed into the upper corners of the unit after delivery of the units to the construction site. The thread must have disappeared completely into the aluminium corner.



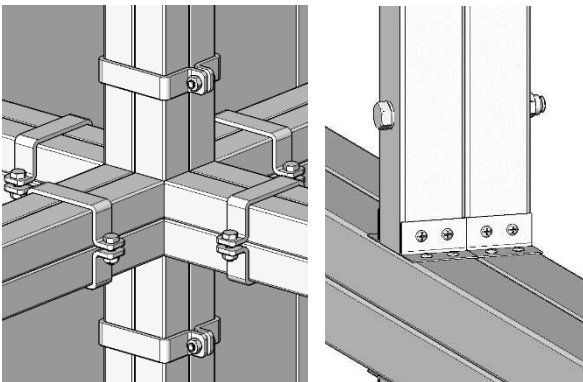
- For unit widths between 2000 and 3000mm, the supplied trough connectors (see diagram) must be fitted on site.



- When joining two modules where two trough covers meet at the unit partition, difficulties may arise in properly sealing them with sealing compound. To ensure a reliable seal, sealing compound must be applied over the self-adhesive sealing tape at the unit partition before sliding the modules together. This must be carried out on the lower horizontal profile as well as on the vertical profiles up to the level of the trough cover. If the sealing compound is applied to the top of the trough covers only afterwards, this will inevitably result in leaks.



- For large units, the square tubes (VK50) must also be connected with connecting clips.
- Fastening of the clamping brackets for **4x VK50** (for height division and/or width division):
- **Height division** (horizontal VK50):
  - 1) Front & rear always with edge distance of **110mm**.
  - 2) Profile length  $\geq 5000\text{mm}$  &  $< 6000\text{mm}$  → **1 additional piece** each between frame profile and VK50.
- **Width division** (standing VK50):
  - 1) Top & bottom always with edge distance of **110mm**.
  - 2) Profile length  $\geq 2500\text{mm}$  → additional **1 piece**.
- Fastening of the clamping brackets for **2x VK50** (uprights/standing VK50) or with M10x120 through bolts and M10 lock nuts: (profile length):
  - 1) Top & bottom always with edge distance of **110mm**.
  - 2) Profile length  $\geq 2500\text{mm}$  → additional **1 piece**



- Finally, seal the separation point of the unit parts on the inside with the sealing compound supplied.

#### 4.7. Installing or removing the fan

For the installation and removal of a motor or fan, a removal rail can be supplied in an individual design as an accessory.

The motor is transported in the system by means of a trolley. The drive motor can be placed in front of the unit, e.g. on a pallet truck.

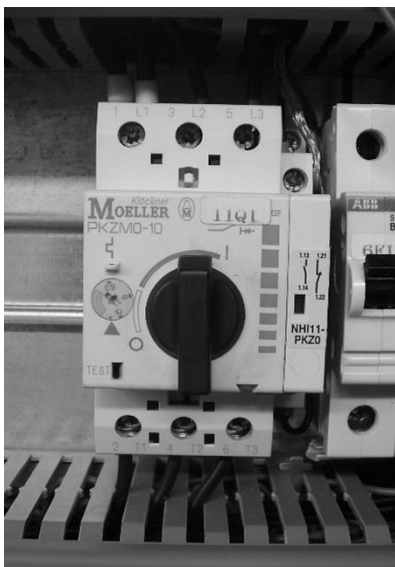


The roller and chain hoist are to be installed for maintenance purposes only and must be removed upon completion of the work. They must not remain in the unit during ventilation operation. The pull-out rail, roller and chain hoist must be inspected regularly in accordance with DGUV V54 (Winches, Hoisting and Pulling Equipment).

#### 4.8. Motor protection

Protect motors against overload according to DIN EN 60204 / DIN VDE 0113.

Provide a motor protection switch and set it to the rated motor current (see type plate). A higher setting value is not permitted!



Protect motors with built-in PTC thermistor sensor using a PTC thermistor tripping device.

Motors with a rated power of up to 3 kW can generally be switched on directly (observe the power limitations of the responsible power supply company). Provide star-delta starting or soft starting for larger motors.

Safety precautions against overload, short circuits, over- or undervoltage and excessively high ambient temperatures must be taken by on site.

Particular care must be taken when connecting motors, especially on units equipped with two-speed motors. The connections must be made according to the information on the type plate and the connection diagram on the inside of the motor terminal box.

Fuses and circuit breakers are not sufficient motor protection. Damage caused by inadequate motor protection voids the manufacturer's warranty.

#### 4.9. Electrical connection

All electrical work may only be carried out by qualified personnel with relevant electrical knowledge in the activated state and secured against being switched on again.



All electrical connections must be made in accordance with the applicable international, national and local regulations and directives, as well as the manufacturer's specifications.

To prevent damage, it is essential to observe the connection diagram in the terminal box.

When electrically connecting weatherproof units, ensure that they are watertight. Connection from below or waterproof screw connections (at least protection class IP65) with sufficient cable radius.

Check all electrical connections (control cabinet, frequency converter, motor, etc.) are mechanically secured and tighten if necessary (see also DIN 46200).

All power cables that are routed through the housing must be fixed in place and protected against damage.

To prevent overheating of the air heaters, it is essential to observe the overrun time of the fan. Depending on the size, set 6 – 8 min.

If modifications are made to the unit afterward, such as attaching cable trays with screws, Huber & Ranner can no longer guarantee compliance with the declared tightness class. In such cases, it is strongly recommended to use sealing rivets instead of screws.



#### 4.10. Pocket filter

The filter pockets are to be fixed in the installation frames with clamping devices. Care must be taken to ensure an airtight fit in the installation frame.

When installing, make sure that the pocket filter is in the correct position and that the filter surface is not pinched.

**Damage to or pressure points on the filter surface must be avoided at all costs, as otherwise the filter may tear during operation and the filter classes are no longer guaranteed.**



Pull-out filters are to be fitted laterally into the existing slide-in rails. Care must be taken that a seal is applied between the filters.

The ATEX filter must be connected to earth. All conductive and dissipative parts must be be interconnected and earthed.



Constant checking and cleaning of the filters is of great importance and therefore requires special attention, because dirty filters reduce the air performance and pose an increased hygienic risk if they are left standing for a long time.

#### 4.11. Heat exchanger connection

Only connect the heat exchangers in counterflow, otherwise the performance cannot be guaranteed.

Supply and return pipes must be connected in such a way that no vibration transmissions and thermal stresses can occur. The connections are to be made according to the designation "flow", "return". Before connecting, check the position of the identification plates against the drawing and the function. Flanges, connections and shut-offs in flow and return must be arranged on the unit in such a way that the air heater can be removed without major dismantling work.

All screw connections, flanges, etc. on the pipe side must be checked to ensure they are mechanically secured and free from leaks during installation.

Proper venting and draining of the air heaters and pipelines must be ensured on site.

When tightening the on-site threaded connections on the connection pipe of the heat exchanger, they must be held carefully with a pipe wrench, otherwise the internal pipes will be twisted off and damaged.



If there is a risk of frost, the heat exchanger must be secured against freezing.

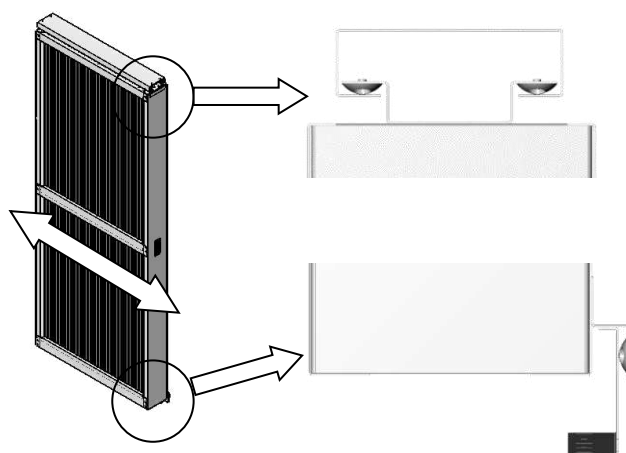
It is to be expected that residual water will remain in the heat exchanger during normal draining. For safety reasons, compressed air must be blown through the heat exchangers (danger of freezing!).

#### 4.12. Droplet separator

To assemble and dismantle the droplet separator, the removable panel must be removed.

The droplet separator cassettes are hooked onto the upper runner and the lower guide rail and pushed into and pulled out of the unit from the side.

When installing the cassettes, pay attention to the direction arrow in the air direction.





#### 4.13. Scrubber housing

Transport the scrubber housing to the specified location and align it precisely horizontally and vertically by placing blocks underneath it.

Dirt (especially drilling chips) introduced during transport, installation and assembly must always be removed as soon as possible. We also recommend cleaning the interior before commissioning.

To connect the scrubber housing to the other modules, carry out the following work:

- Stick the self-adhesive seal onto the profile frame in 2 strips per separating point on one part of the unit.
- The profile frame must be filled with sealing compound inside the seal.



- Push the unit parts together with a winch until they rest exactly against each other.
- **Do not use the screws to pull the unit parts together. Danger of deformation!**
- Then fix the panel of the H&R module to the scrubber housing with screws on the inside.
- On the outside, the scrubber housing is also screwed to the other modules. The enclosed assembly material is used for this purpose.
- Remove any excess sealing compound.
- If necessary, roof parts must be put on and fitted accordingly.
- After the unit parts have been connected, the joints must be sealed all around on the inside with sealing compound.

#### 4.14. Steam heater connection

The safe drainage of the condensate arising must be permanently guaranteed.

For controllability in partial load operation, each steam coil must be equipped with its own steam trap.

#### 4.15. Connection of the refrigerant pipe

The specifications from the chapter 'Connection of heat exchangers' must be observed.

Before connection, check whether the inert gas filling of the evaporator is still present in the factory.

The maximum operating conditions (pressure, temperature, etc.) must not exceed the permissible factory specifications.



Since this is a pipe system with a relatively small diameter, refrigerant must always be expected to remain in the heat exchanger during normal extraction. For safety reasons, compressed air must also be blown through the heat exchangers.

#### 4.16. Air duct connection

The connection of the air ducts with flexible connectors must be tension-free. The installation length of the flexible connector must never be the stretched length.



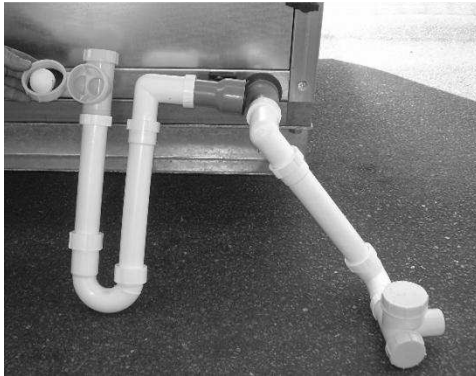
During installation, the earthing, the protective conductor system and the equipotential bonding must be connected properly.

It cannot be guaranteed that the weight of the duct can be supported by the connection frame or flexible connector. This must be assessed for each individual case by the customer.

#### 4.17. Connection of the drain lines

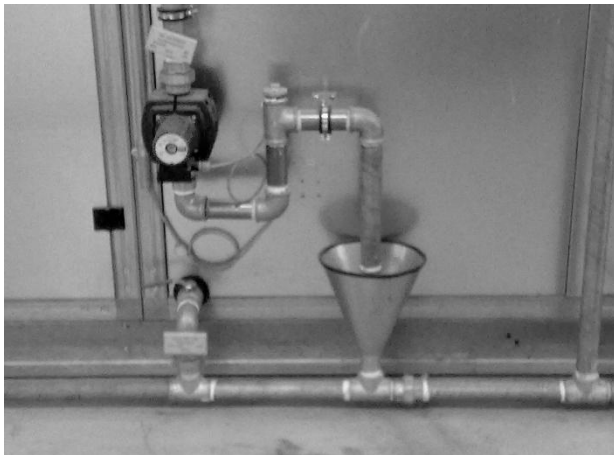
In all cases where water accumulates during operation, each condensate drain must be connected to a frost-free siphon in the immediate vicinity of the unit in order to ensure trouble-free drainage, to avoid unpleasant smells, to prevent leakage or the intake of false air. This applies to the suction and pressure side.

We recommend using a ball siphon on the suction side and a normal siphon on the pressure side (remove ball).



The siphon height must be correctly dimensioned depending on the pressure head.

Each siphon must discharge freely via a funnel on the manifold.



Horizontal drain pipes must have sufficient diameter, slope and ventilation and venting for trouble-free water drainage.

Other drain pipes (e.g. for cleaning troughs) must each be fitted with a stopcock if they are connected to the drainage system. The drains must not be joined before the siphon or stopcock. Trough drains that cannot be connected for technical reasons must be sealed airtight.

Assembly and design according to the siphon assembly instructions.

#### 4.18. Gas surface burner

The regulations and manufacturer's instructions for the burner and gas connection must be observed.

When assembling the unit, any conditions imposed by the approval authority, all local regulations and the requirement of the DVGW and the TRGI must be strictly observed.

#### 4.19. Direct-fired heat exchanger

The burner must be attached to the burner connection plate provided.

The length of the flame tube of the oil or gas burner must be adapted to the combustion chamber of the hot air heater in such a way that the flame only exits the flame tube inside the combustion chamber.

The heat exchanger must be installed with a slope in the direction of the condensate drain.

The regulations and manufacturer's instructions for the burner, fuel connection, condensate drainage, fresh air supply and chimney must be observed.

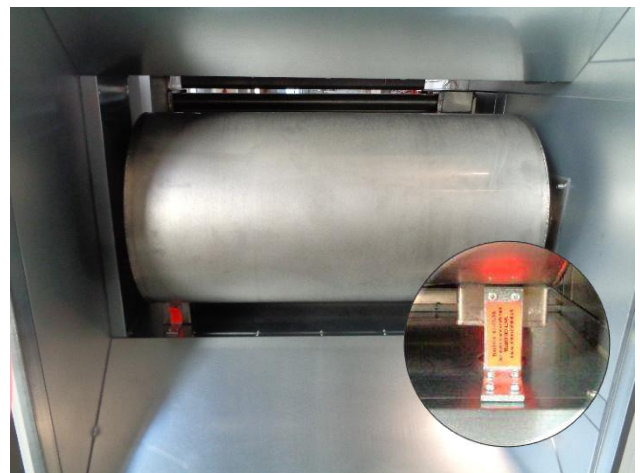
Condensate must not be allowed to remain in the heating register under any circumstances and must drain off freely at all times. The condensate drainage must therefore be connected.



The safety temperature limiter must be installed 50 cm to 100cm downstream of the air heater.

For direct-fired heat exchangers, angle brackets are installed as transport protection.

These securing elements must be removed on site after installation.



#### 4.20. Electric air heating registers

To prevent condensation from forming on the outside, the outside of electric air heaters with a flange plate must be insulated. The insulation must be fitted on site.





#### 4.21. Plastic window

In the case of galvanised sheet metal or galvanised-painted sheet metal, the plastic window must be inserted into the opening and fastened with 8 rapid-fit screws with a maximum torque of 3.3 Nm.

The plastic window may only be cleaned with a neutral cleaner or detergent solution on a microfibre cloth.



## 5. Commissioning and maintenance

### 5.1. Housing / Units

#### General



Before opening the doors, the fan must be switched off, disconnected from the mains and come to a standstill (wait at least 2 minutes).

The relevant provisions and local regulations apply to the electrical installation.

The accident prevention regulations must always be observed! Point loading of the units must be avoided (e.g. ladder on the unit) as this can lead to damage.

A functional test of the safety measures should be carried out regularly at nominal air volume!

The operator of the central unit is obliged to allow only such persons to work on the unit who are familiar with the basic regulations on work safety and accident prevention, as well as these operating and maintenance instructions, and who have been instructed in the handling of a fan.

**The operating instructions must be kept at the place where the air-conditioning unit is used at all times.**

#### Commissioning

To be able to carry out commissioning, the system must be completely assembled, all media connected and all electrical parts wired.

Close the drain valves during operation.

Before switching on the system, a protective conductor test must be carried out.

A functional test and a performance measurement must be carried out and a record made of this.

Check the flanges and screw connections for leaks.

#### Maintenance

- Check all unit chambers for dirt and damage, clean chambers if necessary.
- Check drains for free discharge.
- Check doors for leaks and locks for function.
- Check duct connection joints for leaks.
- All joints are maintenance joints. These must be checked at regular intervals and renewed if necessary. In this way, consequential damage can be avoided.

After completing the maintenance work, all points for commissioning must be observed when switching on the unit.



### 5.2. Fan

#### Commissioning

Before commissioning the fans, the following conditions must be met:

- Duct network connected.
- Exhaust air and supply air lines open.
- The duct network and unit chamber must be free of foreign bodies and contamination.
- Check the fan wheel for free running by turning it by hand.
- The transport locks must be removed.



- All inspection doors must be closed.
- Check V-belt tension.
- Set max. speed according to the type plate on the FI.
- After fitting the motor and impeller, the overlap dimension of the nozzle and impeller must be set correctly, otherwise there will be a reduction in performance. Depending on the make, type and size, the overlap dimension can be taken from the manufacturer's documentation or obtained by contacting Huber & Ranner.

After connecting, carry out a test run to check the performance and direction of rotation of the motor.

Check the fan direction of rotation according to the direction arrow on the housing by briefly switching it on. If the direction of rotation is incorrect, reverse the polarity of the motor observing the safety instructions.

After the fan has reached operating speed, immediately measure the current consumption of all three phases with the doors closed. The measured values must not exceed the nominal values on the type plate (and thus the nominal motor power). Switch off immediately in case of overcurrent. Check motor connection in case of unequal phase current.

Observe the manufacturer's specifications for the maximum motor ambient temperature.

Any combination of frequency converter, motor and fan can start vibrating at one or more frequencies. During commissioning, these vibrations must be determined and suppressed in the frequency converter.

### **Maintenance**

- If necessary, clean the fan to eliminate imbalance.
- Check bearings and relubricate if necessary. Observe relubrication intervals!
- Check the vibration damper for function.
- Check fastening screws, tighten if necessary.
- In case of abnormalities (noises), check fan and motor bearings.
- In case of abnormalities (vibrations), check fan impeller without V-belt for imbalance (impeller must stop in any position).

### **Decommissioning**



If the fan is left standing for a longer period of time, it must be rotated once a month to avoid one-sided loading of the bearings. For downtimes of 3 months or more, remove the V-belts to avoid point loads on the bearings.

Remove the old grease from bearings with relubrication device and grease again before putting back into operation. Observe the fan manufacturer's instructions.

## **5.3. Belt drive (fan)**

### **Commissioning**

Check for correct voltage and alignment before commissioning.

#### **V-belt**

After commissioning, the V-belt drive should run in under load. After approx. 30–60 minutes, the tensioning device must be readjusted.



**It should be noted that the belt tension must be checked after the first 50 hours of operation and retightened if necessary.**

The V-belt must not be too tight or too loose as this will reduce the life of the motor and fan bearings.

#### **Flat belt**

With flat belts, care must be taken to avoid direct starting. The sudden forces can cause the belt to run off the drive.



#### **Flat belt stretching**

There are 2 thin measuring marks on the top of the belt. Tension the belt until the target value of the measuring mark distance is reached (2% belt elongation).

The drive must be turned several times and then the tension checked again.



**It should be noted that the belt tension must be checked after the first 100 hours of operation and retightened if necessary.**



According to the manufacturer, the belt tension must be checked after the first 4 hours.



## Maintenance

- Check the belt drive for contamination, damage and wear.
- Check the fastenings of the complete drive.
- Only replace the complete belt set.
- Check the function of the protective device.
- Adjust alignment of motor and fan pulley.
- Check belt tension, retighten if necessary.

## 5.4. Silencer

### Commissioning

Check the silencers for damage and contamination.

### Maintenance

- Check the silencers for dirt and damage, clean carefully if necessary or repair with repair kit.



**Do not damage the surface.**

## 5.5. Filter unit

### General

Sufficient air filtration and regular filter changes reduce the dust content of the air and prevent contamination of the unit and the duct system. Excessively long filter service lives worsen the air quality due to odours.



Moisture penetration of the filters must be avoided for hygienic reasons.

Depending on the operating conditions, the filter must be checked at regular intervals and replaced if necessary. If the pressure difference specified by the manufacturer is exceeded, the filter must generally be changed. When changing the filter, the tightness in the filter mounting frame should be checked.



Damage to or pressure points on the filter surface must be avoided at all costs, otherwise the filter may tear during operation.

The filter resistance can be determined by measuring the differential pressure with an inclined tube manometer or electronic manometer. The pocket filters are not regenerable. When the final resistance is reached, replace them with new pocket filters.

Filter classes DIN EN 779	Filter classes DIN EN ISO 16890	Highest final pressure difference DIN EN 13053
G1–G4	ISO Coarse dust	The lower value, either from adding 50 Pa to the pressure difference with an uncontaminated filter or three times the pressure difference with uncontaminated filters.
M5–F9	ISO ePM <sub>10</sub> , ISO ePM <sub>2,5</sub> , ISO ePM <sub>1</sub>	The lower value, either from adding 100 Pa to the pressure difference with an uncontaminated filter or three times the pressure difference with uncontaminated filters.

The recommended final pressure difference can be taken from the information on the type plate.

The replacement of individual filter elements is only permissible in the event of damage to individual elements, provided that the last replacement was not more than 6 months ago.

When changing the filter inserts, wear a respirator mask with P3 filter and observe the local environmental protection regulations.



Dust-laden filters pose an increased health risk.

Filters must be stored in a dry and dust-free environment. Do not use filters after the minimum shelf life has expired.

### Commissioning

Filter inserts are fixed in the installation frame with clamping clips. Do not pinch or damage filter inserts. Check the air-tight fit of the filter inserts in the installation frame.

Before commissioning, filter units must be checked for damage.

### Maintenance

- Check the pocket filter and frame for contamination and damage.
- Check filter support for tightness, visual inspection for damage.
- Replace filter cartridges in case of noticeable contamination, odours or leaks.
- The ATEX filter must be connected to earth.
- Replace filter inserts when the recommended final resistance is reached.
- Change the 1st filter stage after 12 months at the latest and the 2nd filter stage after 24 months at the latest.

### Activated carbon filter

The cartridge is fastened with a bayonet catch. When replacing the filter, turn the cartridge out of the frame.



To ensure proper functioning of the filter cartridges, an odour test must be carried out after the filters. If necessary, replace the cartridges.

### Special filters

Special filters must be maintained in accordance with the manufacturer's special maintenance instructions.

## 5.6. Heat exchanger

### General

In order to prevent the heat exchanger from freezing, frost protection device must be installed on the air, water or condensate side, depending on the system design.

In order to achieve optimum temperature stratification for units with several heat exchangers or to avoid possible freezing despite the heating valve being open, it is recommended to use the Tichelmann pipe system. Where this is not feasible, the hydraulic balancing must be carried out via a regulating/shut-off valve. The adjustment must be carried out on site by the system operator.



Do not use high-pressure water or steam to clean the heat exchanger. The fins can be damaged (exception: galvanised steel heat exchangers with reinforced fins).

There may still be unavoidable punching oil residue in the heat exchanger due to production. This must be removed before commissioning.

Do not inhale the air flow of the heat exchanger. Excess coating particles can be blown off with the first air flows.

Clean the heat exchanger when installed or, if not accessible, remove it for cleaning. Dirt removed must not get into adjacent parts of the system. Carefully remove dirt and dirty water. Use water only if the chamber or floor can collect and drain water.

In the case of copper or aluminium fins, cleaning is carried out by carefully blowing them out with compressed air against the direction of air flow.

The surface of the fin packs can be cleaned with a brush (no metal) or a vacuum cleaner. Hard or pointed cleaning tools must not be used.

### Commissioning

The on-site piping must be carefully flushed before connecting the heat exchangers.

Check for correct connection of supply and return.  
Pay attention to counterflow.

The heat exchanger must be carefully vented at the highest point of the system during filling.

If the heat exchanger is not properly vented, air pockets form which lead to a reduction in performance .

Check shut-offs and other fittings for correct installation.

The following work must be carried out for filling:

- Fully open all shut-off and control devices.
- Open the provided venting devices, unless automatic vents are provided.
- Slowly fill the system from the lowest point.
- Close the vent valves gradually at different level heights as soon as water escapes without residual air.
- Switch on the primary and secondary pump, check the direction of rotation and operate the system for some time.
- Move the control valves to the opposite position (three-way valves).
- Re-check by opening the vent valves again.
- Check the system for leaks.

## Frost protection

The frost protection function is ensured via the frost protection sensor, which must be adjusted according to the glycol content of the medium.

Glycol percentage	Setting value for ethylene glycol	Setting value for propylene glycol
20 %	-11 °C	-7 °C
30 %	-18 °C	-12 °C
40 %	-25 °C	-19 °C

If a frost protection thermostat is present, the complete frost protection circuit (e.g. mixing valve, circulation pump, fan multi-leaf damper, heat supply) must be checked for function.

If the temperature next to the unit can drop below 5°C, the frost protection sensor must be installed inside or the outside frost protection capillaries must be insulated.

Even after the VAC units have been switched off, the hot water supply to the heat exchanger must still be guaranteed.



**Damage caused by frost is not covered by our warranty obligations.**

## Maintenance



**Allow the heat exchanger to cool down to ambient temperature.**

- Check the fins for contamination, clean if necessary.
- Check the fins and pipes for damage, comb out any bent fins.
- Check the heat exchanger for leaks.
- Check the function of the components in the supply and return lines.
- Check frost protection for function (thermostat by means of cold spray).
- Clean condensate drain at cooling register, check siphon for function and clean and refill at the start of the cooling period.

## Decommissioning

In case of a longer standstill, especially if there is a risk of freezing, the heat exchanger must be completely drained. To do this, first remove the vent screws and then the drain screws. Then blow compressed air through each heat exchanger to drain it completely, as residues of the medium may remain in the heat exchanger if it is drained freely.

## 5.7. Droplet separator

### General

The droplet separator is only fully effective after a start-up phase of approx. 4 weeks.

If necessary, clean the droplet separator by rinsing it with water. In the case of coarse soiling, cleaning can be carried out with a steam jet device.

Excessively contaminated and calcified droplet separators, with clogged drip noses, lead to drop entrainment and increased pressure loss.



The droplet separator, which may be installed downstream on the air outlet side of the air cooler, usually has fins made of PPTV, which are temperature resistant up to +95 °C.

Droplet separators are only necessary if the limiting speed is exceeded and a certain amount of condensate is present.

To clean the droplet separators, pull out the cassettes, remove the fins and clean them (remove existing biofilm).



**When installing, pay attention to the direction of air flow.**

### Commissioning

Check the installation direction of the droplet separator. The drip nose must point against the direction of the air.

### Maintenance

- Check the droplet separator and condensate pan for contamination and damage, clean if necessary.

## 5.8. Cooling unit

### General

Since the cooling components in VAC units can be of very different design, a detailed description of the commissioning and maintenance work is not possible within this framework. The individual operating instructions must be observed.



Avoid physical contact with refrigerant as frostbite may be caused to skin and limbs or retinal damage to the eye. Use personal protective equipment against exposure to refrigerants according to VBG 20 (safety goggles, gloves, etc.)!

Modifications to the system may only be carried out by authorised specialist personnel.

Loose filter dryers supplied may only be opened by the refrigeration technician and must be installed immediately after opening, as air humidity damages the filter dryer.

### Commissioning

Commissioning may only be carried out by a qualified specialist refrigeration company.



### Maintenance

Depending on the operating mode and filling quantity, maintenance should be carried out under a maintenance contract at least once a year by a qualified specialist refrigeration company in accordance with VDMA 24186, and in accordance with F-Gas Regulation (EU) 517/2014, preferably before the start of the cooling period. During maintenance and inspection work, the additional information provided by the component manufacturers must also be observed.



According to F-Gas Regulation (EU) 517/2014, the prescribed intervals for leak tests depend on the type of refrigerant and the refrigerant filling quantity.

The system filling quantity is converted to a CO<sub>2</sub> equivalent:  
refrigerant filling quantity (t) \* GWP = CO<sub>2</sub> equivalent of the system

GlobalWarmingPotential:

R134a = 1.430 t/kg

R407c = 1.774 t/kg

CO <sub>2</sub> equivalent	Frequency of control checks
from 5 t	annually
from 50 t	semi-annually
from 500 t	quarterly

### Inspection work

The following checks and work can be carried out by the operator itself.

- Clean the fin surface to avoid excessive condensation pressures. Contaminated surfaces lead to loss of performance. Do not damage pipes and fins.
- Check the oil level in the compressor. When the compressor is switched off, the oil must cover half of the sight glass.
- Check and clean condensate drain.
- Pay attention to unusual noises or operating conditions.

## 5.9. Spray humidifier

### General

For units for outdoor installation, the control concept must provide for the humidifier to be switched off at least 5 minutes before the fans. This reduces the risk of condensation and corrosion in the unit.



Only switch on the pump when the scrubber is filled with water to avoid damaging the mechanical seal.

To ensure dry-running protection, the pump must switch off when the water level drops below 20mm above the suction pipe.

For float switches, pull the cable inwards or outwards accordingly.



Water quality should be hygienically perfect (germ-free), or the minimum standards according to the Drinking Water Ordinance and VDI 3803 must be met.

It must also be ensured that the condensate cannot be fed back into the drinking water network.

The conductivity of the water must be within the limits of the manufacturer's specifications.



The float valve must be set so that the fresh water supply is switched off at the maximum water level 10 to 20mm below the overflow connection.



UV lamps can be suitable for continuous disinfection.

Use chemical disinfectants (biocides) only if their health safety has been demonstrated in the application concentration.

When using additives, care must be taken that the water does not form foam.

### Commissioning

During commissioning, proceed in the following order:

- Clean foreign objects off the spray humidifier tray.
- Check spray humidifier installations for proper condition and visible damage (transport and assembly damage).
- Check nozzle carrier tubes and nozzles for tight fit and direction (with or against air flow).
- Check spray humidifier pump strainer.
- Fill with water up to 20 mm above the intake pipe.
- Set dry-running protection.
- Fill the system up to approx. 10–20mm below the overflow connection.
- Adjust the float valve (move the float and adjust the lever).
- First start up the unit on the air side and then switch on the spray humidifier pump.
- Check the direction of rotation of the pump.
- Set the overcurrent trip on the pump motor to nominal current, measure and record the current consumption.
- Check all pipe connections for leaks, tighten if necessary.
- Check the float valve for function.
- Adjust the desludging device.
- Adjust any biocide additives.
- Operate the spray humidifier for approx. 2–3 hours and check for function and leaks.

After commissioning, the bacterial count of the circulating water should be checked weekly within the first 700 operating hours; if necessary, measures should be taken to improve the water quality.

### Maintenance

- Decalcification of the entire spray humidifier.
- Switch off the ventilation system, add limescale remover to the circulation water and run the circulation pump until the limescale is dissolved. Then rinse and neutralise the entire spray humidifier well and clean the pump strainer.
- Decalcification of the humidifier nozzles and the nozzle holders, the nozzle bores must never be cleaned with hard objects.
- Clean and decalcify the droplet separator and rectifier with water (max. 50°C) or with diluted formic acid and rinse well with water or clean with a steam jet device.
- Checking the water quality.
- Checking the float valve.
- Clean and refill the integrated siphon.
- When the unit is not in operation, the trough, pump and fittings must be drained.
- Check the spray humidifier pump is running properly and that no water is leaking.

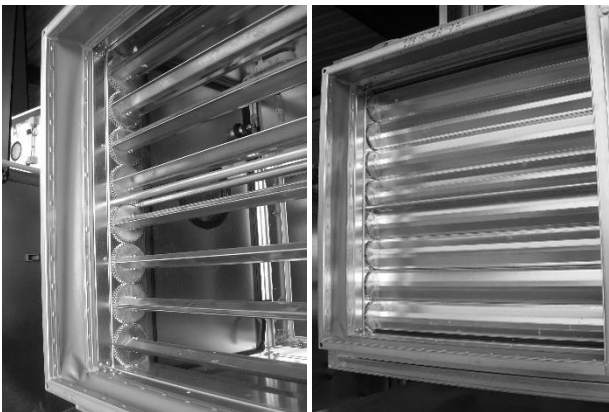


## 5.10. Multi-leaf dampers

### Commissioning

If several dampers are coupled together, the connecting rod must be checked for correct seating and ease of movement.

If the actuator is driven by a servomotor, the rod must be adjusted so that the angle of rotation of 90° is guaranteed and the dampers reach their end position when closing.



The multi-leaf damper controller can be fitted on the inside or outside of the housing. For units with outdoor installation, it must be fitted inside the unit or protected against moisture.

During commissioning, the dampers must be moved to all positions required during operation. The respective damper position must correspond to the control (limit switch setting).

### Maintenance

- Check the multi-leaf dampers for contamination and damage. Pay particular attention to clean gearing in the case of gear drives.
- Check for mechanical function.
- Damper actuators must be checked for correct mounting and end position and readjusted if necessary.
- The ease of movement and tightness of the dampers is determined after decoupling the actuator.

## 5.11. Rotary heat exchanger

### General

The drive motor is easily accessible through removable cover plates using quick-release fasteners.

To avoid damage during cleaning, only direct the air or water jet at right angles to the storage mass.

If power is not interrupted on all phases, there is a risk of crushing and abrasion due to sudden start-up of the rotor via automatic cleaning run or automatic restart after mains failure.



### Commissioning

Before commissioning, make sure that no objects block the free movement of the rotor. Remove foreign bodies and contamination.

Check the sealing strips for tightness. They must be pushed as close as possible to the storage mass, whilst avoiding direct grinding even under operating pressure conditions.



As a matter of principle, the bearing of the rotor is aligned in the factory. However, depending on the installation conditions, a realignment may be required. Please refer to the manufacturer's operating instructions.

As the V-belt is subject to natural stretching, the tension of the V-belt should be checked regularly, especially during the first 400 hours of operation.



Open the inspection cover at the marked corner of the rotor and check whether the belt is sufficiently tensioned by the tensioning device. The drive belts are tensioned by the motor rocker, if necessary shorten the V-belt:

- Open the joint lock.
- Shorten the endless V-belt accordingly.
- Close the joint lock.
- Close the inspection cover.

Start up the drive motor. In the case of a rotor control unit, observe the manufacturer's operating instructions.

Checking the specified rotor speed (e.g. 10 rpm with 10 V control signal).

Check the direction of rotation of the rotor (arrow), electrically reverse the motor connections if necessary. If a purge zone is installed, storage mass must rotate from the extract air via the purge chamber into the supply air.

### Maintenance

Ball bearings and gear motor (lifetime filling) do not require maintenance under normal operating conditions.

- Check the rotating surfaces for contamination and damage on the air side.
- Application-related cleaning (e.g. using compressed air or grease-dissolving cleaning agents).
- Check sealing strips for contamination, foreign bodies and contact pressure, replace if necessary.
- Check rotor bearing play, imbalance and lateral runout.
- Checking the drive elements.
- Check minimum and maximum speed.
- Run through the control range.
- Direction of rotation check.
- Checking the motor bearings.
- Checking the electrical connections.
- Check gearbox for leaks.
- V-belt check.
- Check the control display function of the control units.
- Check water drain and siphon for function, clean if necessary.

### Decommissioning

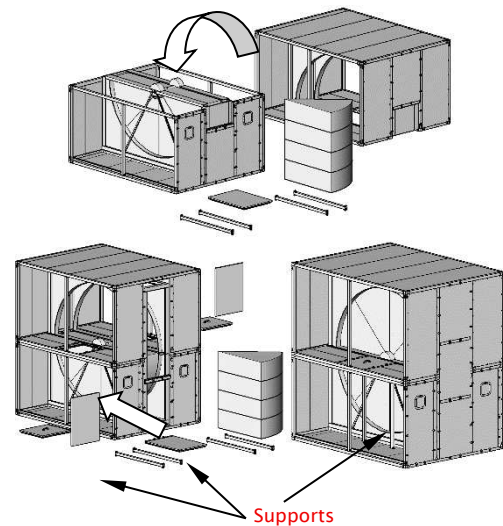
In case of a longer standstill (e.g. summer), start the rotor every 4 weeks in normal ambient air to maintain self-cleaning.

### Assembly instructions

The lower half of the module containing the storage mass is placed on a flat surface. The upper half of the housing is then positioned

on top and screwed to the lower half. The rotor segments are then mounted through the side opening.

If the section contains maintenance hatches (similar to the illustration), the intermediate level must be secured with the supports supplied separately. It is **not permitted** to enter the upper chamber before the supports have been installed.



### 5.12. Plate heat exchanger

#### General

For plate heat exchangers, a condensate drain must be connected on the exhaust air side above the frost-free siphon.

Commissioning and maintenance work on the bypass damper must be carried out in accordance with the instructions in the chapter on multi-leaf dampers.

#### Commissioning

Check the plate heat exchanger for foreign bodies and contamination, clean if necessary.

#### Maintenance

- Check plate heat exchanger and possibly droplet separator for dirt and damage, clean if necessary.
- Remove dry dust and fibrous materials at the inlet to the heat exchanger with a vacuum cleaner.
- Clean condensate drain, check siphon and refill if necessary.
- Remove oil and grease deposits from kitchen exhaust air with hot water and grease-dissolving cleaning agents.
- Clean only with compressed air or high-pressure cleaner (only water without additives), carefully collect and remove dirty water.

#### Assembly instructions



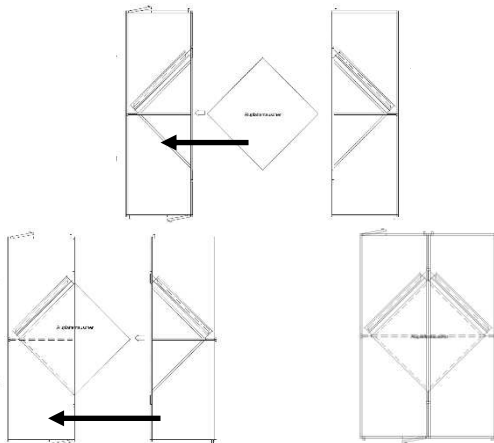
For safe loading and unloading of the components, use a suitable forklift truck or crane with a suitable load lifting beam.

The two-part transport hanger can be used for crane transport.

When lifting the components, take care not to damage the edges.

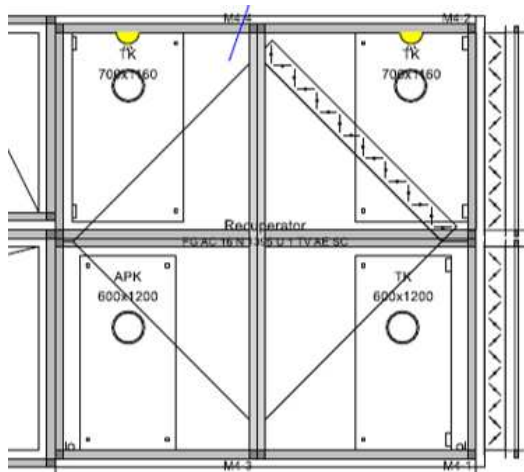
Please refer to the assembly instructions of the respective manufacturer for details.

In the case of split delivery units, the heat exchanger must be inserted into the first half of the module after it has been installed and fixed in place there. Dismantle transport stiffeners beforehand. Then push and mount the second half of the device module.



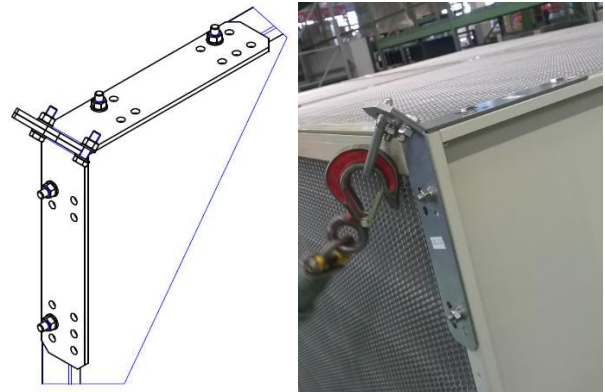
Do not use the pre-assembled unit connectors to pull the modules together! These can tear out or deform the unit if overloaded. After connecting the unit parts, check the position of the heat exchanger in the holding rails again and readjust if necessary. Once assembly is complete, grout the unit joints and corners.

If the plate heat exchanger is installed via the operating or rear side or module ceiling, the corresponding unit profiles and housing covers must first be dismantled. Insertion from the front with a forklift truck or similar, from above with a crane or cable pull.



Here, too, the joints between the plate heat exchanger and the housing must be sealed with sealant after assembly.

For large or multi-part plate heat exchangers that can only be assembled on site, there is a two-part transport hanger. This must be screwed to the heat exchanger **with at least four M8 hexagonal bolts** and can be dismantled after installation. Finally, seal the drill holes with aluminium adhesive tape. A lifting device is only permitted with a crossbar to avoid damage.



### 5.13. Closed-circuit system (CC)

#### General

The commissioning and maintenance work for the closed-circuit system must be carried out in accordance with the specifications in the chapter on heat exchangers.

#### Commissioning

If the system is not put into operation immediately, it must be completely drained or filled with antifreeze to prevent the heat exchangers and pipes from freezing.



The heat transfer medium must be tested for frost protection effectiveness before each winter period.

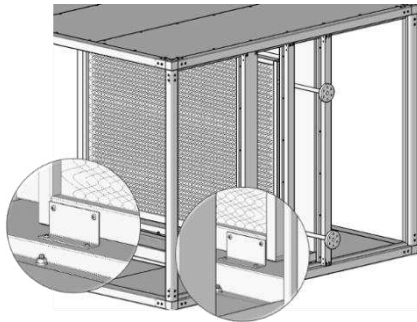
To avoid icing of the condensate on the fins of the extract air heat exchanger at low temperatures, it is necessary to reduce the transfer capacity from the freezing limit.

Vent the system very thoroughly during filling (several times if necessary) until all flow noises caused by air bubbles have disappeared. Also vent at the pumps and heat exchangers (internal vent valves). Filling is always done with an external circulation pump. No warranty if the pump runs dry.

The static nominal pressure must be set according to the manufacturer's instructions (see data sheet).



For safety reasons, two brackets must be fitted to the bottom frame of each register with castors.



### Maintenance

- Check pumps for damage, fastening, function and noise.
- Check fittings for damage, leaks and function.
- Check dirt trap strainer for damage and clean.
- Check piping system for damage, leaks and fastening.
- Check fluid level, top up if necessary.
- Check glycol content according to data sheet.

## 5.14. Direct-fired heat exchanger (combustion chamber in air flow)

### General



To avoid burns, do not touch hot surfaces. Observe safety requirements.

Assembly and connection of the oil or gas burner according to the manufacturer's instructions.

Every installation must be equipped with an emergency switch. Overheating damage can occur if the unit is operated without sufficient cooling or in the event of an emergency shutdown via the safety devices. Therefore, only use the emergency shutdown for personal protection. We do not assume any warranty for damage due to emergency shutdowns.

Ensure that the flow into and out of the combustion chamber is as even as possible. The adjustable cladding panels may need to be adjusted to avoid heat build-up or temperature stratification.



### Commissioning

Install and wire all sensors and thermostats.

Check the flame; it must not touch the combustion chamber walls. Use flame head extension or other nozzle angle.

Make the connection to the chimney. This must comply with the building and official regulations.

Establish operational readiness:

- Venting the oil or gas pipe.
- Fan thermostat: setpoint approx. 40 °C.
- Temperature monitor: setpoint approx. 75 °C.
- Burner safety temperature limiter: setpoint not adjustable.

(These values only apply to standard systems with a supply air temperature of 60 °C. For higher temperatures, the manufacturer's specifications must be observed).

Put the burner into operation. The commissioning instructions of the burner manufacturer must be followed exactly. Make sure that the fan is in operation all the time. The fuel supply must be adjusted so that the unit's rated output is not exceeded. For gas burners, it is mandatory to use a gas meter for this purpose.

Determine exhaust gas value.

- Maximum exhaust gas temperature: approx. 210°C.
- Minimum exhaust gas temperature: approx. 110°C.

All settings must be recorded in a setting log and kept.

Condensate accumulation is only permissible during the start-up phase. Adjust the exhaust gas temperature to the permissible range by adjusting the turbulators (removing the turbulators increases the exhaust gas temperature).

Any condensate must be disposed of in accordance with local regulations.

### Maintenance

#### **Combustion chamber**

- Dismantle the burner. Check the combustion chamber with a light source for dirt, damage and leaks. The burner must not be put into operation if it is damaged.
- After cleaning the top heating surface, vacuum out the combustion chamber.



#### Flame pot

- Check the flame pot for damage. Replace if damaged or deformed. To do this, dismantle the firing plate and cylinder cover.

#### Top heating surface

- Remove the inspection cover plate and the cleaning cover of the combustion chamber. Remove all turbulators and check for general condition. Replace individually or altogether in case of severe corrosion.
- Clean all pipes on the top heating surface with a stainless steel brush and vacuum out the collection box.
- Check drainage system and clean if necessary.

#### Burner

- After completing the combustion chamber cleaning, carry out burner maintenance in accordance with the burner manufacturer's instructions.
- Determine exhaust gas values.
- All work shall be recorded.
- Check the gas line, connections and gas control section for leaks and re-seal if necessary.
- Check regulating and safety elements.
- Check bypass and combustion chamber dampers.



#### Maintenance

It is important to check the connection cables from the following points of view:

- Tightness of the connection fittings.
  - Functional safety of both earths (electrical connection and housing) must be ensured.
- Insulations of the cables must not be brittle.

Maintenance of the air heating registers is generally not required. However, if the medium to be heated has a high dirt or dust content (e.g. wood dust), cleaning measures must be taken. Cleaning with compressed air is recommended for this purpose.

### 5.16. Gas surface burner

#### General

CO<sub>2</sub> content of indoor air must not exceed locally prescribed limits. Recirculation mode not permissible. Do not enter running systems as there is a risk of burns.



Every installation must be equipped with an emergency switch.

### 5.15. Electric air heating register

#### Commissioning:

Before the test run, the connections of the supply lines and the two earths (electrical connection and housing) must be checked to ensure correct execution.

During the test run, make sure that all parameters (e.g. air volume or final air temperature, see technical data sheet of the air heating register) are fully complied with. If the values prescribed in the technical data sheet deviate or are only partially taken into account, this may result in damage and destruction of the air heating register.

The setting of all thermostats present must be made according to the required conditions on site.



To control an air heating register, the following 4 parameters must be observed:

- Air volume
- Air inlet and outlet temperature
- Operating voltage and the resulting current
- Use of vector groups (power distribution)

In addition, make sure that the fan continues to run for 5 minutes after the air heating register has been switched off. This can prevent overheating of the air heating register.



#### Commissioning



Connect the gas control section to the gas line. Ensure that the connection is tension-free. The gas type and gas pressure must be suitable for the control.

Direct the blow-off valve outside the building.

Install and wire all sensors and thermostats.

Check the gas line, connections and gas control section for leaks using a test device.

The position of the safety temperature limiter is approx. 3m after the gas burner in the ceiling area before the next component.

Establish operational readiness:

- Venting the gas line.
- Check the settings of the safety temperature limiter. Set point: approx. 60°C.



Put the burner into operation. Make sure that the supply air and exhaust air fans are always in operation.

## Maintenance

The replacement of damaged parts may only be carried out by a specialist. Replacement parts must be approved for the system.

- Check the gas line, connections and gas control section for leaks and re-seal if necessary.
- Remove dirt from the burner with a brush; make sure that all air holes are free.
- Check gas outlet openings, clean with nozzle needle if necessary. Do not come into contact with ignition or control devices.
- Check the distance between the ignition electrodes; adjust if necessary.
- Unscrew monitoring device (UV cell or ionising bar), clean with soft cloth and re-install. Replace if discoloured.

## 5.17. Cleaning agents

no.	group	assembly	component	material	coating	Cleaner constancy	disinfectant constancy
1	housing	housing	panels	galvanized steel	"Anti-Finger-Print"	metal cleaner article no.: CP502 company: Kuhlmann	Incidur Spray / Incidin Rapid / Incidin Extra N / Incidin perfekt company: Ecolab
2	housing	cooler, humidifier, etc.	condensate pan	Stainless steel	no	Edelstahl Protect (EP) company: Solution Glöckner Vertriebs-GmbH	Incidur Spray / Incidin Rapid / Incidin Extra N / Incidin perfekt company: Ecolab
3	heat exchanger	heater	fins	copper	no	Polygon PCG 1948 company: Polygon Chemie AG	Incidur Spray / Incidin Rapid / Incidin Extra N / Incidin perfekt company: Ecolab
4	heat exchanger	heater	pipes	copper	no	Polygon PCG 1948 company: Polygon Chemie AG	Incidur Spray / Incidin Rapid / Incidin Extra N / Incidin perfekt company: Ecolab
5	heat exchanger	cooler	fins	galvanized steel	no	metal cleaner article no.: CP502 company: Kuhlmann	Incidur Spray / Incidin Rapid / Incidin Extra N / Incidin perfekt company: Ecolab
6	heat exchanger	cooler	pipes	galvanized steel	no	metal cleaner article no.: CP502 company: Kuhlmann	Incidur Spray / Incidin Rapid / Incidin Extra N / Incidin perfekt company: Ecolab

## 5.18. Measuring and control technology

### General

#### **Requirements**

All structural requirements such as accessibility, completed unit and duct installation and uninterrupted availability of all supply media must be met.

### Commissioning

Commissioning may only be carried out by qualified personnel.

#### **Activities**

- Checking the field devices for proper installation.
- Check the power supply to the control cabinet.
- Functional test of the parts included in the scope of delivery.
- Configuration of the controllers or DDC substations including loading of the project-specific control and PLC programmes, if applicable.
- Commissioning and adjustment of the system.
- Adaptation of the parameters to the operating conditions of the operational system.
- Checking the control programmes.



- Instruction of the operating personnel.
- Checking of all safety-related functions.

### **Maintenance**

It would be advantageous to conclude a maintenance contract with a qualified specialist company.

#### **Maintenance work**

See maintenance tables.

After commissioning, the first maintenance should be carried out after only 6 months. After that, a maintenance interval of one year is advisable.

## 6. Shutdown

### 6.1. Decommissioning

When taking a unit out of operation for a longer period of time, the following work or activities must be carried out.

- Stop the power supply (power lines and all media).
- Secure against unintentional restarting.
- Drain water from the heat exchanger.
- In the case of registers, make sure that no medium can leak and blow compressed air through again after approx. 3 weeks.
- For units with an integrated control cabinet, a control cabinet heater should remain switched on.
- Existing dampers must be closed or closed manually.
- Dirty filters must be removed.
- Humidifiers must be drained.
- In the case of fans, if they are at a standstill for a long time without being moved in the meantime, later bearing damage is to be expected.
- To avoid bearing damage, the fan must be rotated once per month.
- General cleaning of the components to be shut down.
- If the machine has been shut down for more than 3 months, the V-belt must be removed.

The instructions in the individual chapters must also be observed.

### 6.2. Dismantling and disposal

At the end of its useful life, the unit must be dismantled properly.



Before dismantling, check that all energy lines (electricity and all media) have been switched off. No line may still be under pressure, temperature or other energy supply.

Then check that all operating materials have been removed from the system, i.e. that there is no water, oil or refrigerant in the system.



All components and operating materials (such as oils, refrigerants, brine, mineral wool) must be disposed of in accordance with local regulations. Metal and plastic parts should be sorted and recycled separately.

## 7. Emergency measures

### 7.1. Firefighting

Local fire regulations must generally be complied with.

If the air conditioning system is part of a smoke extraction concept, the specifications of this must be observed.

Otherwise, in the event of a fire, immediately disconnect the power supply to the unit on all phases. Close multi-leaf dampers to prevent oxygen supply and fire spread.

### 7.2. Leakage of harmful substances

The Huber & Ranner air conditioning unit has a very low fire and smoke load due to an optimised design.

Nevertheless, building materials used in the event of fire can develop toxicologically questionable substances. In addition, flue gases in the unit can escape into the technical centre. Therefore use heavy breathing apparatus.

Water-bearing components can leak in the event of a fire. Do not stay in the immediate danger zone.

## 8. Explosion protection

To avoid an explosion, deflagration or fire, an explosive atmosphere should be avoided as far as possible!

As a matter of principle, the potentially explosive atmosphere must be classified into the appropriate category (zone) in accordance with the applicable directives, whereby a distinction must be made between the atmosphere inside and outside the air flow.

Units with special explosion protection may only be used in the declared category!

- G Gas, mist, steam
- D Dust
- IIA Substances with low ignition sensitivity
- IIB Substances with medium ignition sensitivity
- IIC Substances with high ignition sensitivity
- T1 450 °C Maximum permissible surface temperature
- T2 300 °C Maximum permissible surface temperature
- T3 200 °C Maximum permissible surface temperature
- T4 135 °C Maximum permissible surface temperature
- T5 100 °C Maximum permissible surface temperature
- T6 85 °C Maximum permissible surface temperature
- inside in the air flow
- outside outside air flow

### 8.1. Maintenance and repair

- Maintenance and repair may only be carried out by appropriately trained personnel!
- Work may only be carried out either in a non-explosive atmosphere or when ignition sources are avoided. Particular care must be taken to ensure that all work equipment is approved for the relevant zone.
- Before opening the units, the system must be mechanically and electrically shut down and locked accordingly.
- In addition, it may be necessary to purge the system with fresh air to remove or dilute a potentially explosive atmosphere. This is particularly necessary if the gas groups inside differ from the gas group outside! This task can be automated using control technology.
- In particular, the concentration of the atmosphere can change when the system is at a standstill and thus increase the risk of explosion! In any case, all types of ignition sources must be avoided during maintenance.

### 8.2. Marking

The unit has a marking on the fan chamber, indicating for which atmosphere it may be used. A distinction is made between indoor (conveyed atmosphere) and outdoor (installation room) marking. The unit may only be used in accordance with the unit marking.

Example: Ex II 2G IIA T3 (indoor); Ex II 3G IIB T4 (outdoor)

**The individual designations have the following meaning:**

- Ex Ex-protection (group)
- I Underground operation
- II Above-ground operation
- 1 Protection category 1 (zone 0)
- 2 Protection category 2 (zone 1)
- 3 Protection category 3 (zone 2)

There is a warning on the unit that must not be removed:

**The unit can foster an explosive atmosphere!**

**Only to be opened by qualified personnel with suitable work equipment!**

The VAC unit as an individual component cannot alone guarantee complete and comprehensive explosion protection, as the protection concept must relate to the entire system.

The overall responsibility for explosion protection therefore ultimately lies with the operator or the plant manufacturer.

### 8.3. Avoidance of ignition sources

#### Fan

The fan may only be operated in potentially explosive atmospheres if it is appropriately marked and approved for the zone used. Here, mechanically generated sparks, e.g. by grinding the impeller with the inlet nozzle, must be avoided. This must be ensured by an appropriate combination of materials and by careful adjustment of the nozzle gap. Furthermore, the max. permissible speed of the fan must never be exceeded, as otherwise parts may come loose from the impeller, which may also generate mechanical sparks!

**The fan must not grind on the inlet nozzle under any circumstances!**

**This may cause ignition**

The fan must be permanently monitored for vibrations. This can be achieved by an explosion-proof vibration monitoring system (measuring and control), if necessary, or by a daily visual inspection. If vibrations are visually or acoustically perceptible, the unit must be taken out of operation immediately and the manufacturer informed.

#### Electrical components

All electrical components (e.g. electric motors, lamps, switches, etc.) must be authorised for operation in a potentially explosive atmosphere with an appropriate marking and approval for the category used.

The wiring must be carried out in accordance with the relevant standards. Overall, proper equipotential bonding must be ensured for the entire unit so that static electricity can be ruled out as a source of ignition.

The frequency converter is generally not suitable for use in an explosive atmosphere. It is only supplied loose and may only be used in a non-hazardous atmosphere.

**Lightning protection**

Proper lightning protection must be installed, especially for roof control centres with explosion protection!

**Hot surfaces**

Depending on the atmosphere, it should be noted that pipelines (e.g. on the heater) can reach temperatures of up to 110°C. These temperatures may be sufficient as a source of ignition.



## 9. Maintenance tables of the system components

The specified maintenance intervals must be observed to ensure proper operation.

Maintenance is the basis for a warranty.

The application period for the following points cannot be prescribed. The periodic maintenance and cleaning of the system depends solely on the degree of contamination. These interval specifications apply to standard VAC units under normal operating conditions. In the case of heavy soiling or 24-hour operation, the intervals should be at least 1 level shorter.

Checklist for hygienic operation and maintenance of ventilation and air-conditioning systems							
	Activity	If applicable Measure	Months				
			1	3	6	12	24

### 1 Chamber control units / unit housings (see chapter 5.1)

1.1	All unit chambers are to be checked for contamination, damage and corrosion	Clean and repair			x		
1.2	Check drains for free discharge	Repair			x		
1.3	Check doors for tightness and latches for free movement	Repair			x		
1.4	Check duct connection joints for tightness	Repair			x		
1.5	Check for water formation	Clean, determine cause			x		
1.6	Check seals on doors for function	Replace			x		
1.7	Check joints	Repair			x		

### 2 Fan (see chapter 5.2)

2.1	Check fan for contamination & damage	Clean and repair			x		
2.2	Check bearings	Relubricate (observe time limits)		x			
2.3	Check vibration damper for function	Repair			x		
2.4	Check fastening screws	Tighten			x		
2.5	In case of abnormalities (noises), check fan and motor bearings	Determine cause	in case of abnormalities				
2.6	In case of abnormalities (vibrations), check the fan impeller without V-belt for imbalance	Determine cause (impeller must rest in any position)	in case of abnormalities				
2.7	Check the function of the PTC thermistor	Replace			x		
2.8	Standstill maintenance	Turn	x				
2.9	Lifting systems	Load test					

### .V-belt (see chapter 5.3)

2.10	Check the belt drive for contamination, damage and wear	Clean and repair		x			
2.11	Check the fastenings on the complete drive	Repair		x			
2.12	Renew complete belt set		if required				
2.13	Check the function of the protective device	Repair			x		
2.14	Adjust alignment of motor & fan pulley			x			
2.15	Check belt tension	Retighten		x			
2.16	Standstill maintenance	Turn	x				
		Remove		x			

Checklist for hygienic operation and maintenance of ventilation and air-conditioning systems								
	Activity	If applicable Measure	Months					
			1	3	6	12	24	

3 Silencers (see chapter 5.4)

3.1	Check the baffles for contamination and damage	Carefully clean or repair			x			
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4 Filter unit (see chapter 5.5)

4.1	Check pocket filters and frame for contamination and damage	Clean and repair			x			
4.2	Check filter support for tightness, visual inspection for damage	Repair			x			
4.3	Check filter inserts for conspicuous soiling, odours or leaks.	Replace		x				
4.4	Check differential pressure	Replace filter inserts when end resistance is reached		x				
4.5	Latest filter change 1st stage					x		
4.6	Latest filter change 2nd stage							x
Activated carbon filter								
4.7	Carry out odour test	Replace activated carbon cartridges		x				

5 Heat exchanger (see chapter 5.6)

5.1	Check the fins for dirt	Clean and repair			x			
5.2	Check fins and pipes for damage	Comb out bent fins			x			
5.3	Check the heat exchanger for leaks	Repair			x			
5.4	Check the function of the components in the supply and return lines.				x			
5.5	Check frost protection for function	Thermostat by means of cold spray	at the start of the cooling period					
5.6	Check condensate drain on cooling register	Clean			x			
5.7	Check siphon for function	Clean and refill (at the start of the cooling period)			x			

6 Droplet separator (see chapter 5.7)

6.1	Check the droplet separators and condensate pan for dirt and damage.	To clean the droplet separators, pull out the cassettes and remove the fins (remove biofilm).			x			
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7 Refrigeration (see chapter 5.8)

7.1	Clean fin surface	Evaporator and condenser			x			
7.2	Check oil level in compressor	When the compressor is switched off, the oil sight glass must be half covered		x				
7.3	Check condensate drain	clean (listen for unusual noises or operating conditions).			x			
7.4	Leak test	By certified refrigeration specialists	( )	( )	( )	( )	( )	( )

8 Spray humidifier (see chapter 5.9)

8.1	Decalcification of the entire spray humidifier	Add limescale remover to the circulation water, run the circulation pump until the limescale is dissolved. Then rinse the spray humidifier well.			x		
-----	--	--	--	--	---	--	--

Checklist for hygienic operation and maintenance of ventilation and air-conditioning systems

	Activity	If applicable Measure	Months				
			1	3	6	12	24
8.2	Decalcification of the humidifier nozzles and the nozzle holders, the nozzle bores must not be cleaned with hard objects under any circumstances.	Clean and repair			x		
8.3	Check droplet separator and rectifier	Clean with water, decalcify and rinse well with water or clean with steam jet device			x		
8.4	Checking the water quality	Check the conductivity of the water	x				
8.5	Checking the float valve				x		
8.6	Check integrated siphon	clean			x		
8.7	Checking the spray humidifier pump for proper running and water leakage	Repair		x			

9 Multi-leaf dampers (see chapter 5.10)

9.1	Check the multi-leaf dampers for dirt and damage (in the case of gear drives, pay particular attention to clean gearing).	Clean and repair			x		
9.2	Check for mechanical function				x		
9.3	Damper actuators must be checked for correct mounting and end position.	readjust			x		
9.4	Ease of movement and tightness of the dampers is determined after decoupling the actuator	Repair			x		

10 Rotary heat exchanger (see chapter 5.11)

10.1	Checking the rotating surfaces for dirt and damage on the air side	Adjust, clean, repair seals		x			
10.2	Application-related cleaning	(e.g. using compressed air or grease-dissolving cleaning agents).			x		
10.3	Check the sealing strips for dirt, foreign bodies and contact pressure.	replace			x		
10.4	Check rotor bearing play, imbalance and lateral runout			x			
10.5	Checking the drive elements			x			
10.6	Check minimum and maximum speed				x		
10.7	Run through the control range				x		
10.8	Direction of rotation check				x		
10.9	Checking the motor bearings			x			
10.10	Checking the electrical connections				x		
10.11	Check gearbox for leaks				x		
10.12	V-belt check	retighten, shorten, replace if necessary		x			
10.13	Check the control display function of the control units				x		

10.14	Check water drain and siphon for function	Clean and repair			x		
10.15	Standstill (e.g. summer)	start up the self-cleaning rotor with normal ambient air	x				

Checklist for hygienic operation and maintenance of ventilation and air-conditioning systems							
	Activity	If applicable Measure	Months				
			1	3	6	12	24

11 Plate heat exchanger (see chapter 5.12)

11.1	Check the plate heat exchanger and possibly the droplet separator for dirt and damage.	Cleaning with compressed air or high-pressure cleaner (only water without additives), carefully remove dirty water			x		
11.2	Remove dry dust and fibrous material from the exchanger inlet	remove with vacuum cleaner	if required				
11.3	Check condensate drain and siphon	clean and refill if necessary			x		
11.4	for kitchen exhaust air	Remove oil and grease deposits from kitchen exhaust air with hot water and grease-dissolving cleaning agents	if required				

12 Closed-circuit system – CC system (see chapter 5.13)

12.1	Check pumps for damage, fastening, function and noise				x		
12.2	Check fittings for damage, leaks and function				x		
12.3	Check dirt trap strainer for damage	clean			x		
12.4	Check piping system for damage, leaks and fastening				x		
12.5	Check fluid level	refill		x			

13 Combustion chamber (see chapter 5.14)

13.1	Dismantle the burner. Check combustion chamber with light source for contamination, damage and leaks	Burner must not be put into operation if damaged			x		
13.2	Vacuum out the combustion chamber after cleaning the top heating surface.	clean			x		
13.3	Check flame pot for damage	Replace if damaged or deformed. To do this, dismantle the firing plate and cylinder cover			x		
13.4	Remove the inspection cover plate and the cleaning cover of the combustion chamber. Remove all turbulators and check for general condition	Replace individually or altogether in case of severe corrosion			x		
13.5	Clean all pipes on the top heating surface with a stainless steel brush and vacuum out the collection box.	clean			x		
13.6	Check drainage system	clean			x		
13.7	After completion of the combustion chamber cleaning, the burner maintenance must be carried out according to the burner manufacturer's instructions				x		
13.8	Determine exhaust gas values				x		

13.9	Check the gas line, connections and gas control section for leaks	reseal			x		
13.10	Check control and safety elements				x		
13.11	Check bypass and combustion chamber dampers				x		

Checklist for hygienic operation and maintenance of ventilation and air-conditioning systems							
	Activity	If applicable Measure	Months				
			1	3	6	12	24

14 Electric air heating register (see chapter 5.15)

14.1	Check all components for dirt and damage				x		
14.2	Tightness of the connection fittings.				x		
14.3	Functional reliability of the two earths (electrical connection and housing)	must be provided			x		
14.4	Insulations of the cables must not be brittle.				x		

15 Gas surface burner (see chapter 5.16)

15.1	Check the gas line, connections and gas control section for leaks	Reseal			x		
15.2	Remove dirt from the burner with a brush; make sure that all air holes are free	Clean and repair			x		
15.3	Check gas outlet openings	clean with nozzle needle. Do not come into contact with ignition or control devices.			x		
15.4	Check the distance between the ignition electrodes	adjust		x			
15.5	Unscrew monitoring device (UV cell or ionising bar), clean with soft cloth and re-install. Replace if discoloured	Clean and repair		x			

16 Measurement and control technology (see chapter 5.17)

16.1	Check all components for proper and functional installation and environmental operation.				x		
16.2	Check all components for dirt, corrosion and damage	Cleaning to maintain function			x		
Control cabinets, control panels, controls							
16.3	Check protective covers for completeness				x		
16.4	Check connections for electrical / mechanical functions	tighten (torque spanner)			x		
16.5	Check functional elements (e.g. operating and display devices).	Set, adjust, tighten			x		
16.6	Check input signals for compliance with setpoint	Calibrate signals			x		
16.7	Check optical and acoustic control devices	replace			x		
16.8	Check contactors and relays for wear and damage (e.g. contact burnout).	replace			x		
16.9	Check switching and control operations (e.g. frost protection function)	Spray with cold spray			x		



16.10	Check safety devices (e.g. thermal triggers)	replace			x		
16.11	Check setting of control cabinet components (e.g. time relay)	Readjust			x		

Checklist for hygienic operation and maintenance of ventilation and air-conditioning systems							
	Activity	If applicable Measure	Months				
			1	3	6	12	24
16.12	Check manual, automatic and remote control function	Readjust			x		

Transducers / safety devices

16.13	Check the electrical / mechanical function of the connections	Readjust, regenerate			x		
16.14	Measure and record physical measured values at the measuring location				x		
16.15	Check electrical, electronic and pneumatic measuring signals	Readjust, regenerate			x		

Controller / additional modules

16.16	Check the internal voltage supply (e.g. buffer batteries, rechargeable batteries)	replace			x		
16.17	Check the electrical / mechanical function of the connections	tighten (torque spanner)			x		
16.18	Check functional elements (e.g. operating and display devices).	Set, adjust, tighten			x		
16.19	Check electrical, electronic and pneumatic input signals (e.g. sensor, remote adjuster, reference variable)	Calibrate signals			x		
16.20	Check controller function and control signal	Adjust			x		
16.21	Check the control circuit according to the setting parameters, taking into account all additional functions	Adjust			x		

Actuators

16.22	Check electrical, electronic and pneumatic input signals and working position range	Readjust			x		
16.23	Check position, limit value transmitters and limit position switches for function	Readjust			x		

Software

16.24	Carry out data backup				x		
16.25	Retention of the most recently created programme and data copies	Update system if problems occur			x		

Maintenance instructions discussed and handed out.

-----  
Company -----

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Company -----

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Huber & Ranner

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Place, date

These assembly, operating and maintenance instructions are intended as a guide to installation. They are the result of years of experience and are intended to help avoid typical assembly errors. In no way are they a substitute for the necessary expertise. Applying them does not release from the responsibility for one's own dutiful actions.

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