

Air Handling Units

Installation Commissioning Maintenance

Translation of the original instructions
Englische Version – English Version
Keep for future use

robatherm
the air handling company

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General



Attention

These installation, commissioning and maintenance instructions must be read and observed by all people who carry out work on the unit. For components which are not described, the individual instructions are to be observed (request if required). robatherm will not be held liable for damage or faults which result from non-observance of these instructions.

The manufacturer's warranty and the certificate of installation/conformity do not apply for unofficial or unapproved conversions and changes to the appliance.

Use for Intended Purpose

To the explicit exclusion of any other use, robatherm AHUs may only be used for **air transport** and/or **air treatment**. This includes the functions "filtration", "heating mode", "cooling mode", "humidifying" and "dehumidifying" of the air according to the following definitions of DIN EN 13053:2020.

- **Air treatment**

A process in which the state of the air is modified with respect to one or more of the following characteristics: temperature, humidity, dust content, bacteria content, gas and water content.

- **Cooling mode**

Removal of sensitive and/or latent heat.

- **Dehumidify**

Controlled reduction of the water vapour content of the air.

- **Filtration**

Removal of particles from the airflow.

- **Heating mode**

Transferring heat from one body or medium to another medium.

- **Humidifying**

Controlled increase of the water vapour content of flowing or stagnant air.

Air transport is defined according to DIN EN 13053:2020 on the basis of a characteristic value:

- **Airflow**

Air conveyed within set balance limits (e.g. air ducts).

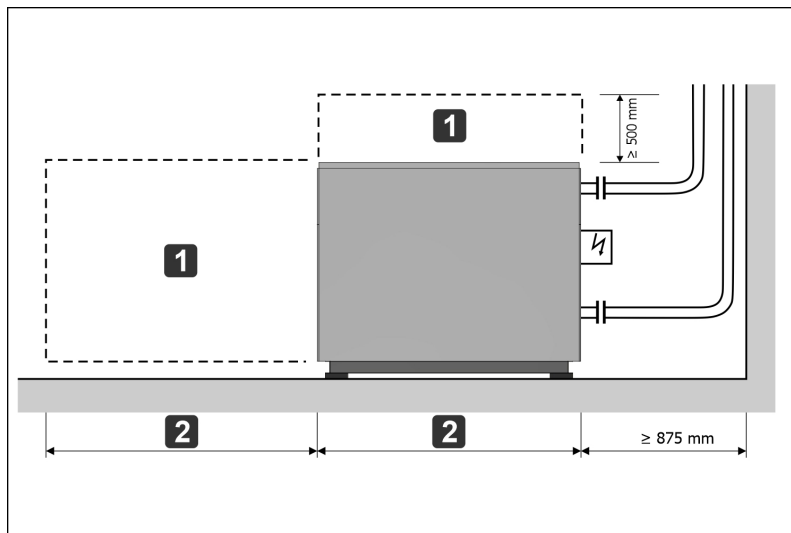
robatherm AHUs may only be used in certain installation locations. The suitable installation site for robatherm AHUs is defined in chapter "Location of the machine". This results in the following limited uses:

- robatherm AHUs are not intended for general technical process applications. robatherm AHUs are not smoke extraction units and must not be used for smoke extraction.
- When handling and conveying air streams hazardous to health, only single units and never combined units (two air streams mechanically connected in one AHU) may be used.
- robatherm AHUs are not suitable for applications with aggressive media, as they do not have sufficient corrosion resistance for this purpose.

Location of the Machine

robatherm AHUs may only be installed, connected, maintained, repaired and entered by qualified experts. Access to the robatherm AHU must be restricted in such a way that only these qualified experts and instructed persons can enter the unit installation area.

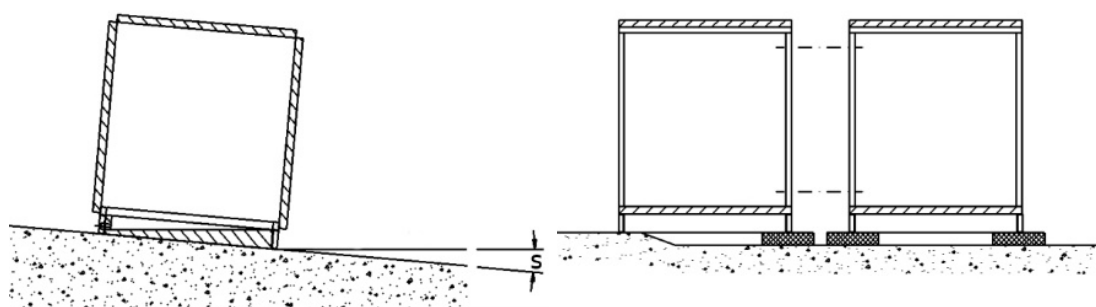
The national standards for operation and maintenance of technical rooms and control centres must be taken into account. The installation site must comply with the applicable building regulations and take into account the specific functions of the robatherm AHU. These include ventilation and air extraction as well as compliance with temperature requirements: robatherm AHUs can be used between -20 °C and +45 °C.



1 - revision area, 2 - unit width

- To pull out the components (coil, filter wall I, fan), leave at least one unit width (2) free as a revision area (1) on the operating side.
- A revision area (1) with a height of at least 500 mm must be provided above the unit.
- A distance of ≥ 875 mm must be maintained on all sides that are not the operating side in order to ensure sufficient space for connections.
- The minimum widths for escape routes according to country-specific standards must be observed.

Install units on a firm and flat foundation. Any other type of installation including suspension or use of the transport lugs for permanent attachment are excluded. Any unevenness, leading to non-parallel frames of connecting parts, must be flattened out with suitable supports (metal strips or equivalent). Maximum tolerance to the horizontal is $s = 0.5$ % (max angle of inclination: 0.3°).



The foundation must conform to the building requirements in terms of statics, acoustics and proper water drainage (drip pan, air humidifier, etc.). Structural beams must be one single piece over their entire length. The maximum beam distortion is 1/1000 of the beam length. The distance between horizontal beams may not exceed 24 modules (2.5 m).

The natural frequency of the supporting structure, especially steel supports, must be separated adequately from the exciter frequency of rotating components of e.g. fans, motors, pumps, compressors etc.

robatherm AHUs must be secured to the foundation. Especially in the case of unfavourable centre of gravity positions (e.g. a height/depth ratio ≥ 2.5), robatherm recommends further security measures.

robatherm AHUs are not intended to be used as substructure for other trades (ventilation ducts, maintenance platforms, cable trays, etc.). The unit roof is not designed as standard to accommodate additional roof loads. If necessary, consult robatherm.

robatherm AHUs must not take over any functions of the building itself. For reasons of mechanical resistance, structural stability and wind load stability, different robatherm AHUs may not be installed directly one above the other (stacking) without a suitable substructure provided by the customer.

The following applies to robatherm AHUs with integrated refrigeration technology: A refrigerant sensor for monitoring the installation site and suitable ventilation of the installation site must be present and functional.

Instructions of the national standards and regulations must be observed. In the event of improper use of the robatherm AHU or different installation, e.g. replacement of the building roof by the unit floor or assumption of static functions, any warranty obligation expires for robatherm.

robatherm AHUs are not intended for use in hazardous areas and must not be used in hazardous areas.

The installation site

- must be clean.
- must be free of conductive dust.
- must be free from strong electromagnetic fields.
- must be free of aggressive media.
- must have a drainage system.

Additional Requirements for Indoor Units:

The installation site

- must be dry.
- must be frost-free.

Additional Requirements for Weatherproof Units:

The installation site

- must take into account the external influences (sun, rain, snow, wind, frost, etc.) of the installation site. Depending on the expected wind load, robatherm AHUs must be fixed to the foundation. The media connections and cabling must be carried out professionally.
- must have a suitable lightning protection system in accordance with national regulations. For Germany at least the lightning protection zone LPZ 0B must be fulfilled. The external lightning protection system must not be installed on or at the air handling unit. When laying the cables of the air handling unit, the customer must maintain the necessary separation distances between the cables and the external lightning protection and other dangerous cables.
- must comply with the applicable regulations against the falling of persons, tools and materials, and suitable fall protection devices must be provided.

- If a hydraulic system is installed in a weatherproof execution, this must be protected against frost on site.

Transport and Storage

All units and components must be transported and stored in such a way that damage, adverse effects through weather factors, condensation (ensure sufficient rear ventilation within the packaging) or contamination are avoided. When storing for over 3 months, loosen belt drives and turn rotating components such as e.g. on ventilators, motors, pumps, HRS rotors on a monthly basis.

Installation

If units are supplied in separate sections, these shall be assembled in accordance with these assembly instructions and professionally connected to the ductwork. All protective devices shall be applied.

The person responsible for assembly on site and changing non-runable components to complete ready to operate units is also responsible for issuing the certificate of conformity and the CE marking.

Before Commissioning

The unit can only be taken into operation if it has been assembled in accordance with these instructions. All protective devices must be effective. A lockable service switch must be installed near the fan unit access door.

Lightning Protection of Outdoor Installations

The installation site must have a suitable lightning protection system in accordance with national regulations. The design and implementation of a lightning protection concept is the responsibility of an authorised specialist company on site and not the responsibility of robatherm.

No surge protective devices are installed for all AHUs destined for countries outside Germany. If this is required, this must be communicated during the planning phase.

The external lightning protection must not be installed on the AHU.

When laying cables of the AHU, the necessary separation distances between the cables and the external lightning protection as well as other hazardous wiring must be maintained by the customer.

When retrofitting AHUs or modernising existing systems, lightning and surge protection measures on or in the building and existing apparatuses may have to be retrofitted.

Fire Protection

Possible spreading of fire between supply- and exhaust air sections of the AHU (e.g. via the heat recovery system or recirculating air) must be prevented by appropriate precautionary measures in the building site's system (e.g. fire dampers) by others.

A downstream grid in the system that may be required in accordance with EN 1886 to prevent combustible parts from the filter, drop eliminator or contact humidifier from being carried into the supply air duct must either have been explicitly ordered as such or be provided on-site. Local laws and regulations must be observed.

Handover

AHUs with integrated control technology may only be taken into operation after to robatherm's initial commissioning and after handover and customer's briefing has been concluded.

Freeze Protection

In case of ambient temperatures below the freezing point, it can make sense not to switch down the unit, e.g. in order to prevent dampers from freezing or to avoid any failures during a later restart.

Safety Instructions



Caution

Serious bodily injuries and even loss of life and material damage can result from non-observation of the following instructions of the valid national and international safety regulations.

References in this document to technical rules (e.g. BGR, BGV, DVGW, TRBS, TRGI) are subject to the relevant local health and safety regulations regarding installation and operation of the unit.

Even if the unit is switched off, certain regulating functions can lead to sudden switching on of unit components such as e.g. resumption of power supply, compressor pump-out, fan overshoot, frost protection, timer programs.

Electrical conductors and terminals in front of the main switch, as well as any built-in switch cabinet lighting and surge protective devices, including their connected wires, cables and terminals, are still under voltage when the main switch is deactivated.

When the fan is in operation, there is perilous voltage on the permanent-magnet synchronous motor → danger to life.

Only enter the unit or work on it when the following conditions are met:

- All-pole disconnection of power supply.
- Minimum waiting period of frequency converter 15 minutes (due to remaining voltage).
- Use a switch-off device to prevent unexpected start-up (e.g. service switch) according to DIN EN 60204-1 (VDE 0113-1).
- Standstill of all moving parts, especially fan impeller, belt drive, motor, rotary heat exchanger.
- Heat exchanger and hydraulic systems adapted to ambient temperature.
- Pressure bearing systems must be free of pressure.
- Wear protective clothing (e.g. safety shoes, gloves, safety glasses, helmet, ...).
- No explosive atmosphere present. (rinse unit beforehand if necessary)

The following requirements must be met before the unit is switched on:

- Protective devices must be fitted and effective in accordance with DIN EN ISO 12100 (e.g. protective grille).
- Check that no persons are in the danger area, e.g. inside the unit.

The unit must not be entered by more than one person at a time. If this is nevertheless necessary, suitable measures must be taken to distribute the weight.

Emergency Provisions

Fire

The local fire provisions must generally be complied with. If there is a fire, disconnect all-pole power supply to the unit immediately. Close dampers and fire dampers in order to stop the oxygen supply and the spread of fire. Direct fire-fighting and first aid measures immediately. Inform the fire brigade. Protection of people has priority over protection of property.



Caution

Serious damage to health or even loss of life if fire gases are breathed in. In a fire building materials used may generate toxic substances. Use heavy duty breathing protection!

Serious damage may be caused to health and property by bursting of pressure vessels or pipelines during a fire. Keep away from danger area!

Maintenance and Cleaning Instructions

Maintenance Intervals

AHUs are machines which require regular maintenance. The maintenance intervals given are approximate and relate to normally polluted air according to VDI 6022. If air is heavily polluted, the maintenance intervals must be shortened accordingly. Regular maintenance does not absolve the operator from his duty of care which involves checking the unit for function and damage on a daily basis.

Cleaning and Maintenance of the Casing (including Pans)

- Coarse contamination must be removed dry with an industrial vacuum cleaner.
- Other fouling: Use damp cloth; with grease and oil dissolving cleaners if necessary (neutral cleaner with pH value between 7 and 9 in the concentrate).
- To completely clean pans with limited accessibility, (eg. under coils) obstructive elements might have to be disassembled prior to cleaning.
- Treat galvanized parts with preservative spray.
- All moving parts such as door handles, hinges must be treated with lubricating spray regularly.
- Check sealings, especially door sealings regularly for damage and function.
- Immediately eliminate damage to the coating or traces of corrosion by using touch up paint.
- Remove pollution and dirt in gaps or grooves using damp cloth with applicable cleansers or a vacuum cleaner.

Disinfectants

Only use disinfectants with an alcohol base with country specific approval (e.g. RKI, VAH, DGKH).

Recommissioning

After carrying out maintenance or disinfecting measures, ensure the unit is sufficiently clean before returning to operation. Toxic or odorous substances must not come into the supply air.

Leak Test

In clean areas where there must be no transfer of particles from exhaust air to supply air, the relevant parts must be tested for leakage annually or following any servicing (e.g. by means of a suitable test gas). Observe manufacturer's safety instructions! If necessary take suitable measures to eliminate any leaks in consultation with the manufacturer.

Delivery

Goods Inspection

On receipt of the goods they must be checked for damage and completeness. Missing parts and damage must be noted immediately on the consignment note and be confirmed by the driver. Details relating to procedures when damage is discovered are noted in detail on the delivery note. If no such procedures are followed, no liability for defects will be accepted.

Unloading and Transport

All units are equipped with lifting eyes or transport loops.
 Units without their own base frame are equipped for transportation with expendable pallets.
 Only transport unit in usage position (not inclined or lying).
 Unloading and transport should preferably be carried out with a crane or fork lift truck.



Caution

Serious bodily damage or material damage may be caused by falling loads.
 Observe the safety instructions of the transporting vehicles.
 Do not stop under an airborne load!

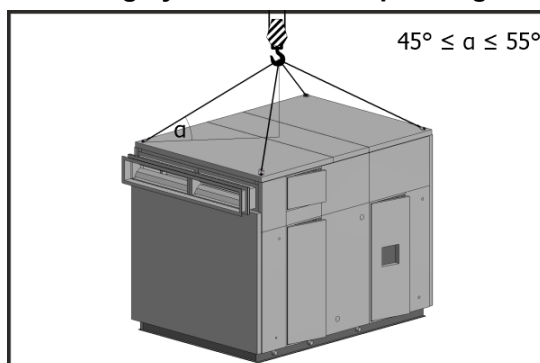
Unloading and Transport by Crane



Attention

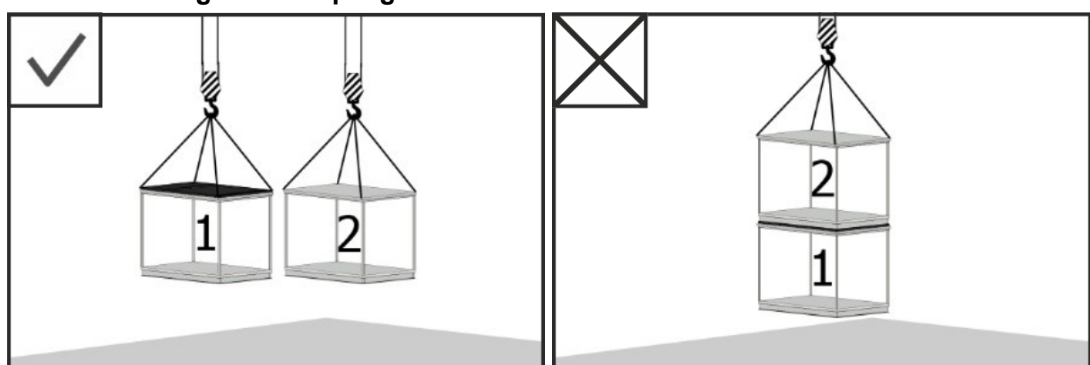
Only use suitable and approved slinging devices (ropes, chains, lifting belts) for unloading and transporting the units and only fasten them to the transport lugs or transport loops in accordance with BGV D6.

Unloading by Means of Transport Lugs



Attach slinging device to transport lugs. The angle of inclination α between the slinging device and load must be between 45° and 55° , otherwise a lifting harness must be used.

Crane of Casing with Coupling Frame

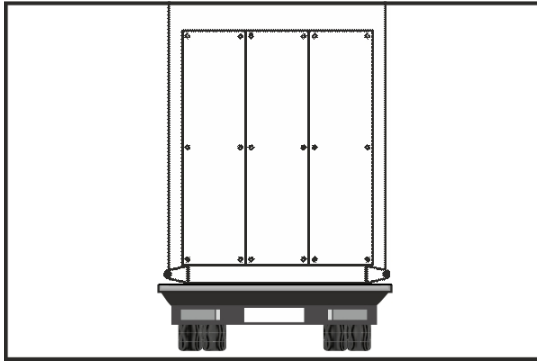


Always crane sections individually! The upper section (2) must not be connected to the lower section (1) until the lower section (2) is at its final installation site. Always crane sections individually! The upper section (2) must not be connected to the lower section (1) until the lower section (2) is at its final installation site. The coupling frame is not designed to lift the lower section (1) together with the upper section (2).
 For the unit connection see page 15.

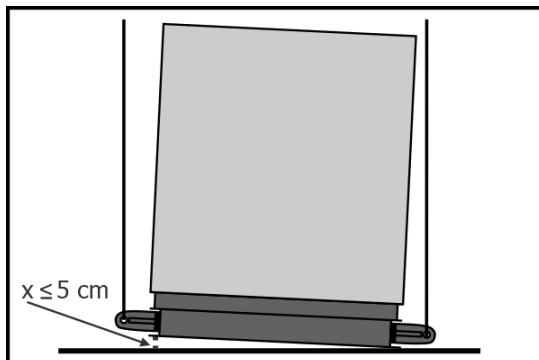
Cranes of rotary heat exchangers supplied separately

If rotary heat exchangers are supplied separately, the rotary heat exchangers must first be attached to the crane before the transport safety device is removed to prevent them from falling over.

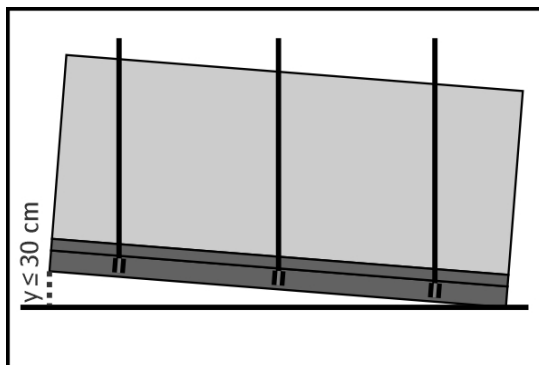
Unloading by Means of Transport Loops



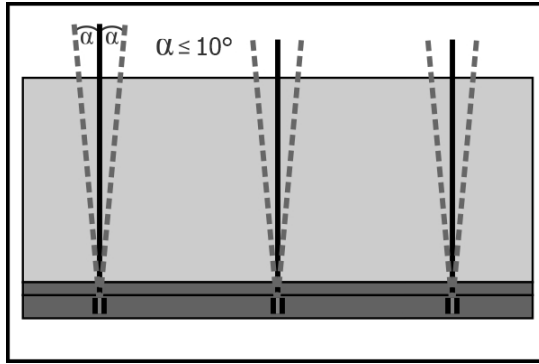
The transport loops must be used for AHUs, which are fully mounted on a DIN-frame. For units with DIN-frame by means of a suitable onsite lifting equipment (e.g. cargo gear), it is imperative that an even load distribution on all transport loops must be ensured. The transport loops have to be removed after installing the unit to prevent injury. Support point layout for DIN frame units is defined exclusively for transportation and handling. For more information see page 2.



The maximum permitted inclination when craning units with DIN frame in width direction is $x \leq 5 \text{ cm}$.



The maximum permitted inclination when craning units with DIN frame in length direction is $y \leq 30 \text{ cm}$.



The maximum permitted diagonal draught of the lifting equipment when craning units with DIN-frame is $\alpha \leq 10^\circ$.



Caution

Determine the centre of gravity! Reduce the inclination by changing the rope length. Failure to do so may result in a tipping hazard. Load all transport loops equally! Use turnbuckles as lifting equipment for even loading. A lifting gear may be required for professional craning.

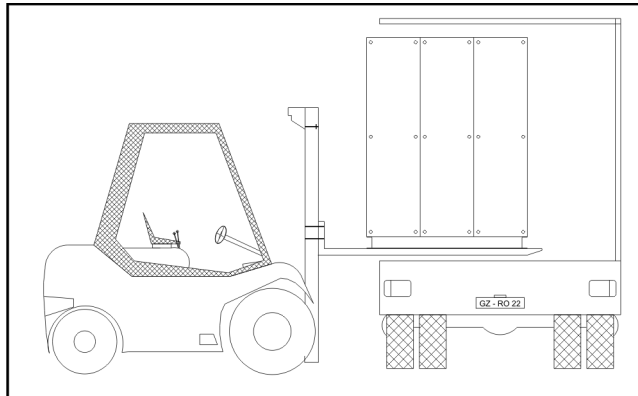
Unloading and Transport by Fork Lift Truck



Attention

When unloading and transporting with fork lift trucks, use forks which go fully underneath the unit. Only transport units on the base frame or on the pallet.

Unloading Fork Lift Truck



Forklift unloading of rotary heat exchangers shipped separately

In case of rotary heat exchangers supplied separately, the rotary heat exchangers must be secured against falling over by suitable auxiliary means (ropes, supports, ...) provided by the customer.

Assembly and Installation

Unit Installation

Lifting Gear

Only use suitable and permitted lifting gear for assembly. Only apply lifting gear at the top edge of the base frame to avoid any deformations.

Note

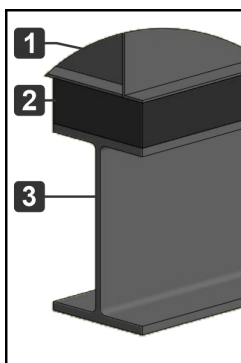
Check arrangement of functional components and unit design in accordance with data sheet and drawing prior to starting unit installation.

Sound Reduction

In order to adhere to the permissible sound emission values, sound reducing components are to be installed at suction and pressure points or on the unit housing (e.g. duct sound damper, sound proofing walls) if they are not or insufficiently integrated into the unit.

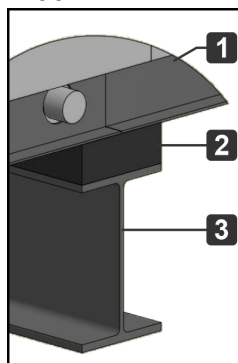
Vibration damping

Installation on longitudinal support



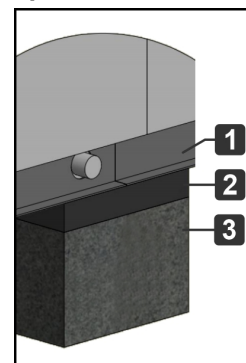
- 1 – base frame
- 2 – vibration damper
- 3 – on-site support

Installation on width support



- 1 – base frame
- 2 – vibration damper
- 3 – on-site support

Installation on foundation spots



- 1 – base frame
- 2 – vibration damper
- 3 – on-site foundation spot

Use vibration dampers for vibration damping (e.g. Mafund, Sylomer or Ilmod Kompri tape) in length and width direction. Use the appropriate type depending on the load. The dimensioning of the vibration dampers is done on site. Use vibration dampers on all types of supports!

Base Frame with Thermal Break

Misalignment of the casing connecting holes through different compression of the decoupling profile on the basis of weight differences of neighbouring appliance parts must be balanced out for unit installation e.g. by means of suitable lifting gear.

Transport Lug / Transport Loops

Following assembly remove the transport lug / transport loops and seal the openings by means of plugs. For weatherproof units see page 32.

Unit Connection

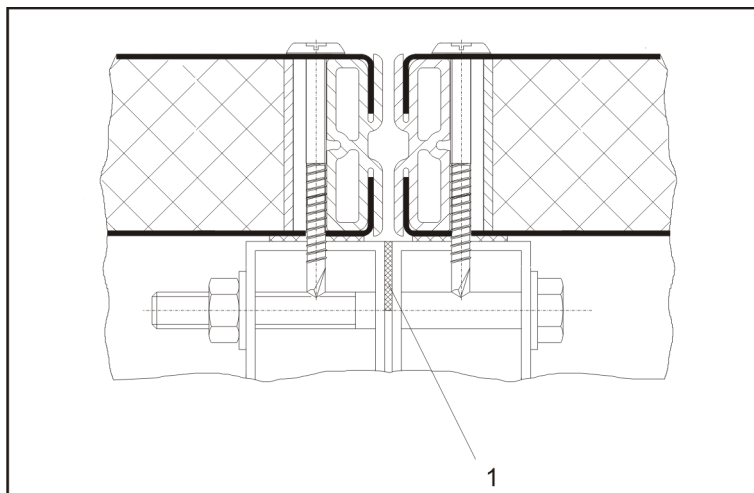
All connecting parts such as screws, sealing tapes and roofing strips (only for weatherproof units) are included in the units – mostly in the fan unit.

The unit sections are connected by bolts used through the inside. If no access doors are provided at connection points, the marked covering panels must be removed for better access.

If unit sections are only accessible from one side, there will be threaded bushes in the frame. In this case the connecting screws must be tightened by hand for the first 10 mm, followed by tightening with a torque of max 30 N.m.

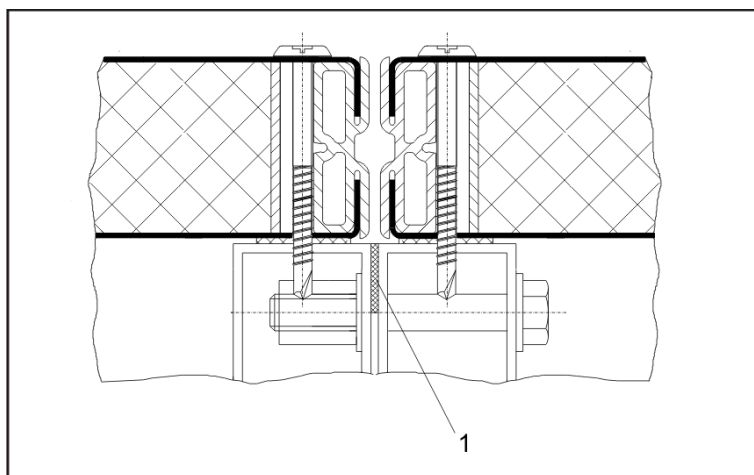
For the stainless steel version only use stainless steel connecting elements.

Through Bolt Connection



1 – Self-adhesive sealing

Bolt with Thread Bushes



1 – Self-adhesive sealing

In order to connect the unit parts, proceed as follows:

- Stick self-adhesive sealing along the circumference of the section frame at each division area of a unit

Note

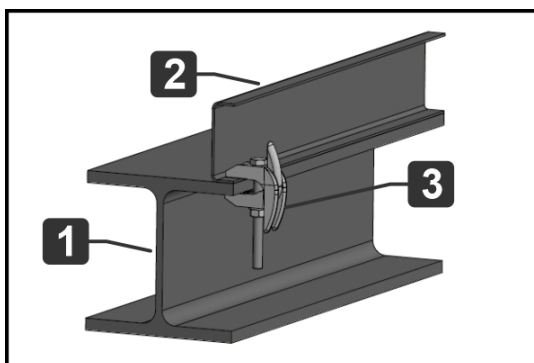
The sealing must be stuck between the covering panel and the row of holes.

- Cut out holes or threaded bushes in the sealing.
- If necessary remove marked covering panels.
- If necessary press unit parts together with screw clamps.
- Connect components.
- Refit covering panels which have been removed.

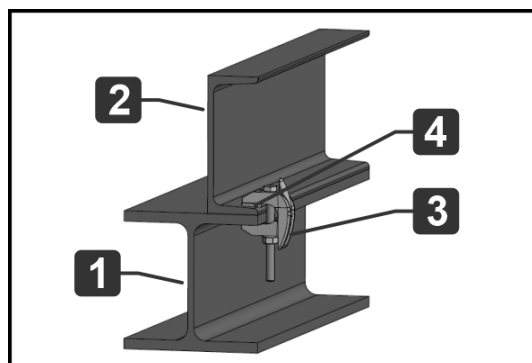
Fastening to on-site supports

Installation on Longitudinal Support

Special beam clamps are recommended for fixing AHUs to on-site longitudinal supports.



- 1 – on-site longitudinal support
2 – base frame
3 – beam clamp F9



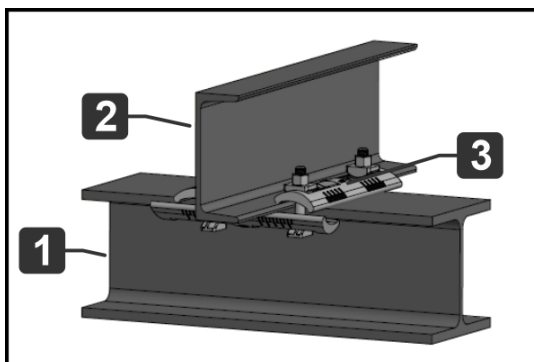
- 1 – on-site longitudinal support
2 – DIN frame
3 – beam clamp F9
4 – DIN 434 taper washer

For units on DIN frames use DIN 434 taper washers. They are used to compensate inclination in the flanges of the U-beams.

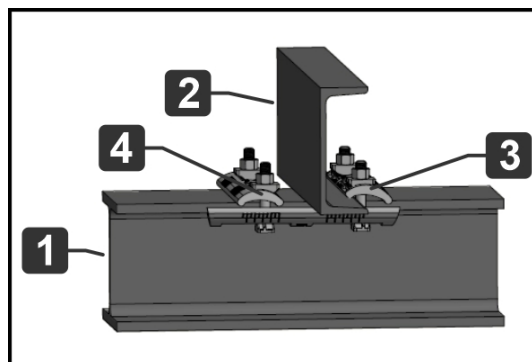
For further information, please contact your robatherm representative.

Installation on Width Support

Special beam clamps are recommended for fixing AHUs to on-site width supports.



- 1 – on-site longitudinal support
2 – DIN frame
3 – beam clamp FC



- 1 – on-site longitudinal support
2 – DIN frame
3 – beam clamp FC
4 - beam clamp completely closed

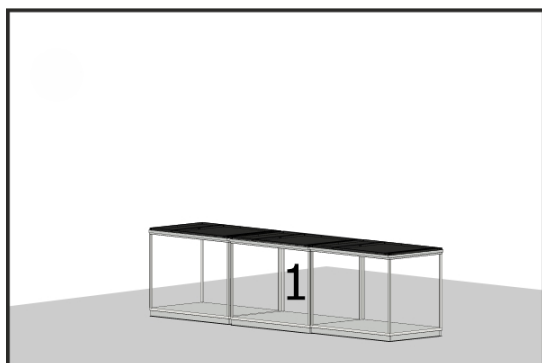
For further information, please contact your robatherm representative.

Avoiding the risk of tipping

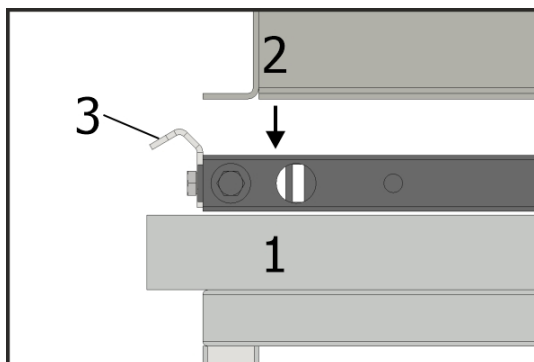
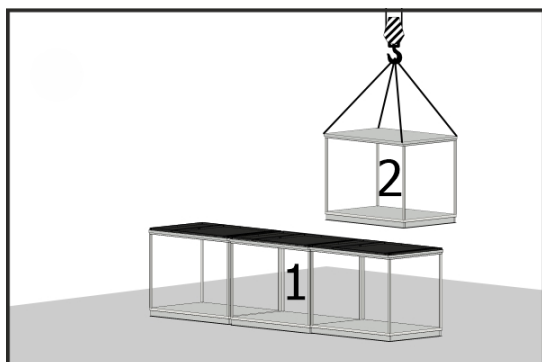
Especially in the case of unfavourable centre of gravity positions (e.g. a height/depth ratio ≥ 2.5), robatherm recommends further security measures. For the exact arrangement of the fixing points on the AHU, please contact your robatherm representative.

Coupling frame

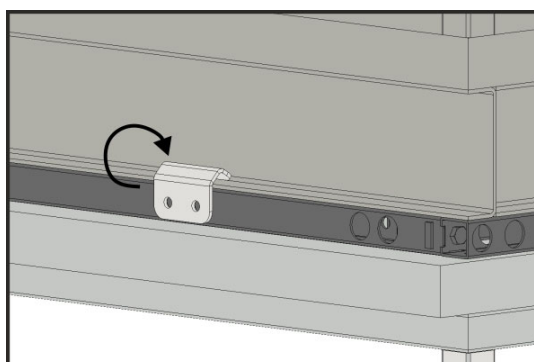
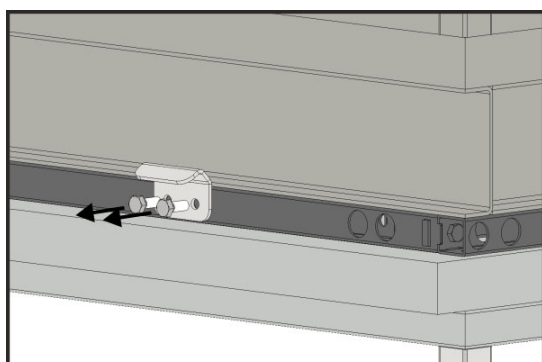
The coupling frame is used to install two robatherm AHUs one above the other. The delivery units are only connected to each other at the final installation site (for more information see page 2).



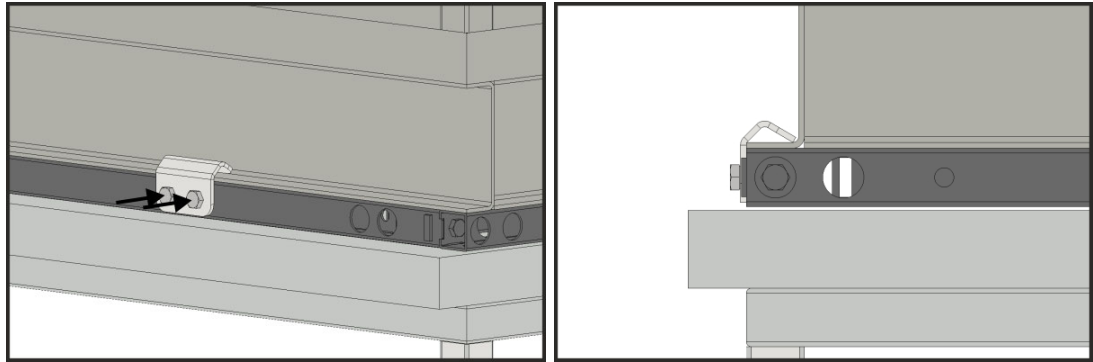
- Install and connect the lower robatherm AHU (1) (for more information see page 9).



- Place the upper robatherm AHU (2) on the coupling frame of the lower robatherm AHU.
- Coupling brackets (3) on the coupling frame serve to guide and centre the base frame of the upper robatherm AHU.



- Remove the hexagonal screws of the coupling brackets.
- Turn the coupling bracket so that the roof-shaped loop faces the base frame.



- Mount the coupling bracket with the hexagonal screws.
- The coupling brackets fix the base frame of the upper robatherm AHU to the coupling frame of the lower robatherm AHU.

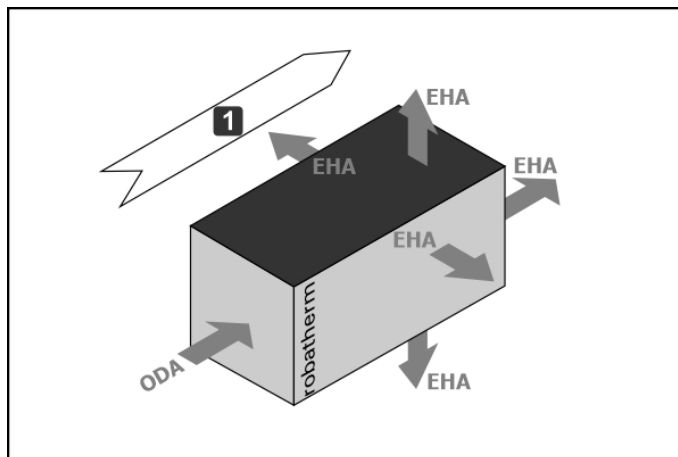
Sealing of Unit Section Joints

For residue free cleaning of the unit, all unit casing splits in the base area are to be sealed with microbially inert PU jointing compound.

Units in Weatherproof Version

All unit openings (e.g. duct discharge, electrical connecting box etc.) must be sealed or equipped with weather protection in order to prevent water ingress into the unit. Plan the installation height of the unit in accordance with max. snow level. Connected ducts must be drained professionally on site.

Do not locate the outdoor air intake in the main wind direction of evaporative cooling systems/wet cooling towers (CEN TR 16798-4 2017 chap. 8.8.2).



1 – Main wind direction

If the outdoor air quality is independent of the orientation, the outdoor air intake shall be in the windward direction. This is to avoid short circuiting of the air flows.

Snow Load

It is the customer's responsibility to carry out a snow load calculation for the AHU. The result of the calculation is the clearing height.

Above this height, the snow must be cleared from the AHU roof to avoid damage.

For safe snow clearance of the unit roof, robatherm offers an individual solution for your AHU. For further information, please contact your robatherm representative.

Wind Load

It is the customer's responsibility to make a wind load calculation for the attack surface of the AHU. According to the expected wind load, robatherm AHUs must be fastened to the foundation.

Fall Protection

A fall height of more than 1 m constitutes a fall hazard.

For fall heights of 1 m or more, protection by a guardrail is recommended.

From a fall height of 3 m, fall protection can be realised by means of securants. For lower fall heights, securants do not fulfil their function.



Caution

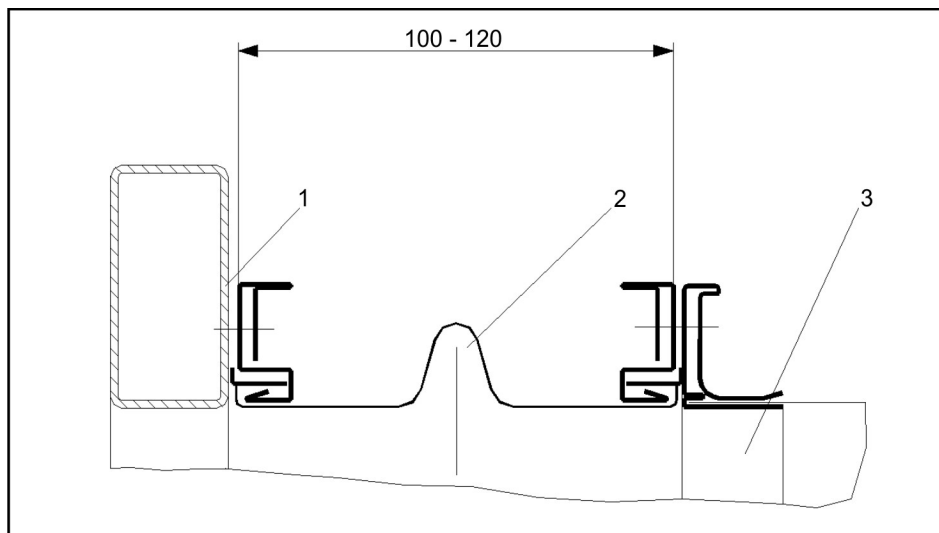
The transport lugs must never be used for fall protection.

For safe snow clearance of the unit roof, robatherm offers an individual solution for your AHU. For further information, please contact your robatherm representative.

Connection Air Duct

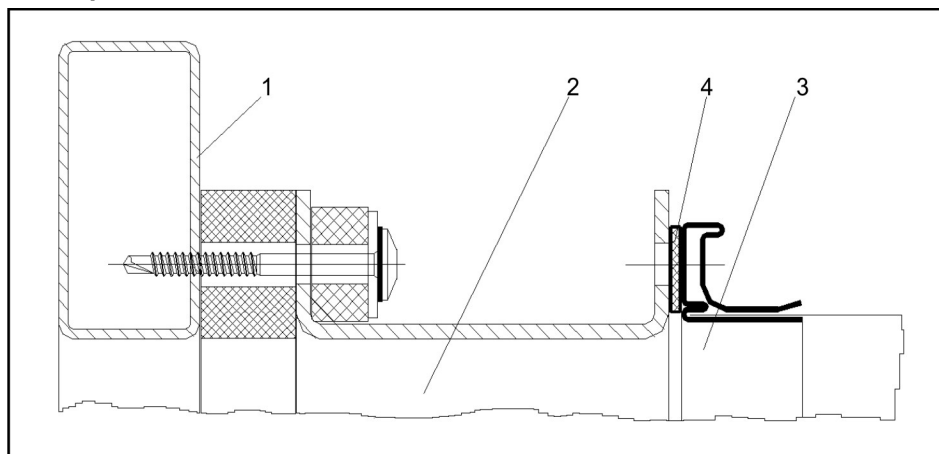
All air ducts shall be installed stress-free. Any flexible connectors must not be extended to their max length. Adjust its installation length at 100 to 120 mm. Air ducts including connection profiles and flexible connectors should be professionally insulated and protected from the elements. Provide the same to the units' frames.

Flexible Connection



1 – Unit frame, 2 – Flexible connection, 3 – Building duct

Decoupled Section Frame



1 – Unit frame, 2 – Decoupled section frame, 3 – Building duct, 4 – Sealing

Openings downwards



Caution

Removing the grates creates the danger of falling through the exposed opening. Secure at the fixing point with a fall protection device.

Through exposed openings, objects such as tools can also fall down and endanger persons who are under the opening. Block off the endangered area, e.g. safety net.

If installed incorrectly, there is a risk of falling due to the limited load-bearing capacity of the grate.

To connect the air ducts to downward openings, it may be necessary to remove grating elements. To install the grating elements after work has been carried out, please refer to the instructions on page 39.

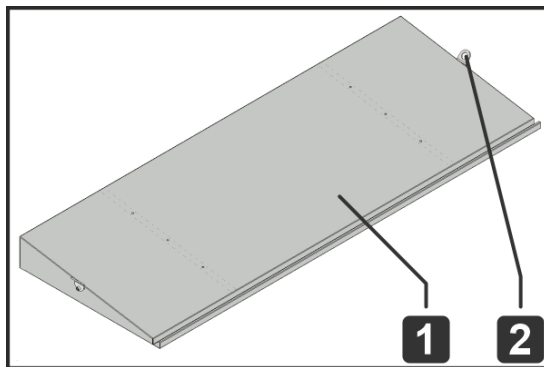
Protection Roof

General

Weatherproof units can be equipped with protection roofs.

The following material is supplied:

- Protection roof with mounted transport lugs
- Presentation tape, 20x4 mm, PE foam, anthracite
- Drilling screw with lens head DIN 7504, 6.3x80 mm, Torx, galvanised
- Plug 13,0x11,0x5,0 PE RAL 9010/pure white



1 – Protection roof, 2 – Transport lug

Safety Regulations



Caution

Serious bodily damage or material damage may be caused by falling loads.
Observe the safety instructions of the transporting vehicles.
Do not stop under an airborne load!



WARNING!

Life threatening danger due to falling

There is a risk of life threatening falls if the protection roof is stepped on, as the protection roof is not suitable for carrying loads.

- Do not step on the protection roof.

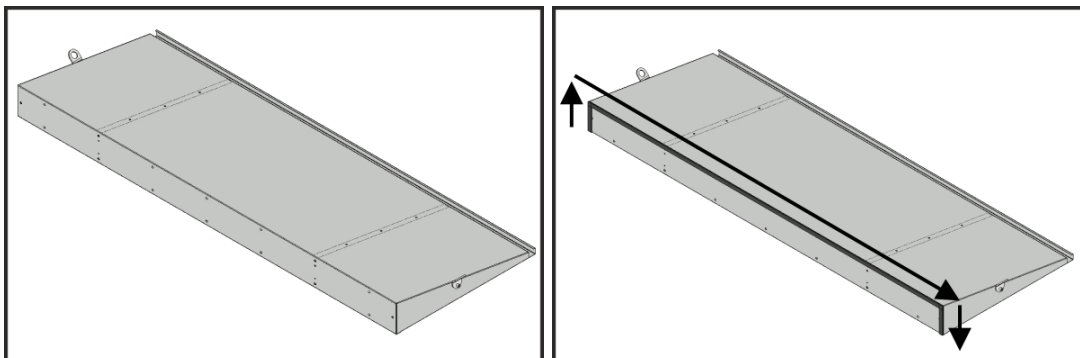


Attention

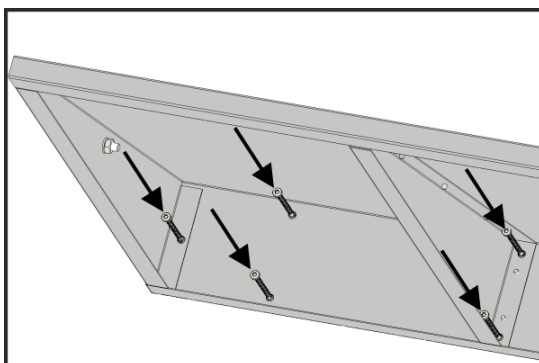
Only use suitable and approved slinging devices (ropes, chains, lifting belts) for unloading and transporting the units and only fasten them to the transport lugs or transport loops in accordance with BGV D6.

Work Process

Masking the Protection Roof

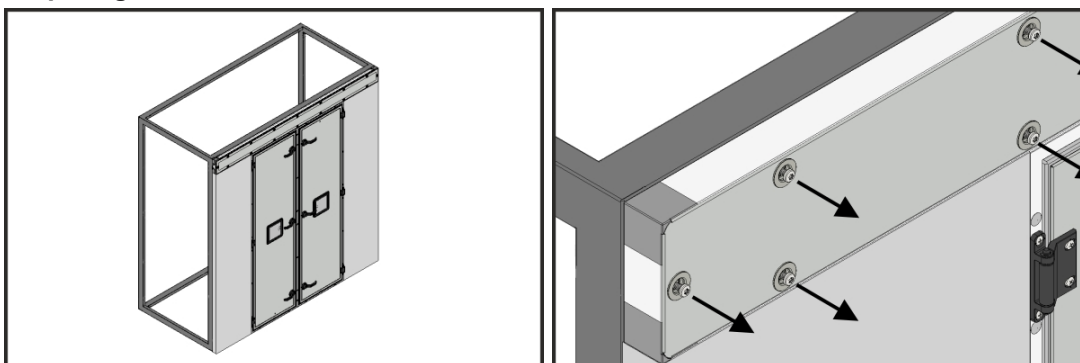


- Mask protection roof on the sides and on top with Presentation tape, 20x4 mm, PE foam, anthracite.

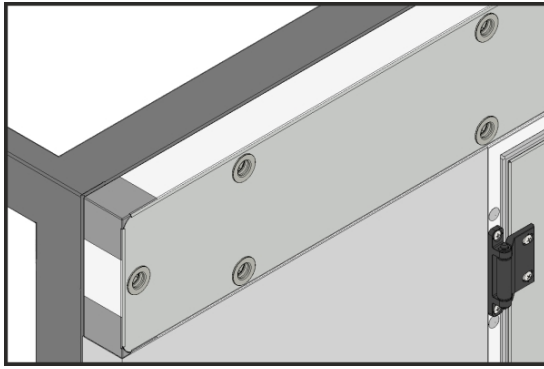


- Pre-attached the supplied drilling screw with lens head DIN 7504, 6.3x80 mm, Torx, galvanized.

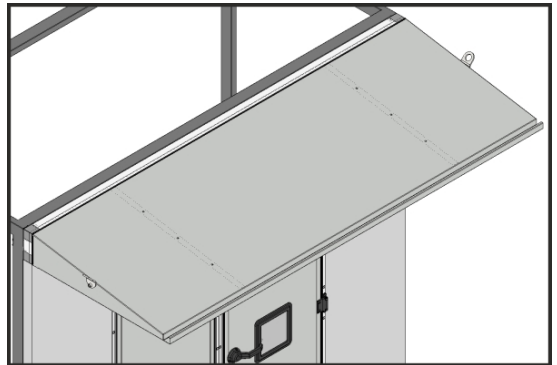
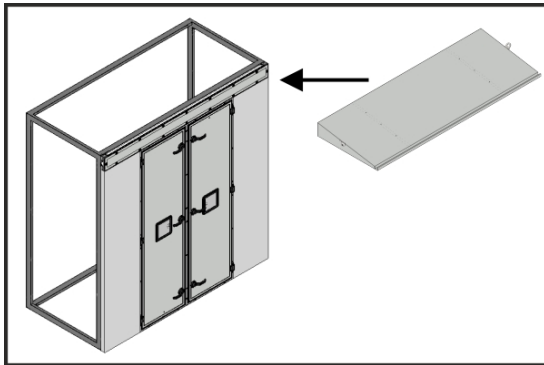
Preparing the Panel



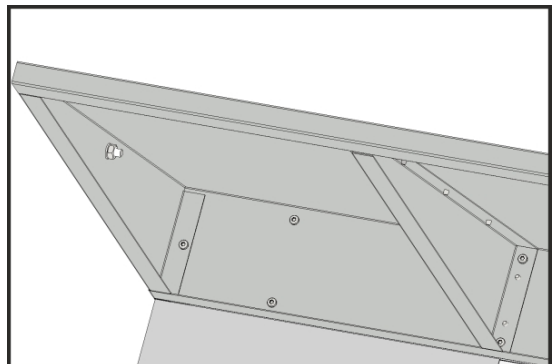
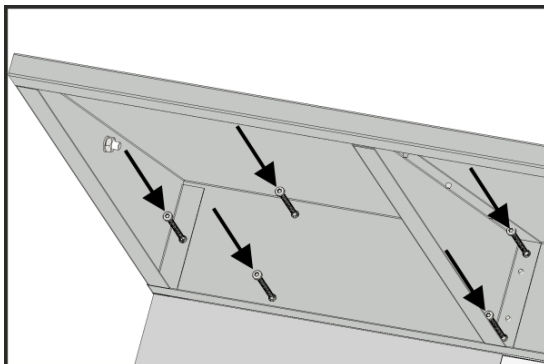
- Remove all screws from the corresponding panel.



Mounting the Protection Roof

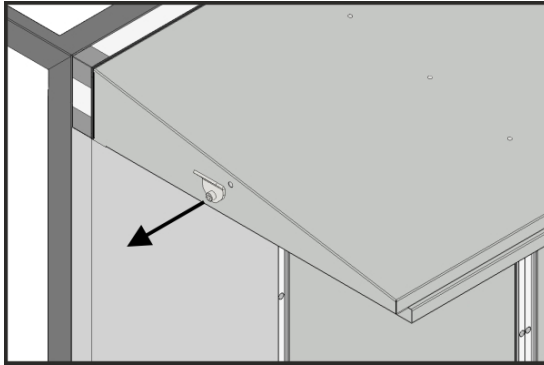


- Align the protection roof with the panel.



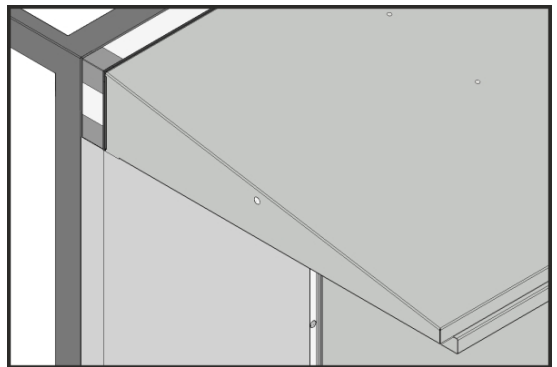
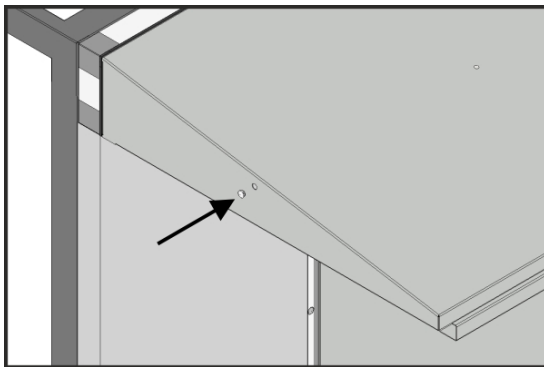
- Use bit extension.
- Mount the protection roof with pre-attached drilling screw with lens head DIN 7504, 6.3x80 mm, Torx, galvanized.

Removing the Transport Lugs

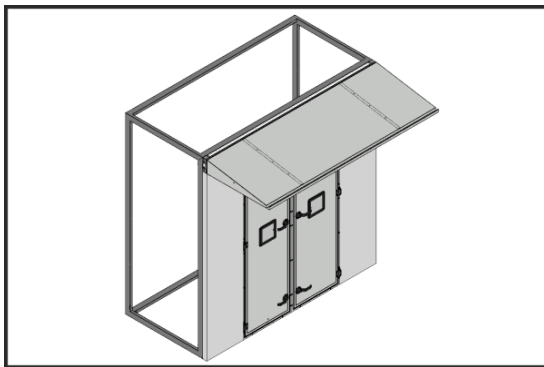


- Remove the transport lugs.

Seal Holes with Plugs



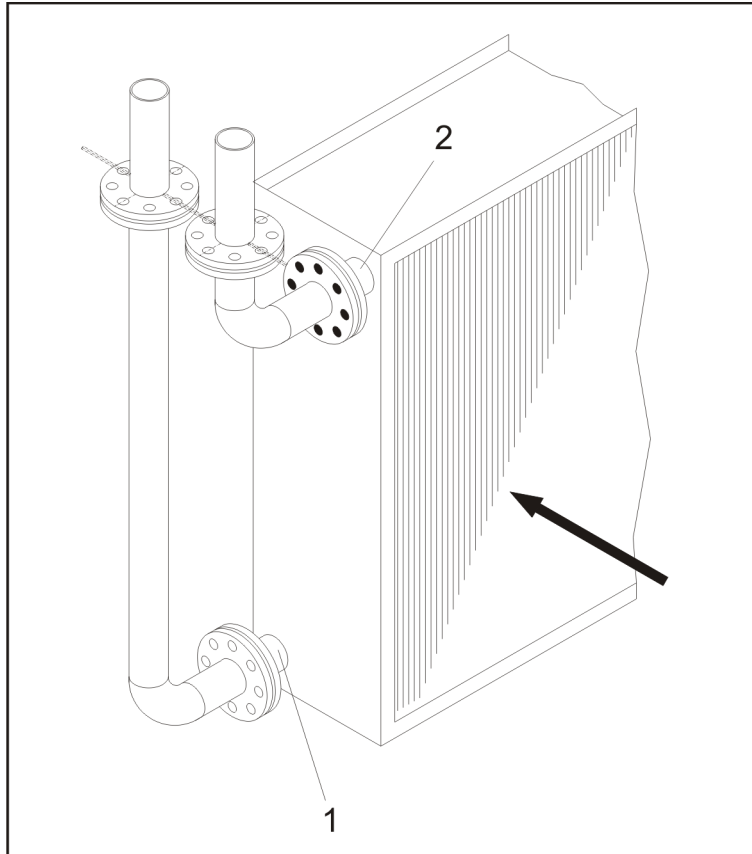
- Close the holes with plugs 13,0x11,0x5,0 PE RAL 9010/pure white



Connection of Heat Exchangers

When connecting heating and cooling water piping (inlet and outlet), care must be taken to ensure that the inlet and outlet connections are not confused (counterflow principle with water inlet and air outlet side).

Connection of the Heating and Cooling Water Piping – Example



1 – Inlet, 2 – Outlet, Arrow – Direction of Air



Attention

Plan and fit pipework to and from the unit so that the heat exchanger is not subject to stress and strain e.g. as a result of heavy weights, vibration, tensional forces, heat expansion etc. Use compensators if necessary.

When tightening the threaded connections of the heat exchanger on site use e.g. a pipe wrench for counter pressure as the inner pipes may otherwise be twisted and damaged.

The pipes must be flanged in such a way that problem free removal of the heat exchangers for maintenance or exchange purposes is possible.

Connection of Refrigerating Piping

Prior to connection check the heat exchangers and pipes for leaks, i.e. whether the inert gas charge on the operation side is still under pressure.

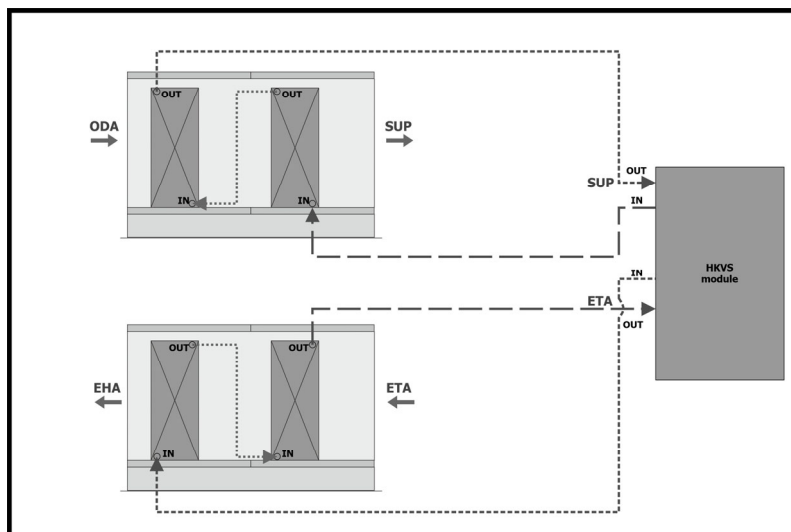
The pipework outside the AHU must be insulated to be diffusion-tight.



Caution

In the case of heat exchangers containing refrigerant, observe the notes on page 61 on the refrigeration plant, heat pump and split air conditioner!

Connection of HE-RAC



The coils are to be connected according to the counterflow principle.
Coils divided in height are to be connected in parallel.

Connection of the Condensate, Discharge and Overflow Piping

Provide all outlets with a siphon (with non-return valve and self-filling device) and remove waste water appropriately. The height of the siphon must be set in accordance with the low pressure or overpressure of the ventilation unit so that suction or blowing out of the air in relation to the connected waste water pipe is prevented.

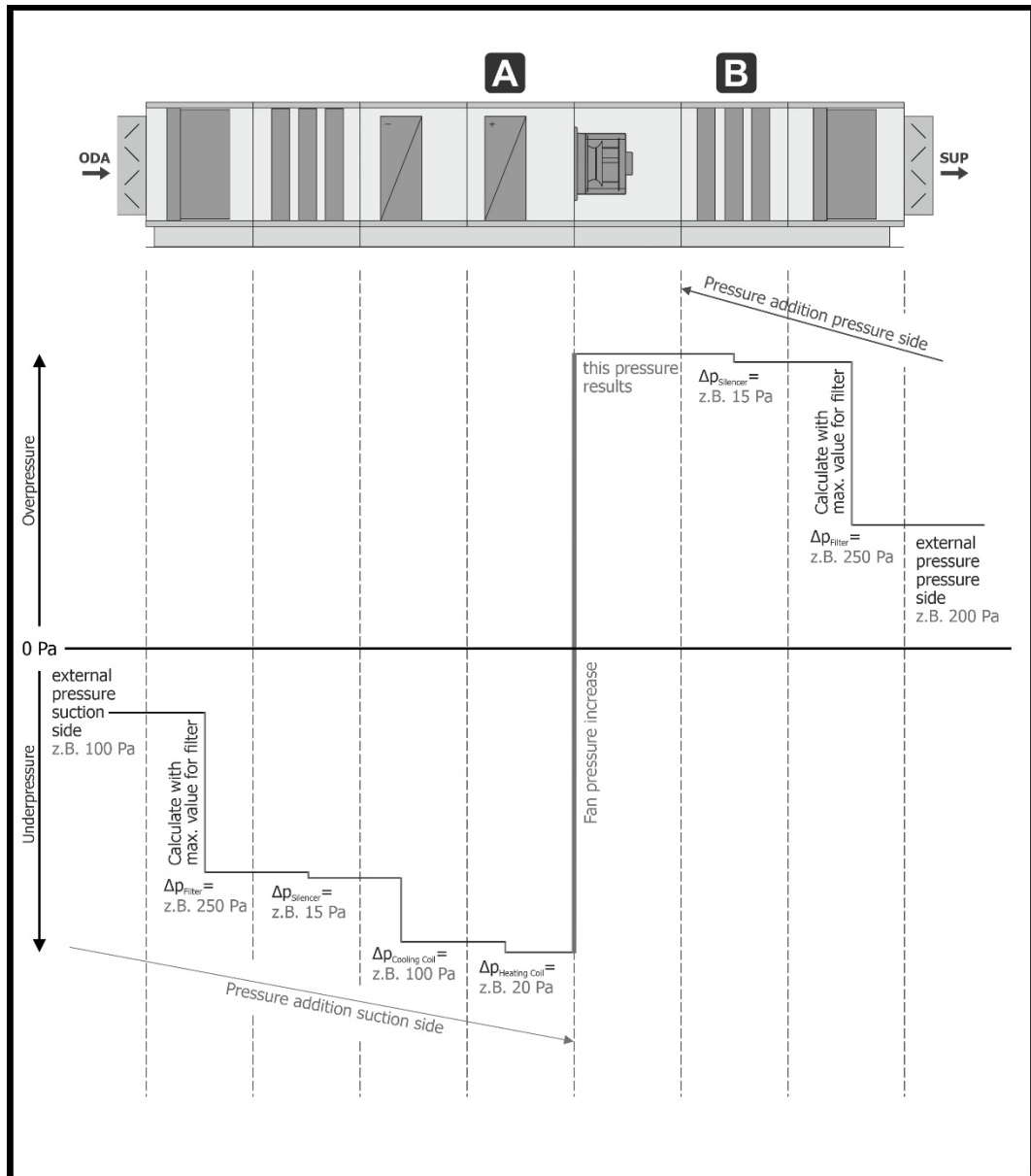
Connection of Siphon



Caution

Each drain outlet from a floor pan must be connected individually with its own siphon and a free outlet.

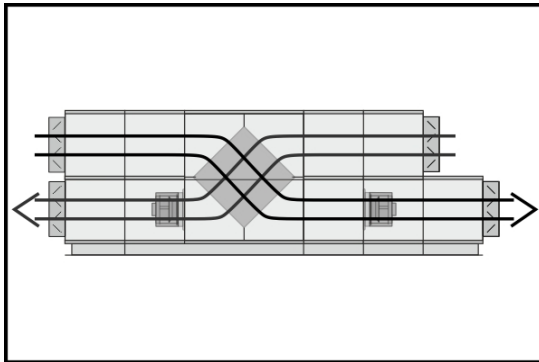
Determining the pressure curve



In order to calculate the pressure in a component, following parameters are needed, depending on the part of the system in which the component to be considered is located:

- the pressure loss of individual components in the unit (see technical data sheet) and
- the external pressure on the suction side or
- the external pressure on the pressure side.

Pressure Calculation for Plate Heat Exchangers



Caution

In a combine unit with a plate heat exchanger, the air flows cross. Make sure that you follow the air flow when calculating the pressure.

Siphon with Underpressure

Pressure Calculation Suction Side

Pressure calculation in the heating coil (A)

• External pressure on suction side		z.B.	-100	Pa
• Pressure loss	Filter component	z.B.	-250	Pa
• Pressure loss	Silencer	z.B.	-15	Pa
• Pressure loss	Heating coil	z.B.	-100	Pa
• Pressure loss	Cooling coil	z.B.	-20	Pa
Total			$p_1 = -485$	Pa

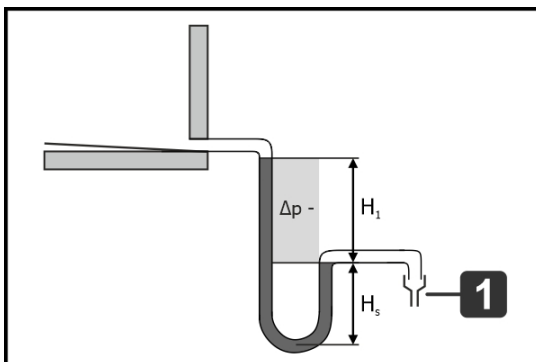
With this pressure you can now calculate the siphon height for a siphon with underpressure (suction side).

Note

This pressure + the corresponding siphon height only applies to the component under consideration.

Always use the final pressure loss for the filter pressure loss.

Siphon Height Calculation for Siphon with Underpressure



1 – Free outlet at atmospheric pressure

The siphon height for a siphon with underpressure is determined as follows:

$$H_1 [\text{mm}] = p [\text{Pa}] / 10$$

$$H_s [\text{mm}] = p [\text{Pa}] \times 0,075$$

p - maximum internal pressure [Pa] on the suction side of the component in question
(e.g. (A) $p_1 = -485$ Pa)

$$H [\text{mm}] = H_1 + H_s$$

Note

This is a recommendation for the siphon height calculation procedure.
Please always use the specific heights of the siphon manufacturers.
See siphon data sheet.

Siphon with Overpressure

Pressure calculation Overpressure Side

Pressure calculation in the silencer (B)

• External pressure on the pressure side	e.g.	+200	Pa
• Pressure loss Filter component	e.g.	+250	Pa
• Pressure loss Silencer	e.g.	+15	Pa
Total		$p_2 = +465$	Pa

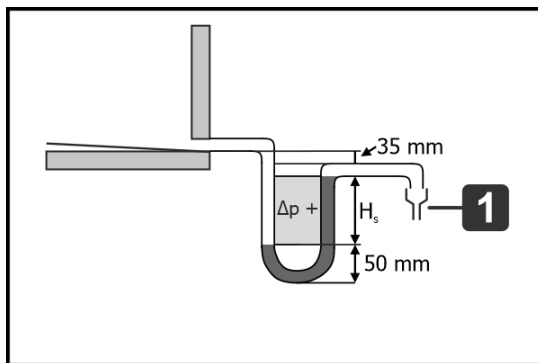
With this pressure you can now calculate the siphon height for an siphon with overpressure (overpressure side).

Note

This pressure + the corresponding siphon height only applies to the component under consideration.

Always use the final pressure loss for the filter pressure loss.

Siphon Height Calculation for Siphon with Overpressure



1 – Free outlet at atmospheric pressure

The siphon height for a siphon with overpressure is determined as follows:

$$H_s [\text{mm}] = p [\text{Pa}] / 10$$

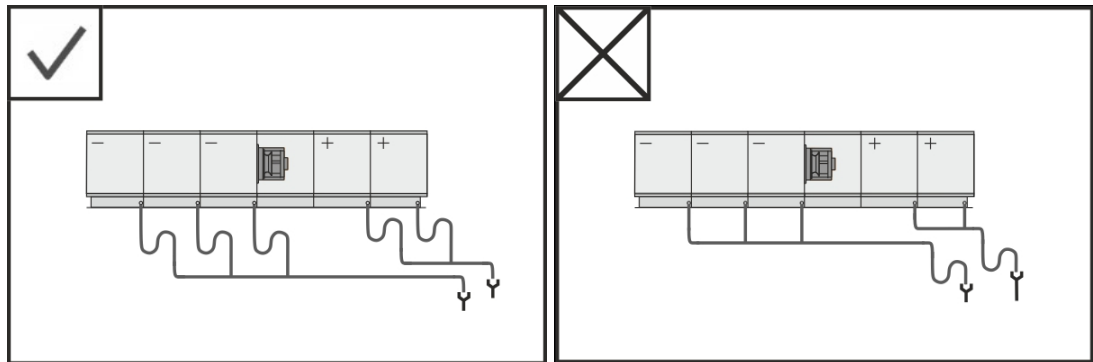
p – maximum internal pressure [Pa] on the pressure side of the component in question
(e.g. (B) $p_2 = +465$ Pa)

$$H [\text{mm}] = 35 \text{ mm} + H_s + 50 \text{ mm}$$

Note

This is a recommendation for the siphon height calculation procedure.
Please always use the specific heights of the siphon manufacturers.
See siphon data sheet.

Merging of several pan drains



When merging several drain outlets, a single siphon must be connected to each drain outlet. After the siphon, they can be combined. Only pressure-side OR suction-side siphons may be connected together. The joining must end in a free outlet.

Note

Only a siphon filled with water can fulfil its function. After a longer standstill, a siphon can dry out and must be filled again manually before commissioning. To avoid this, the installation of a ball siphon for underpressure or overpressure (suction or pressure side) is recommended.

Connection Humidifier

Connect the drain pipe of the humidifier and the drain of the prefabricated pan separately to the waste water drain.

Electrical Connection



Attention

Electrical work must only be carried out by a qualified expert.

Make sure that the electrical connection of weatherproof units is water tight. Connection from below or waterproof unions (at least protection rating IP 65, use sealings) with sufficient cable radius.

Check all electrical connections (switch cabinet, frequency converter, motor etc.) for correct seating and retighten if necessary (see also DIN 46200).

Electrical components such as electric air heaters, electric motors, actuators, etc. should be connected and grounded according to manufacturer's specifications, local electrical regulations as well as general recommendations concerning the prevention of electromagnetic interferences (grounding, cable lengths, cable shields, etc.).

The connection tags are attached in the terminal box.

All existing ground straps (equipotential bondings) shall be inspected and, if necessary, readjusted/retightened.

Electrical safety inspections should take place in accordance with DIN EN 60204-1 (VDE 0113-1) and by adhering to all required safety precautions.

The on-site power supply must fulfill the requirements cited in DIN EN 60204-1, Table 10.

According to nationally valid regulations, the operator is obligated to repeat these inspections on a regular basis.

In Germany, the periodic intervals of the repeated inspections according to BGV A3 §5 Table 1A (Repeated inspections of stationary electrical units and equipment) must be observed.

Motor Protection

- Protect motors against overload in accordance with DIN EN 60204 (VDE 0113).
- Provide motor protection switch and adjust to the motor nominal current (see nameplate). A higher set value is not permissible!
- Protect motors with integrated PTC thermistor sensors via a PTC release device.
- Motors with a nominal power up to 3 kW can generally be switched on directly (observe power limitations of the responsible energy supply company). For larger motors provide star-delta circuit or soft start up.
- Permanent-magnet synchronous motors must not be operated directly on the net without extra motor electronic (e.g. appropriate frequency converter) (net-bypass-operation is not possible).

Attention



Fuses and circuit breakers are not sufficient motor protection.

For damage due to insufficient motor protection the manufacturer's warranty lapses.

Clean Up

When assembly is complete all components must be inspected for contamination and cleaned if necessary in accordance with VDI 6022. Metal swarf in particular must be removed carefully as it can lead to corrosion.



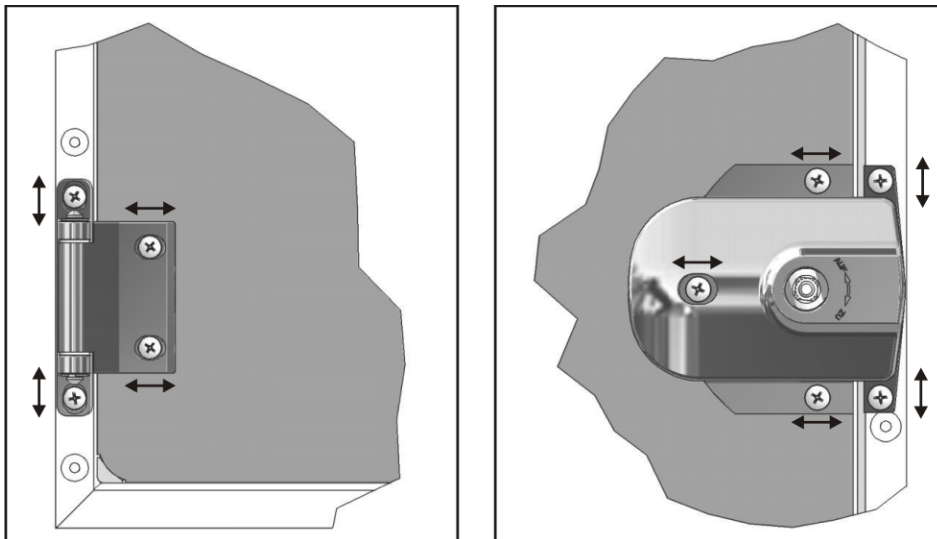
Caution

Observe general safety instructions on page 6!

Access Door

On completion of the assembly work all access doors must be checked for freedom of movement. Depending on the operating conditions it can be necessary to align the access doors accordingly. Bolt torque: 3 Nm.

- Hinge side (image left): The long holes in the hinge carrier enable vertical alignment of the door leaf, the long holes in the hinge bracket allow horizontal alignment.
- Lock side (image right): Following alignment of the door leaf on the hinge side, an adjustment of the outer lock may be necessary. For this purpose the ramp of the closing cam can be adjusted vertically and the closing housing horizontally.



Rotary Heat Exchanger

For rotor housings which are supplied separately the rotor housing must be bolted in position as instructed by the rotor manufacturer prior to installation of thermal mass. For this it is necessary to lower the upper rotor housing accordingly.

Assembly of Rotors

In case assembly of a rotor is provided by the customer, the client is responsible that the connection between rotor and unit casing will be professionally made and tightened (e.g. with elastic joint seal).

Sealing the Roof of Weatherproof Units

General

The roofs of the weatherproof units are covered with roofing membranes.

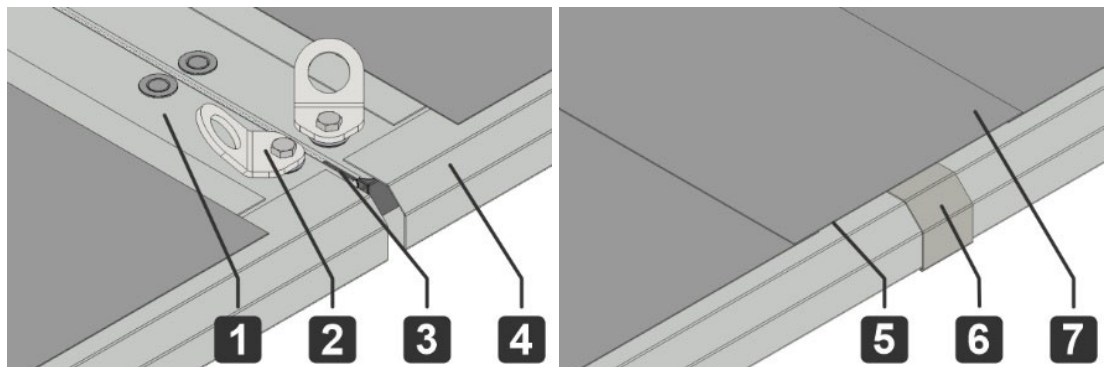
If units are supplied separately for easier transportation, separations points must be sealed as described in the following work instruction.

The following material is supplied:

- Roofing membrane stripes (PVC, fibre reinforcement).
- Solvent-welding agent for roofing membrane (can).
- Sealing paste for roofing membrane (plastic bottle).
- Drip nose overlapping parts.
- Connecting screw (JD-22 window screws 3,9 x 16 mm, pan head H, drill tip, galvanized).
- Depending on execution:
 - Plug (grey) and cap (white).
 - Cap (grey).

Additionally the following material is necessary:

- Flat brush or similar for application of solvent-welding agent for roofing membrane.
- Sand bag or similar for weigh down.
- Hot air blower or similar for drying and heating.
- Rag or similar for cleaning.



1 – Panel, 2 – Transport lug, 3 – Separation point, 4 – Drip nose, 5 – Joint edge, 6 – Drip nose overlapping part, 7 - Roofing membrane stripe

Note

If it rains during unit assembly the roof must be covered (e. g. with a tarpaulin).

Safety Regulations



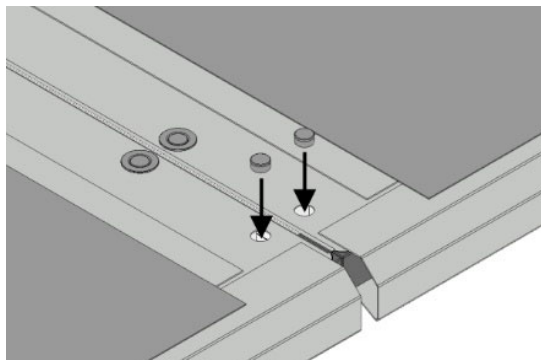
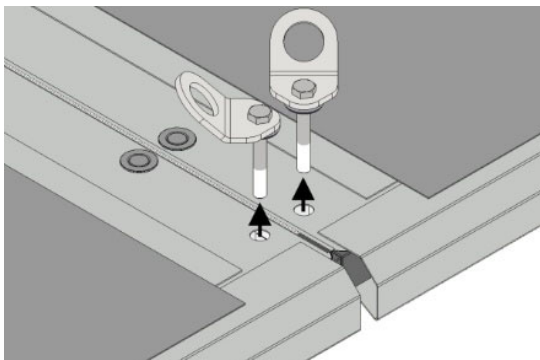
Caution

Solvent-welding agent Tetrahydrofuran and sealing paste are slightly volatile and flammable. The following regulations are compulsory while using them:

- Observe the safety instructions on the vessels!
- Injuries caused by fire or deflagration! Naked flame and smoking are forbidden.
- Damage to health caused by solvent vapours. Avoid inhaling!
- Keep solvent-welding agent and sealing paste in hermetically sealed vessels and use open containers quickly.
- Storage must be frost-free and protected from light.
- Wear personal protective equipment (safety goggles, respiratory mask, gloves and protective clothing).

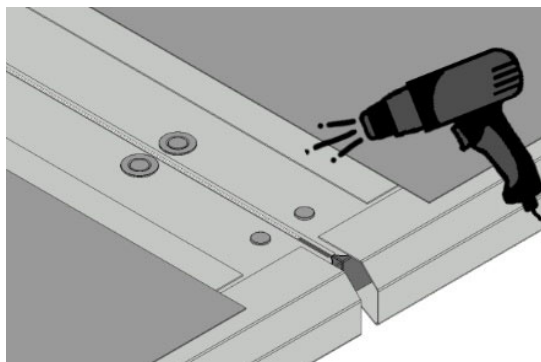
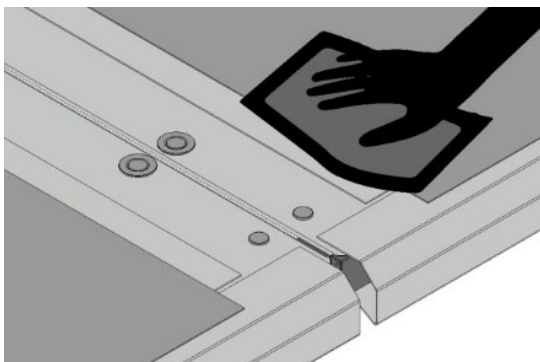
Work Process at Separation Point

Remove Transport Lugs and close Holes



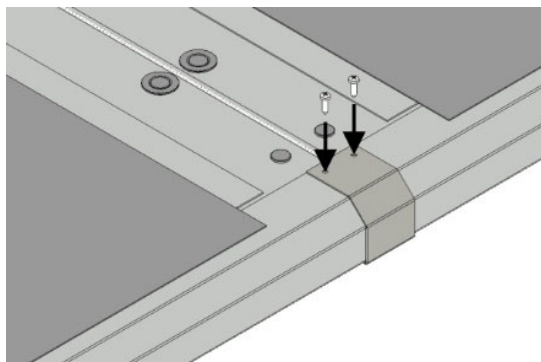
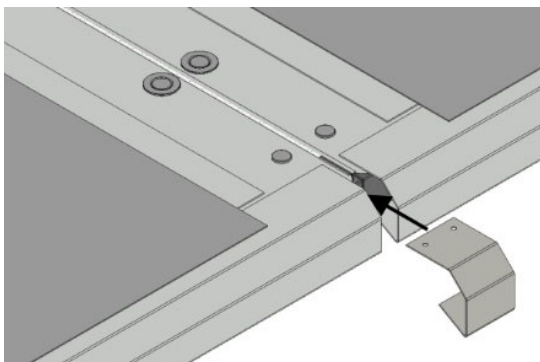
- Remove transport lugs and screws.
- Seal holes from above depending on housing construction with plug (grey) or cap (grey).
- Seal holes from below depending on housing construction with cap (white).

Clean and dry Work Area



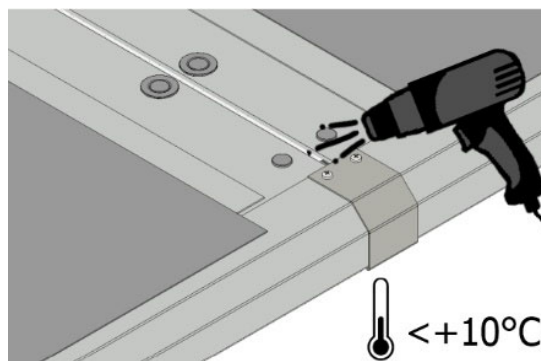
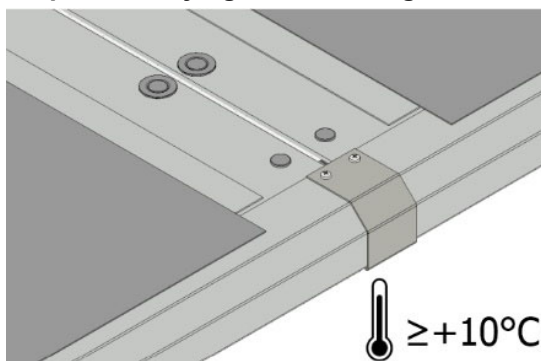
- Roofing membrane and drip nose next to the separation point have to be clean.
- Clean polluted roofing membrane and drip nose with a rag.
- Roofing membrane and drip nose next to the separation point have to be dry.
- Dry wet roofing membrane and drip nose with hot air.

Mount drip nose overlapping part

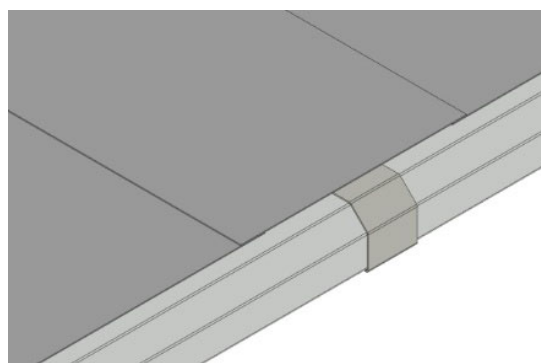
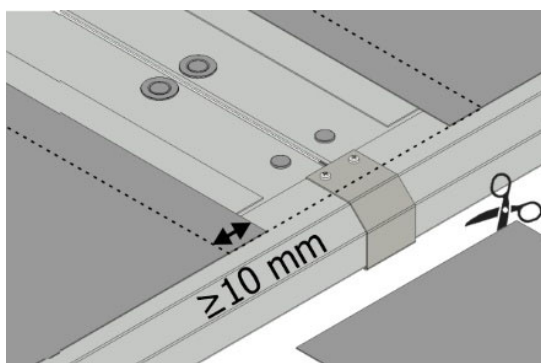


- Place the drip nose overlapping part over the drip nose at the separation point.
- Attach the drip nose overlapping part with the supplied connecting screws (JD-22 window screws 3,9 x 16 mm, pan head H, drill tip, galvanized).

Prepare the laying of the roofing membrane

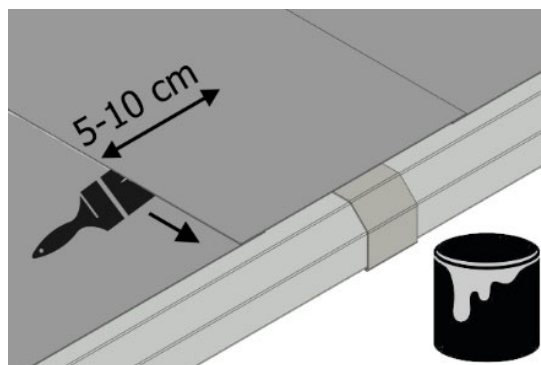
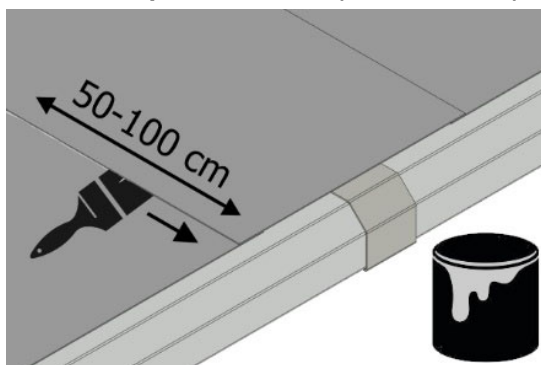


- Laying temperature has to be at least 10 °C.
- If temperature is lower than 10 °C, the roofing membrane next to the separation point and the roofing membrane stripe have to be preheated with hot air.

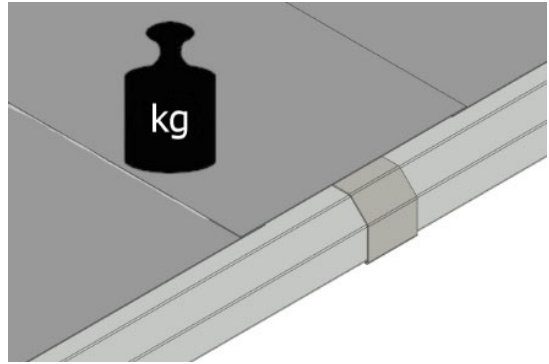
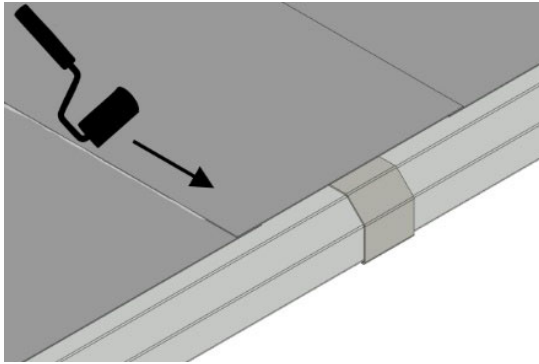


- Cut roofing membrane stripe to size, so that the roofing membrane stripe and the already laid roofing membrane have an overlap of at least 10 mm.
- Place the roofing membrane stripe.

Seal the Separation Point (max. 100 mm)

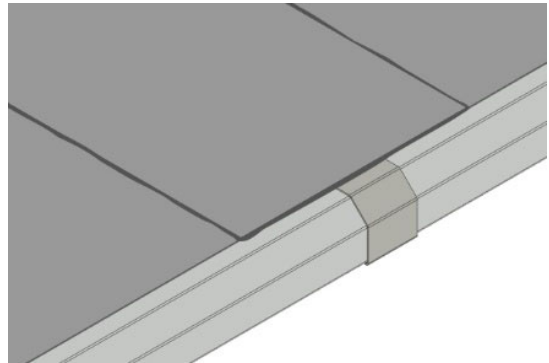
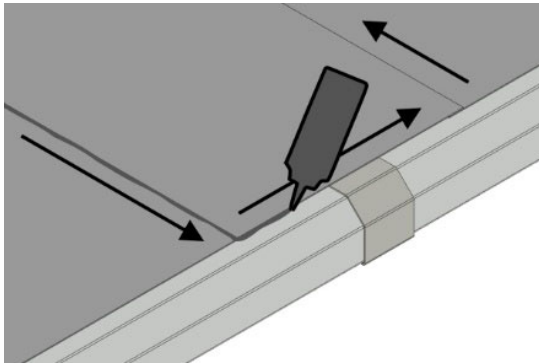


- Apply solvent-welding agent with a flat brush between the roofing membrane stripe and the already laid roofing membrane as follows:
 - In short sections of approx. 50 to 100 cm length in laying direction
 - Approx. 5 to 10 cm wide
 - At drip nose and overlapping part over the complete footprint of the roofing membrane



- Press on with a roller or with the flat of your hand.
- Weigh down the roofing membrane with a sand bag.
- Repeat work process for the next sections of approx. 50 to 100 cm length.
- The weight need not be left for a long time.

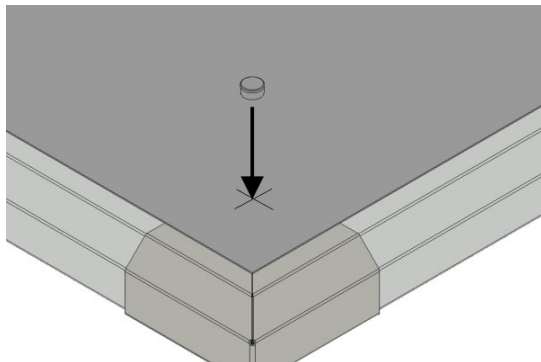
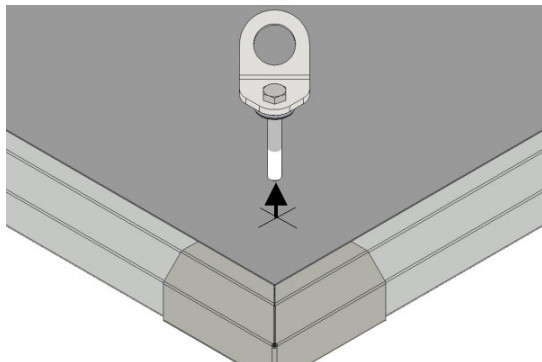
Seal the Joint Edge



- Continuously press the sealing paste as a thin strand into the joint edge.
- The sealing paste quickly dries quickly to a dense film.

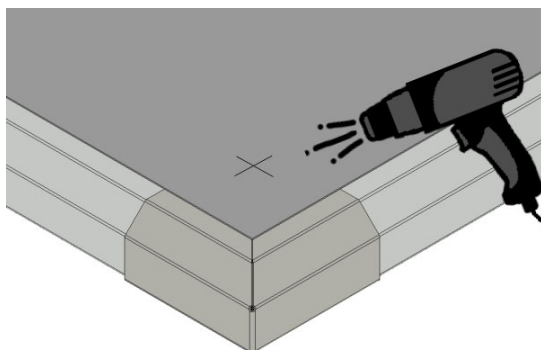
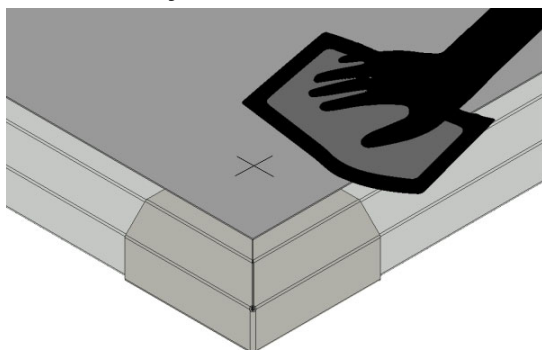
Work Process at Corner

Remove Transport Lugs and close Holes



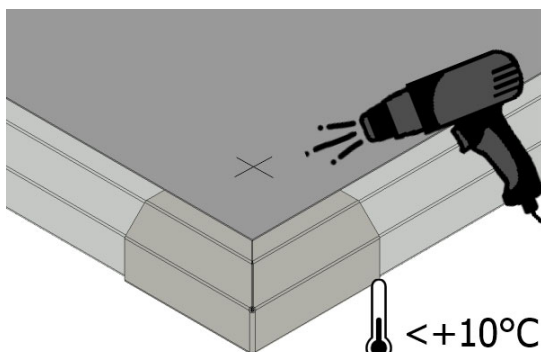
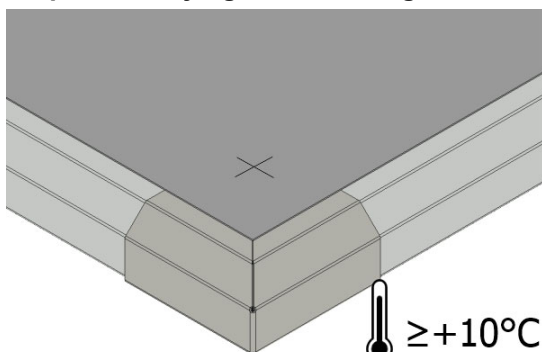
- Remove transport lugs and screws.
- Seal holes from above depending on housing construction with plug (grey) or cap (grey).
- Seal holes from below depending on housing construction with cap (white).

Clean and dry Work Area

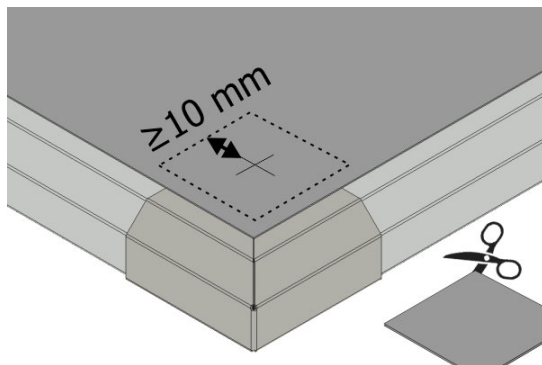


- Roofing membrane and drip nose next to the separation point have to be clean.
- Clean polluted roofing membrane and drip nose with a rag.
- Roofing membrane and drip nose next to the separation point have to be dry.
- Dry wet roofing membrane and drip nose with hot air.

Prepare the laying of the roofing membrane

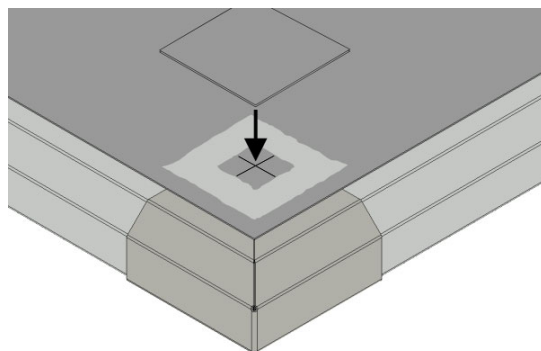
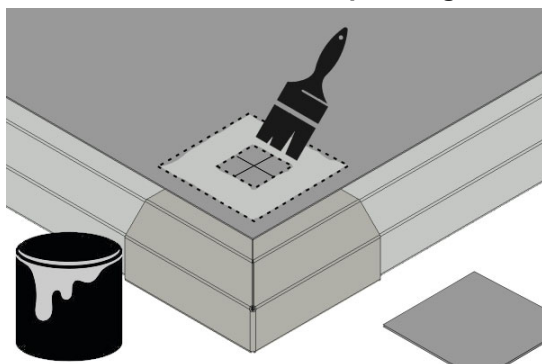


- Laying temperature has to be at least 10 °C.
- If temperature is lower than 10 °C, the roofing membrane next to the separation point and the roofing membrane stripe have to be preheated with hot air.

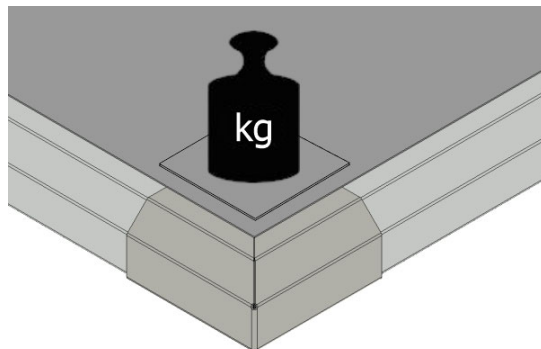
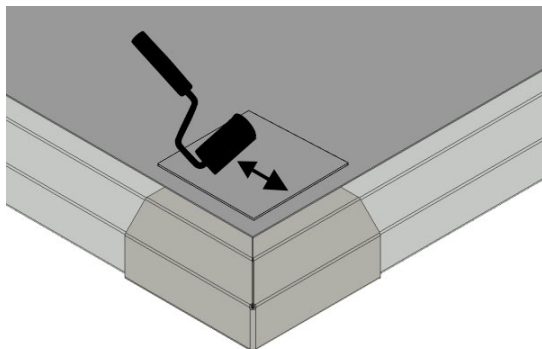


- Cut roofing membrane stripe to size, so that the roofing membrane stripe and the already laid roofing membrane have an overlap of at least 10 mm.

Seal the Holes of the Transport Lugs

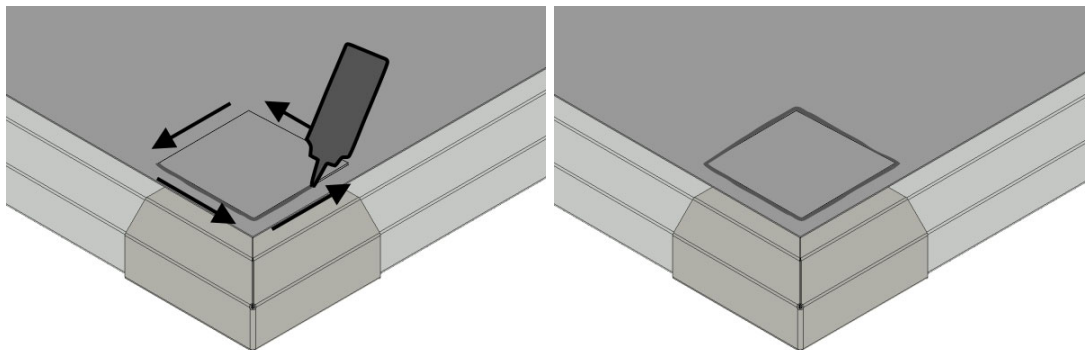


- Apply solvent-welding agent with a flat brush in the area of the hole in the size of the roofing membrane stripe on the already laid roofing membrane.
- Place the roofing membrane stripe.



- Press on with a roller or with the flat of your hand.
- Weigh down the roofing membrane with a sand bag.
- The weight need not be left for a long time.

Seal the Joint Edge



- Continuously press the sealing paste as a thin strand into the joint edge.
- The sealing paste quickly dries quickly to a dense film.

Grates

Maintenance



Caution

Observe general safety instructions on page 6!



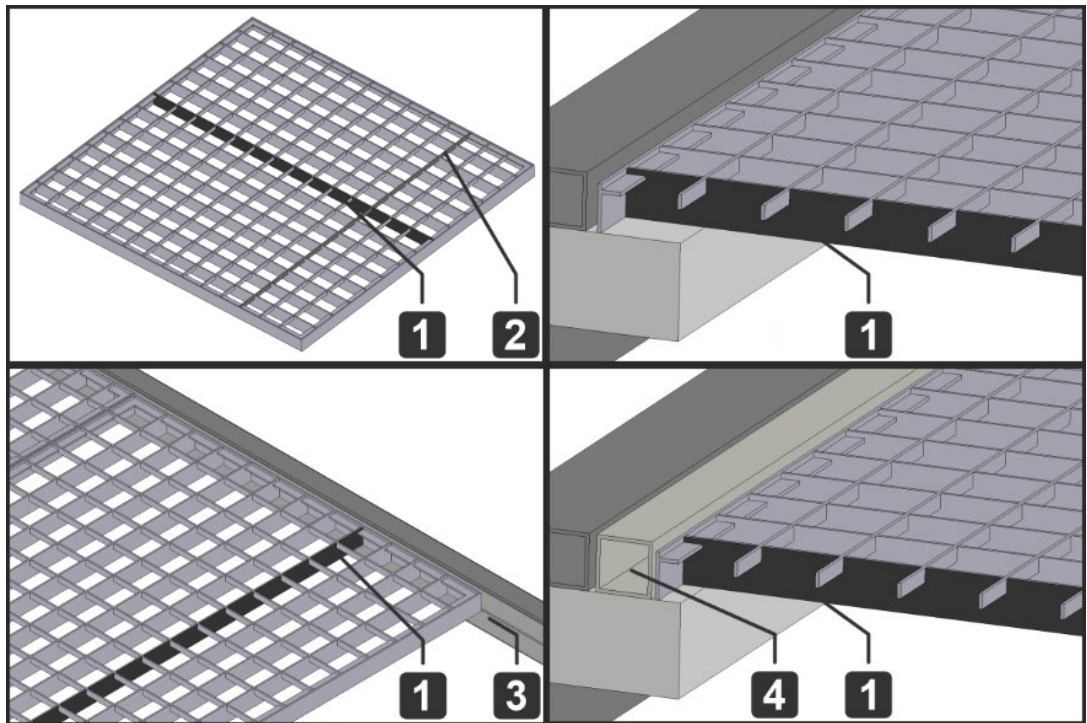
Caution

Removing the grates creates the danger of falling through the exposed opening. Secure at the fixing point with a fall protection device.

Through exposed openings, objects such as tools can also fall down and endanger persons who are under the opening. Block off the endangered area, e.g. safety net.

If installed incorrectly, there is a risk of falling due to the limited load-bearing capacity of the grate.

Mounting of the grate after work on openings downwards



1 – bearing bar, 2 – cross bar, 3 – support bracket, 4 – PVC spacer

All bearing bars of the individual grating elements must rest on a load-bearing substructure at both ends. With square dimensions, confusion may occur. PVC spacers prevent the grating element from slipping.

Grating elements are available with the following dimensions:

Bearing bar length

[modules]	L03	L04,5	L06	L07,5	L09
[mm]	178	331	484	627	790

Cross bar width

[modules]	T03 - 60 mm	T06 - 60 mm	L06
[mm]	230	536	612

Damper

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

Do not grip into damper as there is a danger of crushing to limbs! Protection devices such as e.g. duct connection, protective grille etc. must be present in accordance with DIN EN ISO 12100.



Attention

Do not switch on fan before checking that the appropriate damper is open or that its opening is indicated by a position switch. Provide a control linkage so that when a damper closes, the fans affected are switched off immediately.

robatherm accepts no liability for damage due to incorrect operation.

Provide pressure relief dampers to prevent damage from pressure spikes due to fire dampers in the system.

Backflow

Appropriate actions need to be taken to avoid backflow from the building.

Coupled Dampers

If dampers are coupled, check friction locking and proper functioning linkage, i.e. direction of rotation and end position of dampers.

Check for proper tightening of all screws and connections.

Motor Driven Dampers

For drive by servo motor: Set linkage so that there is a rotational angle of 90 degrees and the dampers reach their end position on closing.

Maintenance

Maintenance Interval

Every three months.



Caution

Observe general safety instructions on page 6!



Caution

Do not grip into damper as there is a danger of crushing to limbs! Protection devices such as e.g. duct connection, protective grille etc. must be present in accordance with DIN EN ISO 12100.

Dampers – Periodic Maintenance

- Check dampers for function, contamination, damage and corrosion
- Check effectiveness of protective device

Dampers – Maintenance when necessary

- Clean dampers and rectify any damage and corrosion

Dampers with Linkage Drive – Periodic Maintenance

- Check secure seating and easy movement of linkage
- Check adjustment

Dampers with Linkage Drive – Maintenance when necessary

- Grease brass bearings (plastic bearings do not need to be greased)
- Grease linkage

Note

Do not grease or oil dampers with a toothed drive.

Fan and Motor

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

Serious bodily injuries or even loss of life and material damage can be caused by the breakage of the impeller. Do not exceed maximum fan speed as per nameplate and technical data sheet. Do not operate fan if there are abnormal vibrations.

There is a danger of fire through grinding impeller, belt, hot running bearings.

Danger to health through noise (up to approx. 110 dB).

Transportation Safety Device

Remove transportation safety devices (wooden wedges or locking plates) from base frame of fan. Avoid pulling vibration isolators.



Attention

Before commissioning check unit and duct system for foreign bodies (tools, small parts, building dust) and clean if necessary.

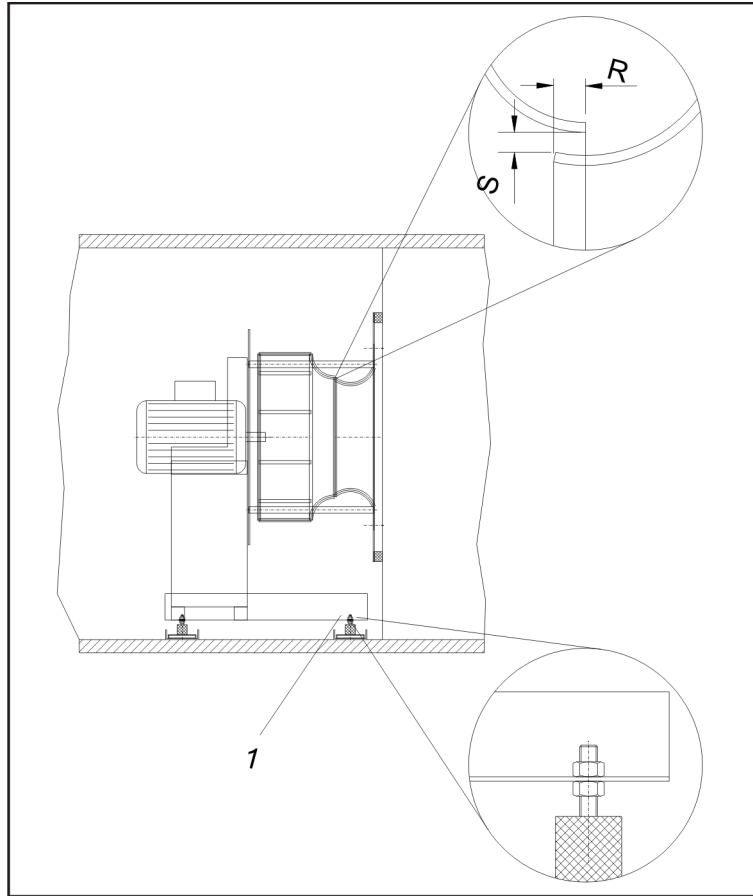
Rotate impeller by hand to check for free running.

Plug Fans

During transportation the circumferential gap between the impeller and inlet nozzle may change. Measure the gap width before commissioning. The gap must be the same width round the whole circumference; if necessary correct the gap at the vibration damper using lock nut and adjusting nut (1).

The overlap (R) must be about 1% of the impeller diameter.

There is no need to perform this check for an open impeller with flexible connection.



1 – Adjusting/locking nut; S – Gap width; R – Overlap

Drive

Check friction locking of bushes and hubs (see torque settings).

Check V-belt drive and adjust if necessary

- Belt tension (see page 47).
- Alignment of belt pulleys (tolerance $< 0.4^\circ$; d.h. $< 7 \text{ mm/m}$).

After a running in phase of 1 to 2 hours:

- Retighten V-belt (see page 47). When retightening check for exact alignment of the belt pulleys and adjust if necessary.
- Check the securing screws of bushes and hubs for correct seating and retighten if necessary (see torque settings).

Direction of Rotation

Check fan direction of rotation is in line with direction arrow on casing by switching on the motor briefly. If the fan rotates in the wrong direction, reverse polarity of the motor in accordance with the safety regulations.

Current Consumption

After reaching the fan operating speed immediately measure the current consumption of all three phases with closed inspection openings.

The measurement values must not exceed the rated values on the nameplate (and with it the motor nominal power) and only vary slightly from one another. If there is a current overload switch off immediately and check external pressures, airflow rate and rotational speed. If phase current is unequal, check motor connection.



Attention

In order to avoid any vibration fractures, fans may not be operated at unacceptably high speeds (see below) and also not in the field of the resonance speed (and multiples of it) of the fan motor system.

Therefore resonance speeds are to be established on commissioning and blanked at the frequency converter. Rebalance if necessary.

Fans may not be run outside the operating range stated by the manufacturer.

The manufacturer's acceleration and delay times must be observed.

There is a danger of fire through grinding impeller, belt, hot running bearings.

Working on Fan Motor Assembly

During work on fan motor assembly, e.g. bearing replacement, fitting of plug fan etc., the separate assembly instructions must always be followed (ask for them to be forwarded if necessary!). After this the vibration speed of the unit must be checked, assessed and balanced if necessary.



Caution

Serious bodily injuries or even loss of life and material damage can be caused by the breakage of the impeller. Do not operate fan if there are extreme vibrations or unacceptably high vibration speeds.

Assessed limits for vibration velocity v_{eff} under VDI 2056 and DIN ISO 10816:

Installation	Machine Class	good	passable	Still permissible
Rigid to 15kW	K	0.7 mm/s	1.8 mm/s	4.5 mm/s
Rigid from 15kW	M	1.1 mm/s	2.8 mm/s	7.1 mm/s
Vibration-isolated	T	2.8 mm/s	7.1 mm/s	18 mm/s

Maintenance

Maintenance Interval

Every three months.

Maintenance Instruction

The maintenance interval must be shortened accordingly if there is a multi-shift operation and/or special operating conditions such as fluid temperature > 40 °C, appearance of dust etc.

If one or more V-belts fail in a multiple groove drive, then a new V-belt set must be fitted. Prior to fitting the V-belts, the axle base must be reduced so that the belts can be placed in the grooves without force. Forcible fitting by means of a screwdriver etc. is in any case not permitted as it can lead to damage.



Caution

Observe general safety instructions on page 6!



Caution

When replacing the motor (e.g. by means of a motor pull-out device) secure the motor against swinging.

Cleaning Agent

Cleaning agent shall have a pH value between pH 7 – pH 9.

Fan – Periodic Maintenance

- Check fan for hygiene, contamination, damage, corrosion and fastening
- Check impeller for imbalance and vibrations; balance if necessary
- Check bearings for noise, vibration and heat
- Check flexible connection for leaks
- Check functioning of vibration dampers
- Check function of protective devices
- Check function of inlet vane control
- Check functioning of dehydration equipment
- Check gap width of open impellers (see page 42); correct if necessary
- Pollution and dirt on flex connector shall be removed with a vacuum cleaner, and, in a second step, wiped with a with damp cloth

Fan – Maintenance when necessary

- Replace bearings (no later than the end of the theoretical service life)
- Grease bearing. Follow manufacturer's instructions!
- Clean fan, rectify any damage and corrosion, retighten fastenings

Electric Motor – Periodic Maintenance

- Check electric motor for contamination, damage, corrosion, fastening, smooth running, heating and direction of rotation
- Check bearings for noise, vibration and heat
- Clean electric motor and rectify any damage and corrosion
- Measure tension, current input and phase symmetry
- Check firm seating of terminals in terminal block; retighten if necessary
- Check protective conductor; retighten or replace if necessary
- Check cable rails. Clean it if necessary with vacuum cleaner and, if necessary with damp cloth

Electric Motor – Maintenance when necessary

- Replace bearings (no later than the end of the theoretical service life)
- Grease bearing. Follow manufacturer's instructions!

Belt Drive – Periodic Maintenance

- Check belt drive for contamination, damage, wear, tension, alignment of motor and fan pulley (tolerance $< 0.4^\circ$; d.h. $< 7 \text{ mm/m}$), check function and fastening (see torque settings)
- Check protective device for damage, fastening and functioning

Belt Drive – Maintenance when necessary

- Replace belt set
- Adjust alignment of motor and fan pulley
- Adjust belt tension (see page 47)
- Clean belt drive

Drive Clutch – Periodic Maintenance

- Follow manufacturer's instructions!
- Check drive clutch for function, contamination, damage, corrosion and fastening
- Check temperature

Drive Clutch – Maintenance when necessary

- Follow manufacturer's instructions!
- Change oil
- Clean drive clutch

Bolt Torques for Locking Bushes

Bush type	1008 1108	1210 1215	1610 1615	2012 2017	2517 2525	3020 3030	3525 3535	4030 4040	4535 4545	5040 5050
Torque [Nm]	6	20	20	30	50	90	115	170	190	270

Motor Removal

When removing the motor only use suitable and permitted load bearing equipment. When using an integrated motor removal device ensure that the unit is sufficiently stable e.g. by fixing to the foundation.

Shut Down

Remove V-belts for down times of more than 3 months to avoid concentrated stress on bearings.

Replace bearings before recommissioning if out of operation for periods of one year or longer, or remove grease if bearings have a regreasing device and grease bearings again. Observe fan manufacturer's instructions.

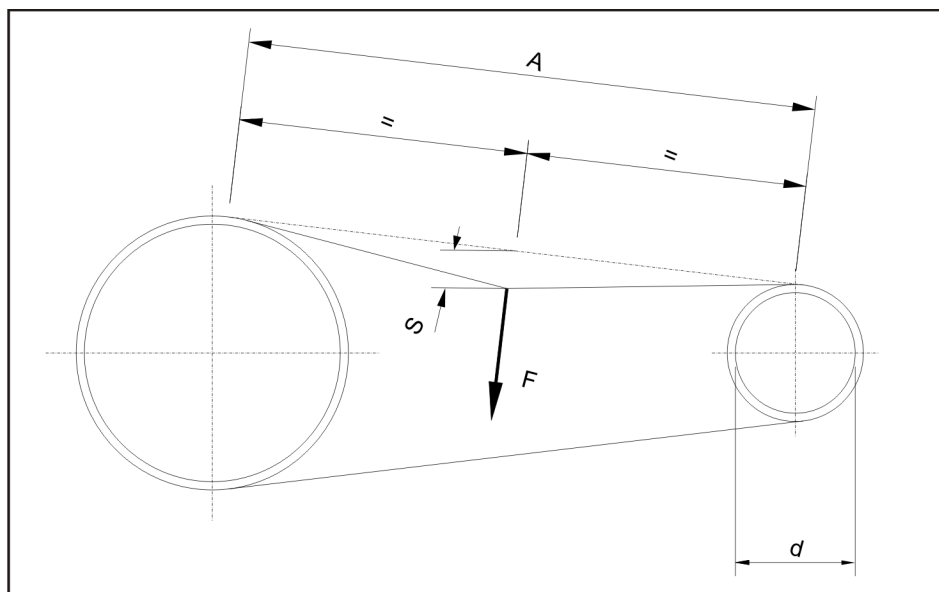
Determination of Belt Pretensioning Force for V-belts DIN 7753

Belt Tension

The belt tension is measured with a suitable measuring instrument in line with instructions (e.g. belt pretensioning force measuring instrument) and adjusted. Observe operating instructions for measurement instrument.

- Measure axle base A of the belt pulleys (in metres).
- Multiply axle base by 16. The result is the belt deflection (S) in millimetres.
- Apply enough force to the belt in the middle of the axle base (A) so that the calculated deflection is reached.
- Measure deflection force.
- Compare deflection force (F) with table values.

Set higher values for the start up phase of new drives. Test deflection force (F) after several hours of operation and adjust if necessary.



A – Axle base; S – Belt deflection; F – Deflection force

Note

For one-groove drives it is easier to use a ruler to set deflection.

The values shown below only apply to narrow V-belts DIN 7753.
If other V-belts are used, the manufacturer should be consulted.

Force (F) for Deflection (S) = 16 mm per metre of axle base (A)

Profile	Effective diameter d of the small belt pulley [mm]			Deflection force F [N]		
SPZ	67	to	95	10	to	15
	100	to	140	15	to	20
SPA	100	to	132	20	to	27
	140	to	200	28	to	35
	224	to	250	40	to	45
SPB	160	to	224	35	to	50
	236	to	315	50	to	65
SPC	224	to	355	60	to	90
	375	to	560	90	to	120

Filters

Commissioning



Caution

Observe general safety instructions on page 6!

Installation of Filter Cartridges

- Carefully fix filter elements to the frames with tension springs or anchor wailers respectively, cartridge filters to be fastened to bayonet joints hand tight.
- Do not shut or damage filter cartridges.
- Check air proof seating of the filter cartridges in the frame.

Filter Monitoring

In order to check the degree of contamination of the filters (except activated carbon filters), the fitting of a differential pressure manometer on the access side of the unit is recommended.

Final Pressure Drop Filter

Recommended Final Pressure Drop for ISO 16890 Filters

Filter Class	Recommended Final Pressure Drop (the lower value)
ISO coarse	50 Pa + initial pressure drop or 3x initial pressure drop
ISO ePM1, ISO ePM2,5, ISO ePM10	100 Pa + initial pressure drop or 3x initial pressure drop

Recommended Final Pressure Drop for EN 779 Filters

Filter Class	Recommended Final Pressure Drop
G1 - G4	150 Pa
M5 - M6, F7	200 Pa
F8 - F9	300 Pa
E10 - E12, H13	500 Pa

Maintenance

Maintenance Interval

Every three months.



Caution

Observe general safety instructions on page 6!



Caution

Allergic reactions on skin, eyes or respiratory organs due to contact with filter dusts. A contamination with viruses, bacteria, ... cannot be excluded. Wear protective clothing,

gloves, safety goggles and respiratory mask for maintenance, cleaning and filter replacement.

Avoid contamination of the surrounding area and new filters.

Replacement Filters

Keep at least one set of replacement filters in stock. Store in a dry and dust free area. Avoid contamination and damage. Do not use filters beyond minimum durability.

Training

The operator of the AHU must provide hygiene training for the maintenance personnel. The recommendations of VDI 6022 on maintenance and servicing must be observed.

Filters – Periodic Maintenance

- Check filter cartridges for hygiene, contamination, odors, damage and corrosion
- Particle filters: Check differential pressure with manometer
- Activated carbon filters: Usually, it is enough to check the filter's odor. (For a reliable determination of the remaining lifetime, the manufacturer may check the filter coal's saturation in his lab in order to appoint proper service intervals.) Weighing of the cartridges does not deliver feasible results, since most of the additional weight is caused by the air's humidity.
- Check filter seat for leakage

Filters – Maintenance when necessary

- Replace filter cartridges immediately if there is noticeable contamination, odor, damage or leakage, when reaching the recommended end resistance or time interval:
 1. Filter cartridge after 12 months at the latest
 2. Filter cartridge after 24 months at the latest

An earlier filter change may be essential if building or conversion measures result in significant strain on the filter or following a hygiene inspection.

The change of single filter elements is only permissible in the case of damage to individual elements provided that the last change does not date back more than 6 months.

When changing the filter cartridges observe the local environmental protection regulations.

Silencer

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

Wear personal protective equipment (respiratory mask) when working on silencers.

Inspection

Check silencers for damage and contamination; for repair and cleaning see below.

Maintenance

Maintenance Interval

Every three months.



Caution

Observe general safety instructions on page 6!



Caution

Wear personal protective equipment (respiratory mask) when working on silencers.

Silencer – Periodic Maintenance

- Check silencers for hygiene, contamination, damage and corrosion

Silencers – Maintenance when necessary

- Clean silencers (see below), repair them with repair kit and rectify corrosion; take contact samples if necessary

Cleaning

Use vacuum cleaner to clean surfaces.



Attention

Do not damage absorption material.

Heating Coil (Hot Water, Steam, RAC, HE-RAC)

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

In the case of heat exchangers containing refrigerant, observe the notes on page 61 on the refrigeration plant, heat pump and split air conditioner!



Caution

Do not use any hot medium while filling, bleeding air or removing as there is a danger of scalding.



Caution

To avoid burns, do not touch hot surfaces.



Caution

Avoid any contact with brine while charging or venting. Danger of poisoning and acid burns! Observe manufacturer's instructions.



Attention

Do not exceed permissible pressure range (see design data sheet).

To avoid freezing of the heating coil:

Add anti-freeze agent or install frost protection control on air, water or condensate side depending on unit design.

To avoid any overheating damage to the unit, run steam coil only when fan is running
Provide air flow control or temperature limiter.

Inspection

Check inlet outlet connections for function (counter flow principle).

Charging

The system must be rinsed (removal of contaminations) according to VDI 2035 and should be filled with the heat exchanger fluid named in the design data sheet to the correct concentration. In case of no or only insufficient system flushing, residual oil can remain in the heat exchanger (lubrication during the production process). The residual oil must be dissolved during the flushing process, otherwise the oil is still in the system. Water / antifreeze mixtures have lipophilic properties and the oil is dissolved in the mixture.

Subsequently, an oil / water / antifreeze mixture circulates in the system and damages seals that are not oil resistant. In closed system circuits (exp. runaround systems), the use of oil resistant seals is generally recommended.

Water quality to VDI 2035. Too high a concentration of glycol leads to reduced performance, too low a concentration of glycol can lead to frost damage.

Venting

When charging the system according to VDI 2035 the heating coil and the system should be vented carefully at the highest point of the system. For this purpose open the venting screw at the top connection or open separate venting screw.

If incorrect venting takes place, heating coils develop air locks which lead to a reduction in capacity. Recommendation: Venting recovery system (stop-cock with hose nozzle).

After Commissioning

After commissioning check the screw fittings of the flange for leakage and retighten if necessary (see page 24).

Maintenance

Maintenance Interval

Every three months.



Caution

Observe general safety instructions on page 6!



Caution

In the case of heat exchangers containing refrigerant, observe the notes on page 61 on the refrigeration plant, heat pump and split air conditioner!



Caution

To avoid burns, do not touch hot surfaces.



Caution

Before starting work allow components to cool/warm up to the ambient temperature.



Caution

Avoid any contact with brine while charging or venting. Danger of poisoning and acid burns! Observe manufacturer's instructions.

Heating Coil – Periodic Maintenance

- Check heating coil for hygiene, contamination on air side, damage, leaks and corrosion
- Vent heating coil
- Check inlet/outlet for function
- Check frost protection for function (determine anti-freeze concentration or thermostat by means of cooling spray)

Heating Coil – Maintenance when necessary

- Clean the heating coil on the air side (see below), rectify damage, leakage and corrosion

Cleaning

Clean coils already assembled or if not accessible pull them out for cleaning. Contamination which has been removed must not enter adjoining unit parts. Remove dirt and contaminated water carefully.

Observe the following points:

- Avoid bending plate fins
- Blow out with compressed air in the opposite direction
- Do not use a high pressure cleaner or a high pressure steam cleaner
- Clean with water and low pressure

Cleaning Agents

Use cleaning agents with a pH-value between 7 and 9 if required.

Shut Down

In case of longer standstill, especially if there is a risk of freezing, all heat exchangers (e.g. air/water and brine/water) must be completely drained if no frost protection agent has been added. For this purpose remove all purging and discharging screws. Then for complete emptying blow air (compressed air, fan etc) through each heat exchanger as up to 50% fluid may remain in the heat exchanger during free purging which results in a higher danger of damage during frost. Remove brine following manufacturer information.

Removal / installation

After decommissioning the heat exchanger and disassembling the control group, unscrew the front panel with Torx (T25) or flat-tip screwdriver. (Air cooler: Unscrew the condensate deflector plate from the housing frame.) Pull out the heat exchanger including the front panel to the front (support the heat exchanger if necessary). Check seals for damage and replace them if necessary. Installation has to be done in reverse order.

Electric Heater

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

To avoid burns, do not touch hot surfaces.



Caution

Hot surfaces due to heat radiation from the electric heater if the electric heater is placed at the end of the unit.

Burning when touching the surfaces (duct, spigot).

- Overshoot the fan to cool down to room temperature.
- Wear heat-resistant gloves.

Note

Heat radiation from the electric heater

Damage to the downstream components and parts

- If the electric heater is placed at the end of the unit, a distance of 300 mm must be maintained between the unit exhaust and the first component installed in the duct.
- The components installed in the duct must be heat-resistant.

Triple Thermostat with Safety Temperature Limiter

Each electric heater must be equipped with a fully tested triple thermostat with safety temperature limiter with manual reset. Test functions (e.g. with hot air blower).

Recommendation

Triple thermostat mounted directly downstream from electric heater:

- "Fan" setting: 40 °C.
- „Temperatur monitor“ setting: 70 °C.
- "Safety temperature limiter" setting: 90 °C.



Attention

Hot surfaces must be monitored during commissioning of the electric heater.

Electric heaters may only be operated if flow control is present.

Overheating damage may occur to the electric heater, housing and other fitted parts if the system is run with insufficient cooling (e.g. system switched off at the main switch when the electric air heater is still on) or in the event of an emergency system shut down triggered by safety devices.

A minimum air velocity of 2 m/s must be maintained in both nominal and partial load operation. This setting must be specially monitored during installation to prevent insufficient air speed from occurring. To avoid skin burns, do not touch hot surfaces.

Flow Control

The airflow is monitored by measurement of the pressure difference at the fan unit, using an air pressure gauge. Functioning must be checked during commissioning.

Minimum distances to components

The minimum distance L06 (612 mm) is for non-heat-resistant components. For heat-resistant components the minimum distance is L03 (306 mm). To avoid burns and damage, the connections to the ventilation system must be heat-resistant.

Current Consumption

The current consumption is to be checked at all phases by measuring all phases. For rated data see nameplate.

If the rated values are exceeded, the robatherm Technical Service must be informed.

Maintenance

Maintenance Interval

Every three months.



Caution

Observe general safety instructions on page 6!



Caution

To avoid burns, do not touch hot surfaces.



Caution

Before starting work allow components to cool/warm up to the ambient temperature.

Electric Heater – Periodic Maintenance

- Check functioning of airflow control; for this remove pressure measurement tubes from air pressure gauge. A switching operation must take place
- Check electric heater for function, hygiene, contamination, damage, corrosion and fastening
- Check function of safety temperature limiter (see Commissioning)

Electric Heater – Maintenance when necessary

- Clean electric heater, rectify scaling, damage, corrosion, retighten fastenings

Cooling Coil (CW – DX Coil, RAC, HE-RAC)

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

In the case of heat exchangers containing refrigerant, observe the notes on page 61 on the refrigeration plant, heat pump and split air conditioner!



Caution

Avoid any contact with brine while charging or venting. Danger of poisoning and acid burns! Observe manufacturer's instructions.



Caution

To avoid burns, do not touch hot/ cold surfaces.



Attention

Do not exceed permissible pressure range.

To avoid freezing of the cooling coil:

Add anti-freeze agent or mount the cooling coil downstream from the pre-heater.

Inspection

Check inlet outlet connections for function (counter flow principle).

In the case of direct expansion coils, the nitrogen protection gas must escape with a hissing noise following opening of the heat exchanger connections. Otherwise there is a leakage; please inform our technical service.

Charging

The system must be rinsed (removal of contaminations) according to VDI 2035 and should be filled with the heat exchanger fluid named in the design data sheet to the correct concentration. In case of no or only insufficient system flushing, residual oil can remain in the heat exchanger (lubrication during the production process). The residual oil must be dissolved during the flushing process, otherwise the oil is still in the system. Water / antifreeze mixtures have lipophilic properties and the oil is dissolved in the mixture. Subsequently, an oil / water / antifreeze mixture circulates in the system and damages seals that are not oil resistant. In closed system circuits (exp. runaround systems), the use of oil resistant seals is generally recommended.

Water quality to VDI 2035. Too high a concentration of glycol leads to reduced performance, too low a concentration of glycol can lead to frost damage.

Refrigerant displaces atmospheric oxygen, can cause suffocation, and may even be flammable. Depending on the refrigerant classification according to ISO 817, only limited filling quantities are permitted, especially for flammable and toxic refrigerants. In Europe, the maximum filling quantities must be in accordance with EN 378-1 and are determined on the basis of the access area, the installation location and respective refrigerant classification. Internationally, calculation is made according to IEC 60335-2-40 (or part 2-89) or ISO 5149. For detailed information on the respective refrigerant, please refer to the safety data sheet. In the case of direct evaporator with external refrigeration system, the system installer is responsible for compliance with the maximum permitted filling quantity.

Venting

When charging the system according to VDI 2035 the air cooler and the system should be vented carefully at the highest point of the system. For this purpose open the venting screw at the top connection or open separate venting screw.

If incorrect venting takes place, cooling coils develop air locks which lead to a reduction in capacity. Recommendation: Venting recovery system (stop-cock with hose nozzle).

After Commissioning

After commissioning check the screw fittings of the flange for leakage and retighten if necessary (see page 24).

Maintenance

Maintenance Interval

Every three months.



Caution

Observe general safety instructions on page 6!



Caution

In the case of heat exchangers containing refrigerant, observe the notes on page 61 on the refrigeration plant, heat pump and split air conditioner!



Caution

Avoid any contact with brine while charging or venting. Danger of poisoning and acid burns! Observe manufacturer's instructions.



Caution

To avoid burns, do not touch hot/ cold surfaces.



Caution

Before starting work allow components to cool/warm up to the ambient temperature.

Cooling Coil – Periodic Maintenance

- Check cooling coil for hygiene, contamination on air side, damage, leaks and corrosion
- Vent cooling coil
- Check drip pan for contamination, clean if necessary
- Check water outlet and siphon function, clean if necessary
- Check water level in siphon refill if necessary
- Check inlet / outlet for function
- Check frost protection for function (determine anti-freeze concentration or thermostat by means of cooling spray)
- Check direct expansion for icing

Cooling Coil – Maintenance when necessary

- Clean the cooling coil on the air side (see below), rectify damage, leakage and corrosion

Drop Eliminator – Periodic Maintenance

- Check drop eliminator for hygiene, contamination, encrustation, damage, drip erosion and corrosion

Drop Eliminator – Maintenance when necessary

- Clean and service eliminator: Pull out cassette, disassemble and clean profiles separately; rectify damage and corrosion

Cleaning

Clean heat exchangers already assembled or if not accessible pull them out for cleaning. Contamination which has been removed must not enter adjoining unit parts. Remove dirt and contaminated water carefully.

Observe the following points:

- Avoid bending plate fins
- Blow out with compressed air in the opposite direction
- Do not use a high pressure cleaner or a high pressure steam cleaner
- Clean with water and low pressure

Cleaning Agents

Use cleaning agents with a pH-value between 7 and 9 if required.

Shut Down

In case of longer standstill, especially if there is a risk of freezing, all heat exchangers (e.g. air/water and brine/water) must be completely drained if no frost protection agent has been added. For this purpose remove all purging and discharging screws. Then for complete emptying blow air (compressed air, fan etc) through each heat exchanger as up to 50% fluid may remain in the heat exchanger during free purging which results in a higher danger of damage during frost. Remove brine following manufacturer information.

Removal / installation

After decommissioning the heat exchanger and disassembling the control group, unscrew the front panel with Torx (T25) or flat-tip screwdriver. (Air cooler: Unscrew the condensate deflector plate from the housing frame.) Pull out the heat exchanger including the front panel to the front (support the heat exchanger if necessary). Check seals for damage and replace them if necessary. Installation has to be done in reverse order.

Refrigeration Plant, Heat Pump and Split Air Conditioner



Caution

Observe general safety instructions on page 6!



Caution

Avoid any physical contact with the refrigerant as this may cause frostbite to the skin and limbs or retinal damage. Use personal protection equipment against effects of refrigerants BGV D4 (goggles, gloves, etc.)!

Refrigerant (odourless and tasteless) ejects atmospheric oxygen and can cause suffocation. If refrigerant does escape only enter the machine room with heavy duty respiratory protective gear.

Refrigerants and compressor oil develop toxic, noxious substances in tandem with naked flame. Do not inhale! Do not smoke in the machine room!

There may be an allergic reaction if compressor oil is touched or swallowed. Avoid physical contact! Observe safety data sheet.

Refrigerant displaces atmospheric oxygen, can cause suffocation, and may even be flammable. Depending on the refrigerant classification according to ISO 817, only limited filling quantities are permitted, especially for flammable and toxic refrigerants. In Europe, the maximum filling quantities must be in accordance with EN 378-1 and are determined on the basis of the access area, the installation location and respective refrigerant classification. Internationally, calculation is made according to IEC 60335-2-40 (or part 2-89) or ISO 5149. For detailed information on the respective refrigerant, please refer to the safety data sheet.



Caution

To avoid burns, do not touch hot/ cold surfaces.



Attention

Completion and commissioning of refrigeration installations may only be carried out by the manufacturer or another expert assigned by the manufacturer; maintenance and servicing work only by qualified personnel.

For all work the requirements of the service booklet (request if required), and the valid standards and guidelines (e.g. DIN EN 378, BGR 500 and EC-F Gas Directive) must be adhered to.

Commissioning Requirements

All construction requirements, such as access, completed unit and duct installation, diffusion-tight insulation of the piping outside the AHU and uninterrupted availability of all supply facilities must be met. A refrigerant sensor for monitoring the installation site and suitable ventilation of the installation site must be available and functional. In addition there must be a possibility of operating the system in the required working phases.

Basis for Warranty

The basis for the warranty is built on a maintenance contract with a qualified company specialised in refrigeration engineering together with records of performance of maintenance work.

System Operation

Operation of the refrigeration unit is only permitted when the AHU is running. The air volume flow must be at least 25% of the nominal air volume flow.

Breakdowns of faults of the refrigerating unit are displayed on the switch cabinet.

According to the German Industrial Safety Regulation (BetrSichV), such units require special supervision; including specific operator-related requirements that are to be fulfilled according to §14 of the German Industrial Safety Regulation. Further applicable statutory provisions of the respective location are to be observed.

Maintenance and Inspection

For requirements see service booklet for refrigeration installations.

Recurring Inspections

According to §15 of the German Industrial Safety Regulation (BetrSichV), the units and unit parts underlie recurring inspections by an authorized person respectively accredited inspection agency. Further applicable statutory provisions of the respective location are to be observed.

Attention



Only use oil approved by the compressor manufacturer (see information on the compressor) as there may otherwise be damage to the unit.

Shut Down

For requirements see service booklet for refrigeration installations.

Heed the relevant environmental regulations when disposing of refrigerant or compressor oil.

Rotary Heat Exchanger

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

When current feed is not disconnected at all poles, there is a risk of crushing and scraping to the limbs through sudden running of the rotor caused by an automatic cleaning run or automatic re-start after power failure.

Inspection

Before commissioning ensure that no objects obstruct the free running of the rotor. Remove any foreign bodies and contamination.

Sealing Strips

Check contact pressure of sealing strips. They must be placed as close as possible to the thermal mass and direct dragging must be avoided even under operating pressure.

Bearing

In principle the bearing of the rotor is aligned in the factory. Depending on installation conditions some rework may be necessary. Please observe the manufacturer's instructions.

Drive

Open inspection cover at marked rotor corner and check whether V-belt has enough tension from tensioning device, shorten V-belt if necessary:

- Open hinged lock
- Shorten endless belt as required
- Close hinged lock
- Close inspection cover

As the V-belt is subject to natural stretching, the tension of the V-belt should be regularly checked in the first 400 operating hours in particular.

Put drive motor into operation. For rotor controller observe the manufacturer's operating instructions.

Check pre-defined rotor speed (e.g. 10 rpm for 10 V input signal).

Direction of Rotation

Check rotational direction of rotor (arrow), if necessary change electrical connections of motor. If a washing zone is installed the storage mass must turn from extract air via the washing chamber into the supply air.

Pressure Drop

In order to avoid contamination of the supply air with the extract air, the pressure potential of the fans should be selected in such a way that the system related leakage from the supply air side flows into the extract air side.

Adiabatic Humidification of Extract Air

Excessive humidity shall be avoided upstream of the rotor to prevent its matrix from over-wetting. If ever possible, permeate from the reverse osmosis should be used to operate the humidifier.

Maintenance

Maintenance Interval

Every three months.



Caution

Observe general safety instructions on page 6!



Caution

When current feed is not disconnected at all poles, there is a risk of crushing and scraping to the limbs through sudden running of the rotor caused by an automatic cleaning run or automatic re-start after power failure.



Attention

In order to avoid damage when cleaning, air or water jet should only be directed onto the surfaces of the heat exchanger at a right angle.

Rotary Heat Exchanger – Periodic Maintenance

- Check rotary heat exchanger for hygiene, foreign bodies, contamination, damage and corrosion
- Check sealing strips for contamination, foreign bodies and contact pressure (see above)
- Check drive belt for wear and tension, shorten (see above) or change if necessary
- Check rotor for imbalance and lateral trueness
- Check bearing for incorrect heating, vibrations or running noises and change if necessary (no later than the end of the theoretical service life)
- Check water outlet and siphon function clean if necessary
- Check water level of siphon, top up if necessary
- Check functioning of rotor control, align sensor if necessary

Rotary Heat Exchanger – Maintenance when necessary

- Rectify foreign bodies, contamination, damage and corrosion
- Clean rotor body with compressed air or high pressure cleaner (only water without additives); remove dirty water carefully
- Clean sealing strips, change if there is abrasion
- Adjust contact pressure of sealing strips (see above)
- Balance or align rotor

Shut Down

If rotor is out of action for a longer period (e.g. summer), turn it on intermittently to maintain self-cleaning function.

Plate Heat Exchangers

Commissioning



Caution

Observe general safety instructions on page 6!



Attention

In order to avoid damage to the heat exchanger, do not exceed the maximum permissible pressure drop SUPPLY/EXTRACT (depending on type approx. 1,000 Pa). Observe notes for closing dampers (see page 40)

Inspection

Check (and clean if necessary) plate heat exchanger for foreign particles and contamination (see below).

Maintenance

Maintenance Interval

Every three months.



Caution

Observe general safety instructions on page 6!



Attention

In order to avoid damage when cleaning, air or water jet should only be directed onto the surfaces of the heat exchanger at a right angle.

Plate Heat Exchanger – Periodic Maintenance

- Check plate heat exchanger for hygiene, foreign bodies, contamination, damage and corrosion
- Check water outlet and siphon function, clean if necessary
- Check water level of siphon, top up if necessary

Plate Heat Exchanger – Maintenance when necessary

- Rectify foreign bodies, contamination, damage and corrosion
- Clean with compressed air or high pressure cleaner (only water without additives); remove dirty water carefully

Heat Pipe

Commissioning



Caution

Observe general safety instructions on page 6!

Inspection

Check (and clean if necessary) heat pipe for foreign particles and contamination (see below).

Maintenance

Maintenance Interval

Every three months.



Caution

Observe general safety instructions on page 6!



Caution

There is a danger to life when charging gas under high pressure! Do not damage or overheat pipes (e.g. by means of welding torch).

Heat Pipe-HRS – Periodic Maintenance

- Check heat pipe for hygiene, contamination, damage and corrosion
- Check water outlet and siphon function, clean if necessary
- Check water level of siphon, top up if necessary

Heat Pipe-HRS – Maintenance when necessary

- Clean the heat pipe on the air side (see below), rectify damage and corrosion

Cleaning

Observe the following points:

- Avoid bending plate fins.
- Blow out with compressed air in the opposite direction.
- Do not use a high pressure cleaner or a high pressure steam cleaner.
- Clean with water and low pressure.

Cleaning Agents

Use cleaning agents with a pH-value between 7 and 9 if required.

Desiccant Rotor

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

When current feed is not disconnected at all poles, there is a risk of crushing and scraping to the limbs through sudden running of the rotor caused by an automatic cleaning run or automatic re-start after power failure.



Attention

If commissioning is not undertaken correctly, overheating, frost damage, erosions of the rotor body or odor problems may occur depending on the type of rotor. It is compulsory to observe the rotor manufacturer's information (request if necessary)!

Do not operate LICI-rotors with e.g. supersaturated air or clean wet.

The commissioning must be carried out in accordance with the rotor manufacturer's instructions and the commissioning described by robatherm (see page 63).

Rotor Speed

The desiccant rotor requires a much lower speed during dehumidification than during HRS operation. The defined rotor speeds have to be checked, e.g. during dehumidification 10 1/h for 2 V input signal (or the priority contact is closed) and in HRS operation 10 1/min for 10 V input signal.

Pressure Drop

In order to avoid contamination of the supply air with the humid regeneration air, the pressure potential of the fans should be selected in such a way that the system related leakage from the supply air side flows into the regeneration air side.

Maintenance

Maintenance Interval

Every three months.



Caution

Observe general safety instructions on page 6!



Caution

When current feed is not disconnected at all poles, there is a risk of crushing and scraping to the limbs through sudden running of the rotor caused by an automatic cleaning run or automatic re-start after power failure.

Maintenance Work

The maintenance work must be carried out in line with the instructions of the rotor manufacturer (ask if required).

Desiccant Rotor HRS – Periodic Maintenance

- Check rotor for hygiene, foreign bodies, contamination, damage and corrosion
- Check sealing strips for contamination, foreign bodies and contact pressure (see above)
- Check drive belt for wear and tension, shorten (see above) or change if necessary
- Check rotor for imbalance and lateral trueness
- Check bearing for incorrect heating, vibration or running noises and change if necessary (no later than the end of the theoretical service life)
- Check functioning of rotor control, align sensor if necessary

Desiccant Rotor HRS – Maintenance when necessary

- Rectify foreign bodies, contamination, damage and corrosion
- Clean body of rotor in line with rotor manufacturer's instructions. Depending on the rotor type, wet cleaning may lead to the destruction of the rotor!
- Clean sealing strips, change if there is abrasion
- Adjust contact pressure of sealing strips (see above)
- Balance or align rotor

Shut Down

If standstill is for a longer period, put the rotor intermittently into operation in line with the manufacturer's instructions to maintain self purification of the rotor.

Combustion Chamber

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

To avoid burns, do not touch hot surfaces.



Caution

Observe requirements in line with DIN 4794, DIN 4755 and DVGW-worksheet (German Technical and Scientific Association for Gas and Water) G600.

There is a danger of fire if flammable materials come into contact with the combustion chamber.



Attention

Flush to ensure that no explosive atmosphere is present before the burner ignites.



Attention

First commissioning of a combustion chamber or the associated system must be carried out by the manufacturer or a specialist appointed by the manufacturer following DIN 4794.

Flame Pot (refers to RWE substitute combustion chamber)

Check position of flame pot; it must be positioned vertically by the back wall.

Emission values

- Maximum exhaust gas temperature: approx. 210 °C for combustion chambers of the RWE series.
- Nominal flue gas temperature: approx. 170-190 °C at nominal capacity for condensate combustion chambers.
- Minimum flue gas temperature: approx. 120 °C for combustion chambers of the RWE series.

Connection

In the case of customer-supplied burners, approval by robatherm must be requested for compatibility testing with the selected combustion chamber.

Installation of oil or gas burner in accordance with manufacturer's instructions. Connect burner to oil or gas line. The operating instructions of the oil or gas burner manufacturer must be followed exactly.

Install and wire all sensors and thermostats.



Attention

Every system must be equipped with an emergency switch.

Overheating damage of combustion chamber, casing, components etc. may occur when the unit is operated with insufficient cooling (e.g. the unit is switched off via crash switch and burner is still running) or the units are switched off via safety bodies.

There is a danger of fire if flammable materials come into contact with the combustion chamber.

Check that there is a good distribution of the airflow at the inlet and outlet of the combustion chamber!

Combustion Air

The required combustion air (environmentally compatible) amounts to approx 1 m³/h per kW installed burner capacity. The intakes should be designed inside the building following TRGI, in the unit to a max. of 1 m/s, min. 150 cm².

Chimney

Make connection to chimney in accordance with applicable regulations. The exhaust system must meet the civil engineering and official regulations.

Readiness for Operation

Combustion Chambers of the RWE series

Make ready for operation:

- Vent oil or gas line.
- Check adjustment values of the triple thermostat:
 - Burner: approx. 70 °C
 - Fan: approx. 40 °C
 - Position of sensor approx. 10 cm downstream from combustion chamber
- For 2 stage burner check set values of single thermostat: approx. 60 °C.

Condensate Combustion Chamber

- Follow the instructions of the combustion chamber supplier. These are part of the documentation supplied.

Gas Consumption

Gas consumption depends on the operating point and the power output. It can be estimated using the equation:

Gas consumption (G₂₀, standard-m³/h) = 0,11 x power (kW)

For more detailed information, refer to the manufacturer documentation.

Burner

Put burner into operation. The commissioning instructions of the burner manufacturer must be followed precisely. Please ensure that the fan is in constant operation. The fuel supply must be set in such a way that the rated capacity Q_N is not exceeded. For this it is essential to use a gas meter for a gas burner.

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

Control and Safety Bodies

Check triple thermostat:

- The fan should start at set "fan" value = 40 °C. Functional test by means of e.g. hot air drier.
- The burner should switch off at set "burner" value = 70 °C. Functional test by means of e.g. hot air drier.
- For functional test of the safety temperature limiter, heat the capillary by means of hot air drier for example. Burner must switch off at approx. 100 °C and the safety temperature limiter must lock. If this does not happen automatically, stop burner, replace triple thermostat and repeat whole test.
- Unlock safety temperature limiter manually by reset button.

The single thermostat is to be tested in the same way as the triple thermostat. The second burner stage must be switched on or off at approx. 60 °C.

Damper Regulation

For combustion chambers with bypass, the active direction of the dampers must be checked. If necessary reverse direction of rotation of servo motor by adjusting the slide switch. For further information see page 40.

Combustion chamber temperature regulation:

- If the heating requirement increases, the combustion chamber damper must open and the bypass damper close. The dampers do the opposite when there is a reduced heating requirement.
- In order to guarantee adequate cooling of the combustion chamber, the combustion chamber damper may be closed no further than 10 mm of free opening cross section between the damper blades. Provide a limit switch to switch off the burner.

Temperature control of flue gas:

- When under-running the set minimum temperature of the flue gas the combustion chamber damper (if present) must close and the bypass damper must open. When the set flue gas maximum temperature is exceeded, the burner capacity must be reduced.

Emission Values

Establish emission value following DIN 4794.

Combustion Chambers of the RWE series

- Maximum emission temperature: approx. 210 °C (protection regulations, observe newest version).
- Minimum emission temperature: approx. 150 °C (to reduce formation of condensate). Observe minimum operation time of burner.

All settings must be documented and filed in the setting records.

Condensate Combustion Chamber

- At maximum power output 175-192 °C (depending on model)

Condensate

Condensate piping must be professionally connected and incidental condensate must be disposed of in line with the local regulations (e.g. ATV information sheet).

Condensate Quantity

The amount of condensate accruing depends on the mode of operation and power output. It can be estimated using the equation:

Condensate quantity (kg/h) = 0,10 x power (kW)

Maintenance

Maintenance Interval

One shift operation: Min. 1 x per year

Two shift operation: Min. 2 x per year

Three shift operation or other modes of operation: Min. 3 x per year



Caution

Observe general safety instructions on page 6!



Caution

To avoid burns, do not touch hot surfaces.



Caution

Before starting work allow components to cool/warm up to the ambient temperature.



Caution

Observe requirements in line to DIN 4794, DIN 4755 and DVGW-worksheet (German Technical and Scientific Association for Gas and Water) G600.

When working on the flame pot, wear protective clothing (skin, eye and inhalation protection). Observe safety data sheet (ask if required). There is a danger of fire if flammable materials come into contact with the combustion chamber.

Combustion Chamber – Periodic Maintenance

- Dismantle burner. Check combustion chamber for contamination, damage and leaks. If damage or leaks are found the manufacturer must be informed immediately in order to effect appropriate repairs. The burner may not be operated until the damage is rectified.

Combustion Chamber – Maintenance when necessary

- Following cleaning of the ancillary surface, vacuum the combustion chamber if necessary.

Flame Pot – Periodic Maintenance

- Check flame pot for damage. Slight cracking is normal. Replace if there is damage or deformation or after 5,000 operating hours. To do this remove burner plate and cylinder cover.

Reheating Surface – Periodic Maintenance

- Remove inspection cover and cleaning cover of the combustion chamber. Remove all turbulators and check for general condition. Replace if there is heavy corrosion.
- Check drainage device and clean if necessary.

Reheating Surface – Maintenance when necessary

- Clean all reheating surface pipes with a stainless steel brush and vacuum the collector.

Burner – Periodic Maintenance

- On completion of combustion chamber cleaning, the burner maintenance is to be carried out in accordance with the instructions of the burner manufacturer (in line with DIN 4755 or DVGW-worksheet G600).
- Establish exhaust gas values as per Federal Emissions Protection Act.
- A record is to be established of all work and forwarded to the manufacturer automatically.
- Check gas pipes, connections and gas control system for leaks and eliminate any leaks found.

Control and Safety Bodies – Periodic Maintenance

- Inspection according to commissioning.

Bypass- and Combustion Chamber Damper – Periodic Maintenance

- For maintenance see chapter “dampers”.
- Checking of active direction: See commissioning.

In general the chimney sweep is responsible for the maintenance of the exhaust pipe (chimney).

Condensate Combustion Chamber

- Follow the instructions of the combustion chamber supplier. These are part of the documentation supplied.

In general the chimney sweep is responsible for the maintenance of the exhaust pipe (chimney).

Gas Surface Burner

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

The CO₂ concentration of the indoor air must not exceed locally prescribed value limits! Recirculation air operation is not permissible! Do not enter running unit due to danger of burns.



Attention

Flush to ensure that no explosive atmosphere is present before the burner ignites.



Attention

First commissioning of a gas surface burner or the associated system must be carried out by the manufacturer or a specialist appointed by the manufacturer following DIN 4794. This person must be approved by the DVGW as a gas expert. There is a danger of fire if flammable materials come into contact with the flame.

Regulations

When the unit is installed, the points here must be followed together with any conditions imposed by the certifying authority, all local regulations and the DVGW and TRGI requirements must be adhered to precisely.

Connections

Connect controlled gas system to the gas pipe. Ensure that there is no stress on connections. Type of gas and gas pressure must be suitable for the control system. The prerequisite for achieving the nominal heat output is compliance with the supply pressure on the gas side (see data sheet). If the supply pressure falls below the specified value under operating conditions, the nominal heat output may not be achieved. Install blow valve outside the building. Install and wire all sensors and thermostats (room thermostats etc.).

Leak Test

Check gas pipe, connections and gas control system for leaks via testing instrument.



Attention

Every system must be equipped with an emergency switch. Overheating damage of combustion chamber, casing, components etc. may occur when the unit is operated with insufficient cooling (e.g. the unit is switched off via crash switch and burner is still running) or the units are switched off via safety bodies. There is a danger of fire if flammable materials come into contact with the combustion chamber. Check that there is a good distribution of the airflow at the inlet and outlet of the combustion chamber!

Readiness for Operation

Make ready for operation:

- Vent gas line.
- Check setting of limit value of safety temperature limiter: 60 °C as standard. Suction and blow openings must be open during operation.

Burner

Put burner into operation. Observe continuous operation of supply and extract fan without any recirculation air.

This work is only to be performed by the robatherm customer service unless an alternative agreement has been made.

The numbers shown below refer to the figures on page 77:

- Open stopcock (1), check pressure at manometer (11). It must correspond to the rated pressure in accordance with nameplate.
- Set gas pressure gauge min (9) at lowest value.
- Set gas pressure gauge max (10) at highest value.
- Set air pressure gauge on burner panel at lowest value.
- For units with combustion air blower: Set air pressure gauge of supporting blower at lowest value.
- Set desired value of duct and room sensor and thermostats above the respective ambient temperature.
- Set control switch on switch cabinet to "heating".

Unit will now start burner.

If there is a fault shutdown repeat start up several times (remaining air).

If there is no flame although there is gas at the burner:

- Check correct venting of the gas pipe.
- Check control units (6, 9, 10, 15, 16) electrically.
- Check fine wire fuse of control unit.
- Check electrical wiring in the switch cabinet and wiring of field units, correct if necessary.
- Check ignition electrodes.

If there is only a short flame although there is gas at the burner:

- Check UV diode for correct connection and discolouring, replace if necessary.
- For units with ionisation control: Check ionisation rod. Where appropriate remove contamination. Rod may not have any contact with metal parts. Check insulation body.
- For units with combustion air blowers check direction of rotation of the ventilator and reverse electrical connections if necessary.

Commissioning and Maintenance Work

The points listed below must also be included in maintenance work.

For testing of the safety temperature limiter (STL), heat the capillary by means of hot air drier for example. Burner must switch off at set value limit and the safety temperature limiter must lock. If this does not happen automatically, stop burner, replace STL and repeat whole test. Unlock safety temperature limiter manually by reset button.

Check whether defined nominal airflow is set; adjust if necessary.

Adjust gas supply with on site gas meter by turning the setting screw on the pressure regulator (3) (control damper with servo motor (7) must be fully open).

At full load (control damper (7) fully open) the pressure on the manometer must match the rated pressure as per nameplate.

The rated value of the duct sensors or room sensor must be set lower than actual value. Control damper (7) must close.

Set minimum gas throughput using control damper (7). For this set control signal to 0 % and to smallest possible throughput by means of limit switch in actuator at which a homogeneous flame pattern is still available. Check via sight glass.

Set unit back to max. capacity (open control damper (7)).

Turn down gas pressure gauge max. (10) until it switches off.
Set value: Switch off value + approx. 20 %

Gas pressure gauge min. (9) remains at lowest setting.

Check direction of rotation of servo motor (7). If the room sensor is set above t_{ist} , the servo motor (7) must open the control damper and vice versa.

Test the function of the controls.

Set sensors and thermostats to rated value.

The whole gas piping must be checked carefully for leakages with a leak indicator spray. If leakages are found, undertake appropriate repair work.

For units with combustion air blower, set combustion air pressure by adjusting suction restrictor; instructions of burner manufacturer must be followed exactly.

Set air pressure gauge on combustion air blower:

Set value: Switch off value – 20 %

Setting of burner slit: Nominal pressure loss at burner slit should be approx. 180 to 250 Pa.

Set pressure switch on burner slit:

Set value: Nominal pressure drop at burner slit – 40 %

All settings must be documented and filed in the setting records.

Maintenance

Maintenance Interval

One shift operation: Min. 1 x per year

Two shift operation: Min. 2 x per year

Three shift operation or other modes of operation: Min. 3 x per year



Caution

Observe general safety instructions on page 6!



Caution

Do not enter running unit due to danger of burns.

There is a danger of fire if flammable materials come into contact with the flame.

Gas Surface Burner – Periodic Maintenance

- Check gas pipes, connections and gas control system for leaks and eliminate any leaks found.
- All maintenance work must be performed as shown for commissioning.
- Clean off dirt with a brush; ensure that all air holes are clear. Check gas outlets, clean with injector needle if necessary. Do not touch with ignition electrode or controls.
- Check distance of the ignition electrodes; adjust if necessary.

For UV monitoring:

- Unscrew UV cell. Clean with soft cloth, refit. Change if discoloured.

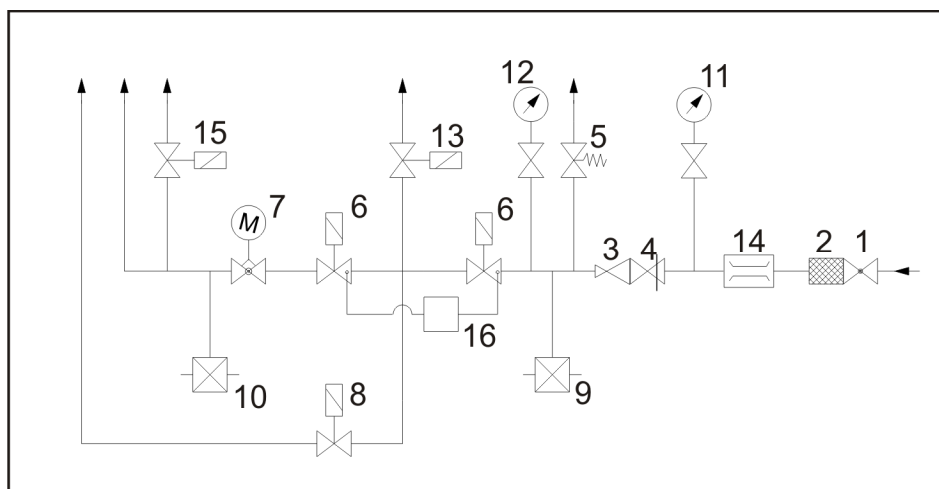
For ionisation monitoring:

- Unscrew ionisation rod, clean with soft cloth, refit.

Gas Surface Cleaner – Maintenance when necessary

- The exchange of defective parts should only be carried out by a specialist in accordance with the procedure described (see page 74). Spare parts must be appropriate for the unit!

Structure of the Gas System



Components of the Gas System

Item	Component Low Pressure ND*	Medium Pressure MD**	France F	Designation	Function
1	x	x	x	Stop-cock	Manual shut off
2	x	x	x	Gas filter	Protection from dirt particles
3	x	x	x	Pressure controller	Pressure reduction and stabilisation
4	-	x	o	Safety shut off valve	Closes mechanically at $p_2 \geq p_{2\text{sol}}$; hand unlocking
5	-	x	o	Safety shut off valve	Opens at $p_2 \geq p_{2\text{rated}}$
6	x	x	x	Magnetic valve	Closes and opens gas supply
7	x	x	x	Control damper with servo motor	Controls gas quantity and thus heating capacity
8	x	x	x	Ignition gas valve	Closes and opens ignition gas supply
9	x	x	x	Gas pressure gauge min.	Monitors gas pressure; burner switches off if value limits are fallen below
10	x	x	x	Gas pressure gauge max.	Monitors gas pressure; burner switches off if value limits are exceeded
11	x	x	x	Manometer with button valve	Pressure check
12	o	o	o	Manometer with button valve	Pressure check
13	-	-	x	Leakage gas valve	Open at zero current (at unit standstill)
14	o	o	o	Flow meter	Gas meter; Measurement of V_{gas} (only install adaptor if applicable)

15	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Magnetic valve	For 2 pass burner
16	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Leakage control device	Checks magnetic valves for leaks

* (< 0.1 bar)

** (> 0.1 - 4 bar)

X Installation mandatory following DIN and TRGI

- Not required

☐ Special equipment

Spray Humidifier

Quality of Fresh and Recirculating Water

Before commissioning the quality of fresh and recirculating water must be checked.

Fresh Water

- Analysis of fresh water (usually available from local water authority).
- Total water hardness under 7° dH.
- Water quality following VDI 6022, VDI 3803, DIN EN 13053 and Drinking Water Ordinance

Recirculating Water

Limits for quality of recirculating water (recommendation partly based on VDI 3803 and German Printing Trades Association):

Quality	Normal Requirement	Data Processing Areas	Sterile and Clean Rooms
Elec. conductivity (µS/cm)	< 1,000*	< 300	< 120**
Carbonate hardness (° dH)	< 4	< 4	< 4
Chloride (g/m³)	< 180	< 180	< 180
Sulphate (g/m³)	< 150	< 100	< 100
pH-value	7 to 8.5	7 to 8.5	7 to 8.5
Germ count (KBE/ml)	< 1,000	< 100	< 10
Legionella (KBE/100ml)	< 100	< 100	< 100
Thickening Count	2 to 4	2 to 6***	2 to 8***

CBU = Colony Building Units

*) Descaling and part desalination may be necessary; for moistening above 95% r.h. electrical conductivity max 800 µS/cm.

**) Full desalination necessary

***) Lower value without extra measures for sterilisation; upper value with extra measures

Thickening Count

Establishment of thickening count from the values of the fresh water analysis and the recommended value limits for the quality of recirculating water (see table):

Thickening count – recommended value for recirculating water / value for fresh water.

Whereby the thickening count must be calculated for the electrical conductivity, hardness, chloride content and sulphate content. The lowest value of the calculated thickening counts should be close to the recommended value limits (see table). For values below 2, additional measures for water treatment should be taken. Contact a company specialising in water processing.

Set Value

Setting values for hygienic monitoring can be established from the lowest thickening count:

Value limit for electrical conductivity =

Lowest thickening count x electrical conductivity of fresh water

(Rated value for blow down device or for monitoring with HYGIENECONTROL)

Cleaning interval =

Sump capacity x (thickening count – 1) / evaporated water quantity

(Setting value for time clock of HYGIENECONTROL)

Note

These settings values are approximations and do not replace the additional monitoring of germ counts.

We recommend the use of test systems (Dip-Slides). Follow instructions for use.

Fresh Water Pressure

The ball valve is acceptable up to an operating pressure of max. 6 bar.

We recommend a fresh water pressure of at least 3 bar; if necessary install booster system.

Adiabatic Humidification of Extract Air

Excessive humidity shall be avoided upstream of the rotor to prevent its matrix from over-wetting. If ever possible, permeate from the reverse osmosis should be used to operate the humidifier.

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

Do not work alone in the humidifier. There is a risk of being locked in. A second person must secure the working area outside the humidifier.



Caution

If there is no leg/foot space, too little or too much working height and limited freedom of movement, the task design must be changed so that a change of posture is possible.

Cleaning

Clean foreign bodies out of humidifier sump, clean contamination with water and cleaning agent (non-foaming, pH-value 7 - 9).

Note

Remove swarf thoroughly, otherwise there is a risk of pitting!

Filling

Fill humidifier sump up to 10 to 20 mm below the overflow connector and set ball valve at this level by adjusting the knurled screw.

Note

When operating the spray humidifier there must be an airflow of at least 1 m/s (related to inside cross section of casing) against the spraying direction in order to avoid rectifier breakdown.

Treated water must be removed from galvanized parts immediately. White rust formation!

Pump

Put pump into operation. Follow instructions of the pump manufacturer.



Attention

Pump may only be operated if the sump is sufficiently filled.

Check pump direction of rotation, if it is incorrect swap electrical connections.

Dry Running Protection

Set dry running protection. The pump must switch off when the water level drops below 20 mm over the suction line, otherwise pull floating switch cables in or out as required.

Ball Valve

Check ball valve. At a maximum water level 10 to 20 mm below the overflow connector the fresh water supply must switch off.

Adjustability

For adjustable humidifiers the pump must switch off at a nozzle pressure of less than 0.3 bar. Setting of control valve or frequency converter as per manufacturer's operating instructions.

Leak Testing

Test external piping for leakage, tighten if necessary.

Brand new eliminator profiles do not reach their full elimination capacity until approx 3 operating days have passed (weathering effect).

Shutdown

The humidifier must switch off automatically as soon as the AHU is switched off or fails. If the humidifier is shut down according to schedule, a fan run-on must ensure that the humidifier chamber can be dried out beforehand.

Downtime

Outside the operating time or if the humidifier is not in operation for more than 48 hours, the humidifier pan and the pipes must be emptied completely. The aim is to empty the system sufficiently so that the water residues remaining due to surface tensions can be completely dried by the fan run-on.

Preventing stagnation

For the supply pipe, the specifications of VDI/DVGW 6023 must be observed. For proper operation, stagnation of the water in the supply pipe must be avoided. Water treatment or drinking water post-treatment plants shall continue to be operated as specified during their downtimes or shall be conserved according to the manufacturer's specifications. In particular, the decommissioning of ion exchangers and softening plants without conservation measures is not permitted.

Hygiene Control

Sedimentation device: Adjust rated value for conductivity in accordance with manufacturer's operating instructions (see page 80).

HYGIENECONTROL: Setting of the cleaning interval (see page 80) and value limit of the conductivity control.

Disinfection

UV rays (with self-controlling UV selective sensors) may be appropriate for continuous disinfection.

Only use chemical disinfection agents (biocides) if their harmlessness to health in the application concentration is proven.

Following commissioning the germ count of recirculating water should be checked on a weekly basis for a while. If necessary the setting values of the hygiene control may be adjusted.



Caution

Increased quantities of germs can cause infections or allergic reactions.

If germ counts are over the recommended limits, clean or service system immediately. If in doubt or if germ counts again rise rapidly, you are recommended to have examination and advice from a qualified body.

If the results are below limits (see page 80), then see maintenance.

Maintenance



Caution

Observe general safety instructions on page 6!



Caution

Do not work alone in the humidifier. There is a risk of being locked in. A second person must secure the working area outside the humidifier.



Caution

If there is no leg/foot space, too little or too much working height and limited freedom of movement, the task design must be changed so that a change of posture is possible.

Maintenance Work

Only fill the humidifier sump with fresh water if humidifying is required.

Spray Humidifier – Weekly Maintenance*

- Empty humidifier sump and clean with fresh water**

Spray Humidifier – Two Weekly Maintenance*

- Check germ count of recirculating water and compare with permissible values (see page 80). If recommended germ count is exceeded, clean and disinfect immediately***.
- Examine inner surface for visible or tangible biological film (slimy covering), contamination, germs, damage or corrosion; if necessary service, scrub manually with a high pressure cleaner and disinfect***. If there are deposits through scaling then the recirculating water must have a commercially available descaling agent ***mixed into it; with the fan at a standstill, it must be allowed to take effect for several hours, the sump must then be emptied and cleaned with fresh water. If necessary remove drop eliminator and straightener profiles for cleaning.

Spray Humidifier – Half Yearly Maintenance

- Check mudflap, pump and pipes for dirt, coating, condition and function; if necessary clean with fresh water; if necessary service
- Check pump incl. bearings for quiet, vibration free running, heating and noises; perform corrective maintenance if necessary
- Check proper functioning of and clean the conductivity electrodes in line with manufacturer's information, service if necessary
- Unscrew caps of atomizer nozzles and examine for deposits, clean with commercially available descaling agent*** if necessary
- Check dry running protection and ball valve and adjust if necessary (see page 82)
- Check function of the deconcentration device, water conditioning, sterilisation plant, water drain and overflow; service if necessary.
- Check shut off installations for function; service and adjust if necessary

Spray Humidifier – Maintenance when necessary

- Drying by fan slow down **
- Lubricate pump motor bearings in line with manufacturer's instructions. Replace bearings (no later than the end of the theoretical service life)
- If the water conditioning or sterilisation plant breaks down all unit parts must be cleaned.
- Refill the humidifier sump with fresh water**

- *) Quarterly maintenance for extract air humidifiers that do not influence the ventilation air quality.
- **) Is performed automatically in units with HYGIENECONTROL, depending on the cleaning interval.
- ***) Observe manufacturer's instructions.

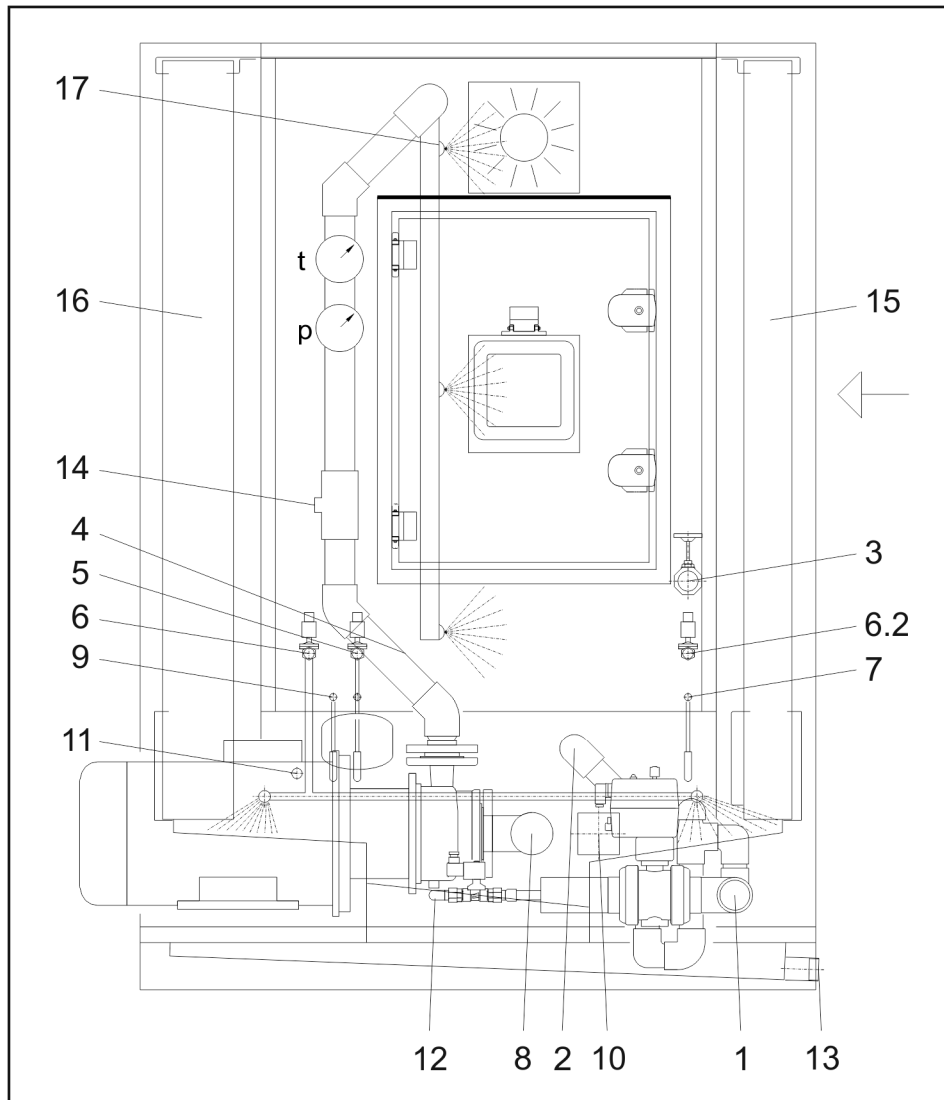
Note

Treated water must be removed from galvanized parts immediately. White rust formation!

Shut Down

- Humidifier sump, siphon and pump (with drain plug or valve) should be completely drained.
- Remove drop eliminator and straightener profiles for cleaning.
- Clean spray humidifier completely with commercially available cleaning agents, if necessary descalers (follow manufacturer's instructions).
- Dry inner surfaces by fan slow down.
- Do not refill humidifier sump until humidification is needed.

Description



Equipment depending on scope of customer order:

1	Drainage	9	Level control
2	Overflow with external siphon	10	Immersion heater
3	Rapid filling	11	PTC Thermistor
4	Manual cleaning	12	Drain plug or valve
5	Floating valve	13	Drain plug of drip pan
6	Cleaning nozzle bank	14	Conductivity electrode
6.2	Cleaning nozzle bank 2 ($\geq T33$)	15	Straightener
7	Pump dry-run protection	16	Drop eliminator
8	Suction basket	17	Nozzle bank with vaporizer nozzle

Note

Drinking water connections shall be equipped with pipe isolators according to EN 1717.

Connect discharge (1) and outflow of the front sump (13) separately to the waste system. Do not discharge humidifier into the casing sloping pan!

High Pressure Spray Humidifier

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

For further information the individual commissioning instructions must be observed!

Fresh Water

- Completely desalinated water (permeate from reverse osmosis) with max. 20 µS/cm and total water hardness max. 1 °dH.
- Water quality following VDI 6022, VDI 3803, DIN EN 13053 and Drinking Water Ordinance
- Water supply pressure: 2 to 8 bar
- Drinking water connections shall be equipped with pipe isolators according to EN 1717.

High Pressure Connection

- Check that high pressure hose is routed so that it is not subject to stretching or chafing; correct if necessary.
- Check threaded connections to humidifier and pump station for leaks; tighten if necessary. Use a second wrench for counter tightening.
- Internal bolts must not be retightened.

Pump Station

- Check oil level through sight glass or with a dipstick; if necessary top up with required type of oil (see information on pump station).
- Check tension of drive belt; retension with pulley if necessary.
- Check discharging screw for leaks; retighten if necessary. For this use a second wrench to counter turn.
- Set system in motion manually and check basic functions.
- Check pump direction of rotation, if it is incorrect swap electrical connections.
- Check protective devices as instructed.

Control Unit

- Commission control unit as instructed.

Shutdown

The humidifier must switch off automatically as soon as the AHU is switched off or fails. If the humidifier is shut down according to schedule, a fan run-on must ensure that the humidifier chamber can be dried out beforehand.

Downtime

Outside the operating time or if the humidifier is not in operation for more than 48 hours, the humidifier pan and the pipes must be emptied completely. The aim is to empty the system sufficiently so that the water residues remaining due to surface tensions can be completely dried by the fan run-on.

Preventing stagnation

For the supply pipe, the specifications of VDI/DVGW 6023 must be observed. For proper operation, stagnation of the water in the supply pipe must be avoided. Water treatment or drinking water post-treatment plants shall continue to be operated as specified during their downtimes or shall be conserved according to the manufacturer's specifications. In particular, the decommissioning of ion exchangers and softening plants without conservation measures is not permitted.

Maintenance

Maintenance Interval

See table.



Caution

Observe general safety instructions on page 6!



Caution

For further information the individual maintenance instructions must be observed!

High Pressure Spray Humidifier – Bi-weekly Maintenance

- Check pump station, hose connections, grating, nozzle blocks and nozzles, drop eliminator, humidifier pan and casing sides for function, foreign bodies, contamination, damage and corrosion; clean and service if necessary*
- Check for bacterial contamination of the humidifier pan floor, clean and disinfect if necessary.
- Check oil level; if necessary top up or change oil*
- Manually reverse filter element*

High Pressure Spray Humidifier – Half Yearly Maintenance

- Check shut off installations for function; service and adjust if necessary

High Pressure Spray Humidifier – Maintenance when necessary

- Replace wearing parts*

*) Observe manufacturer's instructions

Note

Treated water must be removed from galvanised parts immediately. White rust formation!

Shut Down

Empty and dry out all water filled parts.

Clean entire spray humidifier (observe manufacturer's information).

Electric-Steam Humidifier

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

In particular, the manufacturer's operating instructions are to be observed!

Requirements for Assembly / Installation

Steam generator

- Please observe the necessary minimum wall clearances
- The permissible ambient temperature is - 5°C to 40°C.
 - If necessary, aeration (for installations in closed spaces) and/or frost control must be provided for.
- The device must be mounted plumb, both vertically and horizontally.
- Please take into consideration that the generator's back wall can heat up to 70° C.
- May not be installed in rooms with negative pressure.

Hose System

- Hoses should be installed with a constant incline resp. constant decline of 5-10%.
- Any sagging or kinking of the hoses must be avoided.
- Steam hoses should be as short as possible.
 - To minimize condensate loss, insulation of the steam hoses is recommended for lengths > 5 meters.
 - Fixed piping is recommended.
 - Insulation is mandatory for lengths greater than 10 meters.
- Observe the minimum bending radius/radii.
- Depending on the installation position of the steam distributor and steam generator, the types of condensate hose guide installation must be observed.
- Condensate hose must be laid with a loop as a vapor barrier.

Steam distributors / Steam lances

- All steam distributors must be mounted horizontally.
- Installation as close to the steam generator as possible.
 - In this manner, steam losses thru condensate can be minimized.
- Preferred pressure-sided alignment with max. 1200 Pa excess pressure.
 - With suction-sided alignment max. -500 Pa.
- Max. Flow velocity: 3 m/s.

Hygostat

- If the hygostat is unfavorably positioned, exceedance of the maximum necessary steam output can take place.
- This could result in fact that subsequent components become soaked.
- As a guide: The distance of the hygostat should be at least five times longer than the length of the humidification distance. The largest possible distance should be strived for.
- Check the hygostat's function.

Shutdown

The humidifier must switch off automatically as soon as the AHU is switched off or fails. If the humidifier is shut down according to schedule, a fan run-on must ensure that the humidifier chamber can be dried out beforehand.

Downtime

Outside the operating time or if the humidifier is not in operation for more than 48 hours, the humidifier pan and the pipes must be emptied completely. The aim is to empty the system sufficiently so that the water residues remaining due to surface tensions can be completely dried by the fan run-on.

Requirements for Fresh Water Quality

- Use feed water without chemical additives.
- Max. 40°C.
- Permissible water supply pressure 1 up to 10 bar.
- Please observe the manufacturer's instructions found in their operation manuals.
- The limits concerning electrical conductivity must be observed.

Requirement for the water supply and water drainage

- Local regulations of the waterworks or utilities must be observed.
- If not included in robatherm's scope of supply, a system separator according to DIN EN 1717 must reliably prevent any backflow of water into the drinking water network.
- In accordance with DIN EN 1717, free flowage is required.
 - Attention: Danger of scalding by water temperatures up to 95 ° C.

Requirements for the electrical connections

- All electrical work may only be carried out by qualified personnel.
- The connection may only take place after completion of all installation work.
- Please observe the corresponding information in the manufacturer's operating manuals.

Attention:

The information compiled here is only part of the manufacturer's defined requirements and is intended to give an overview of the most important requirements. Careful consideration of the manufacturer's operating manuals is mandatory.

Maintenance

Maintenance Interval

The required maintenance intervals essentially depend on the available water quality and the amount of generated steam.



Caution

Observe general safety instructions on page 6!



Caution

For further information, please consult the manufacturer's individual maintenance manual.

Typical maintenance intervals are listed as follows:

Steam humidifier - 4 weeks after commissioning

- Visual inspection of all joints and connections
- Clean steam cylinder, pump and hoses
- If necessary, Check electrode length
- Tighten all screws.

Steam humidifier - every six months

- Visual inspection of all joints and connections
- Clean steam cylinder, pump and hoses
- If necessary, Check electrode length
- Tighten all screws.

Please observe the manufacturer's information.

Decommissioning

Please observe the manufacturer's information.

Pressure Relief Damper

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

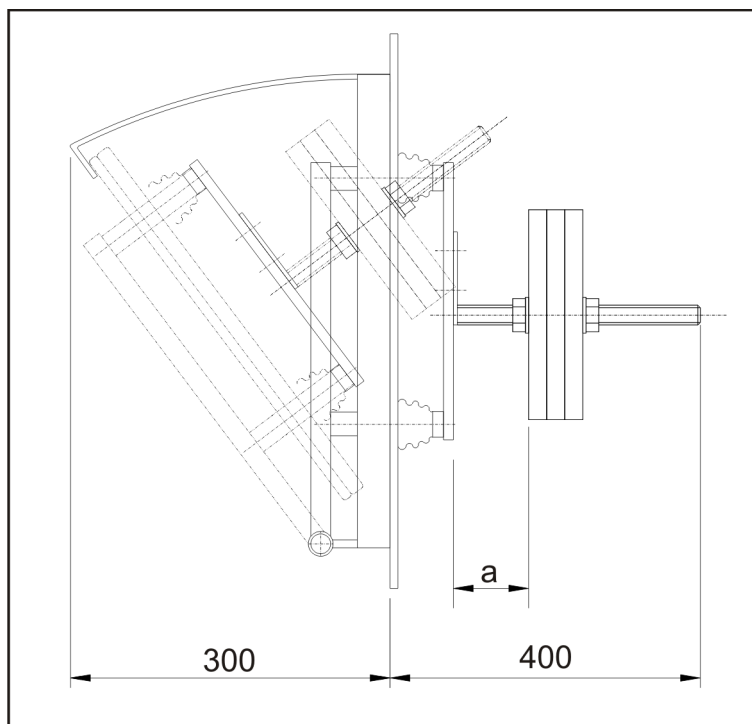
There is a possibility of damage to persons or property as a result of impact or air jet under high pressure through unexpected release of the pressure relief damper!
Protective devices must be fitted and effective in accordance with DIN EN ISO 12100.

Setting

The release or application pressure of the pressure relief damper against the unit or duct wall can be varied by height adjustment, and altering the number and distance of weights (see characteristics).

The presetting is made by means of the indicated a-dimension.

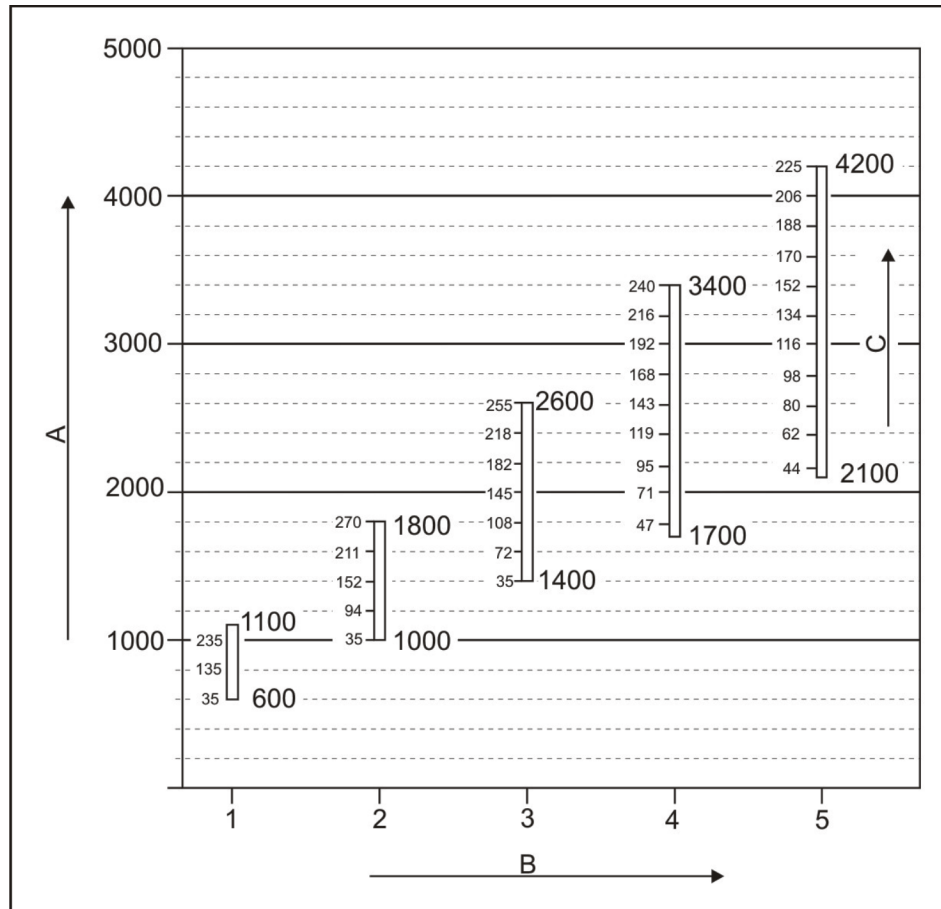
By simulating maximum pressure in the network by using dampers which are as a rule present in every system, release pressure must be tested and weights adjusted if necessary.



Caution

Damage to persons or property may occur if the maximum pressure for the system is exceeded!

Characteristic Release and Application Pressure



A Release pressure (Pa)
 B Number of weight plates (pcs)
 C a-distances (mm)

Maintenance



Caution
 Observe general safety instructions on page 6!

Maintenance Interval

Every six months.

Pressure Relief Damper – Periodic Maintenance

- Check pressure relief damper for function, foreign bodies, contamination, damage and corrosion
- Treat all moving parts with lubricating and preserving spray
- Treat sealing with Vaseline
- Check release pressure, adjust if necessary.

Pressure Relief Damper – Maintenance when necessary

- Clean pressure relief damper and rectify any damage and corrosion
- Clean with a wet cloth, use grease or oil dissolving agents if necessary

Controlling Systems

Commissioning



Caution

Observe general safety instructions on page 6!

Requirements

All construction requirements such as access, completed unit and duct installation and uninterrupted availability of all supply facilities must be met. In addition there must be a possibility of operating the system in the required working phases.

The commissioning may only be undertaken by a qualified company which specialises in process measurement and control technology.

At the start of the commissioning work, the commissioning engineer will be shown the system specific locations by a person nominated by the customer.

Work

The following work must be carried out:

- Check correct installation of the field units
- Check the electrical connections on the switchgear cabinet and the field units
- Functional test of sensors, transducers and actuators included in the supply package
- Configuration of control and/or DDC substations including loading of project specific control and SPS programmes
- Commissioning with all connected data stations
- Adjustment of the parameters to the operating conditions of the technical system, setting and regulation to the specified rated values and reference variables
- Testing of the control programmes
- Briefing nominated operating staff during the course of commissioning work

Maintenance

Maintenance Staff

Maintenance work must only be carried out by a qualified expert.

Maintenance Contract

A maintenance contract with a company which specializes in process measuring and control technology is recommended.

Maintenance Interval

Every year.

Caution

Observe general safety instructions on page 6!



Switch Cabinets, Control Panels, controls – Periodic Maintenance

- Check for proper and functionally correct installation and ambient conditions
- Check for contamination, corrosion and damage
- Check protective coverings are complete
- Check electrical/mechanical function of the connections, especially protective conductors
- Check functional elements (e.g. operating - and display devices)
- Check input signals (e.g. sensor, reference variable) match with rated value
- Check optical and acoustic control devices
- Check contactors and relays for wear and damage (e.g. contact erosion)
- Check switching and control processes (e.g. anti-freeze function)
- Check safety devices (e.g. thermal trips)
- Check setting of switch cabinet components (e.g. time relays)
- Check manual, automatic and remote control functions
- Change switch cabinet filter

Switch Cabinets, Control Panels, Controls – Maintenance as required

- Clean to maintain functioning
- Set, adjust, tighten functional elements (e.g. operating and display devices)
- Compensate signals
- Readjust

Transducers, Safety and Monitoring Equipment, – Periodic Maintenance

- Check for proper and functionally correct installation and ambient conditions
- Check for contamination, corrosion and damage
- Check electrical/mechanical function of the connections, especially protective conductors
- Measure and record measurable quantities at measurement point
- Check electrical, electronic and pneumatic measurement signals

Transducers, Safety and Monitoring Equipment – Maintenance as required

- Clean to maintain functioning
- Readjust, regenerate

Controllers and Supplementary Modules – Periodic Maintenance

- Check for proper and functionally correct installation and ambient conditions
- Check for contamination, corrosion and damage
- Check natural voltage (e.g. buffer batteries, storage batteries)
- Check electrical/mechanical function of the connections, especially protective conductors
- Check functional elements (e.g. operating - and display devices)
- Check electrical, electronic and pneumatic input signals (e.g. sensors, remote adjustment devices, reference variables)
- Check controller functioning and actuating signal
- Check control loop as per setting parameters including all supplementary functions

Controllers and Supplementary Modules – Maintenance when necessary

- Exchange storage batteries
- Clean to maintain functioning
- Set, adjust, tighten functional elements (e.g. operating and display devices)
- Compensate signals
- Adjust controller functioning and actuating signal
- Adjust control loop as per setting parameters including all supplementary functions

Actuators – Periodic Maintenance

- Check for proper and functionally correct installation and ambient conditions
- Check for contamination, corrosion and damage
- Check for external leakage (e.g. valve packing bushes)
- Check electrical/mechanical function of the connections, especially protective conductors
- Check electrical, electronic and pneumatic input signals and operating range
- Check functioning of position sensors, alarm actuators and limit switches
- Readjust

Actuators – Maintenance when necessary

- Lubricate (e.g. valve stem)
- Clean to maintain functioning

Software – Periodic Maintenance

- Perform data back up
- Keep most recent copies of programmes and data

Software – Maintenance when necessary

- Load most recent copies of programmes and data

Hydraulic Set

Commissioning



Caution

Observe general safety instructions on page 6!



Caution

Only use fluid with ambient temperature when charging or purging as there is a risk of scalding/frostbite.



Caution

To avoid burns, do not touch hot/ cold surfaces.



Attention

Do not exceed permissible pressure range.
Observe design data sheet.

In HRS control equipment (e.g. run around coils heat recovery system) the quantity of anti-freeze is to be determined in relation to the lowest outside temperature (note manufacturer's information).

If no drain pan is present beneath a HRS run around coil, heat recovery is only allowed when there is no risk of condensation.

Inspections

Check:

- Correct installation of all components.
- Inlet outlet connections for function (counter flow principle).
- Firm seating of all bolts and glands.
- Easy movement of all valves, slide dampers and baffles.

Charging

The system must be rinsed (removal of contaminations) according to VDI 2035 and should be filled with the heat exchanger fluid named in the design data sheet to the correct concentration. Water quality to VDI 2035. This control equipment charging process can also occur together with the charging of the piping system. During charging check connection points for leakage; retighten screws and glands if necessary.

Venting

When charging the system according to VDI 2035 the control equipment and the system should be vented carefully at the highest point of the system. Open the venting recovery device provided for this purpose. This is also valid for pumps with venting devices (e.g. high pressure centrifugal pumps in high efficiency run around heat recovery systems). Observe manufacturer's instructions.

In incompletely vented systems with pumps, air pockets may cause capacity reduction and severe damages of the pump.

Pressure Check

Carry out as an option following DIN 4753, part 1.

**Attention**

When doing this observe the permissible pressure stage.

Direction of Rotation

Check direction of rotation of pumps and servo motor. Change electrical connections if incorrect.

Hydraulics

Optional performance of hydraulic commissioning with setting and compensation of pressures (e.g. by using pressure regulating device).

Steam

In control equipment for steam the unobstructed discharge of condensate must also be checked (all condensate shut off valves must be open).

Maintenance

Venting

Pumps with venting devices (e.g. high pressure centrifugal pumps in high efficiency run around heat recovery systems) shall be vented again 2 weeks after commissioning. Observe manufacturer's instructions.

Otherwise, bearings and shaft seals might be damaged.

Maintenance Interval

Every three months.



Caution

Observe general safety instructions on page 6!



Caution

To avoid burns, do not touch hot/ cold surfaces.



Caution

Before starting work allow components to cool/warm up to the ambient temperature.



Caution

Avoid any contact with brine while charging or venting. Danger of poisoning and acid burns! Observe manufacturer's instructions.

Hydraulic Control Equipment – Periodic Maintenance

- Check control equipment for contamination, damage, corrosion and leaks
- Vent pump and hydraulic set
- Check filtering systems, clean if necessary
- Check easy movement of all valves, slide dampers and baffles; if necessary lubricate stems in accordance with manufacturer's instructions.
- Check release pressure of pressure relief devices
- Service pumps, control valves and servo motors in accordance with manufacturer's information

Hydraulic Control Equipment – Maintenance when necessary

- Clean control equipment and rectify any damage, leakage and corrosion
- Retighten bolts and glands

Shut Down

If out of operation for some time, especially if there is a risk of freezing, the control equipment must be emptied completely. For this purpose open all purging and discharging devices.

Then blow air (compressed air, fan etc) through the control equipment for complete purging.

UV-C lamps

Safety

Please also refer to the manufacturer's instructions for use.



Caution

The low-pressure mercury UV-C lamps built into AHUs emit UV-C radiation. UV radiation is invisible but harmful to the skin and eyes. UV radiation can cause cataracts, inflammation of the retina and conjunctivitis. Direct exposure to high-energy UV-C radiation must be avoided. Air handling unit doors should therefore be equipped with automatic sensors switches to safely switch off UV-C lamps, even in case of unauthorised access.



Caution

When handling broken UV lamps, the safety rules for handling mercury must be observed. Avoid direct contact with eyes, skin and clothing. Risk of contact with the filling substances exists only if the lamp body breaks. UV-C lamps contain small amounts of mercury. If the lamp breaks, the AHU and the rooms connected to it by air ducts must be very ventilated thoroughly. Disposal of the small amounts that may have escaped from the lamp body when it breaks can be done with special mercury absorbents. Keep the lamp fragments in an airtight container and dispose of them properly. Avoid direct contact with skin, eyes or clothing when disposing of mercury residues and fragments.



Caution

The quartz glass surfaces of UV lamps can become very hot. To avoid burns, do not touch hot surfaces.

Behaviour in case of contact with mercury

In case of skin contact:	Wash off any mercury residue immediately with soap and water.
In case of eye contact:	Flush affected eye with water, holding eyelid wide open for at least 15 minutes, while protecting the healthy eye. Call an ophthalmologist.
If inhaled:	Immediately seek fresh air. Consult a physician. If experiencing breathing difficulties, administer oxygen.
If swallowed:	Induce vomiting (drink 1 tablespoon of table salt dissolved in 1 glass of water). Then give charcoal (3 tablespoons of charcoal powder dissolved in 1 glass of water). Consult a physician.
In case of contact with clothing:	Remove affected clothing immediately.

Maintenance

Before maintenance work, make sure that the UV-C lamps are switched off and that the lamp surface has cooled down sufficiently.

Wear protective glasses and gloves.

Periodic maintenance (weekly maintenance)

- Check the operation of the lamps. Check the messages on the control unit.
- Check the number of operating hours (has the lamp reached the end of its life?).
- Check that the lamps are not dirty.

Caution:

Dirty lamps do not achieve the designed deactivation rate due to shadow effects.

Maintenance when necessary

- Dirty lamps should be carefully cleaned with a cloth and alcohol.
- The quartz glass must not be touched with the hands.
- When the lamps reach their maximum lifetime (a corresponding signal is displayed on the UVC lamp control unit), they must be replaced immediately. Observe manufacturer's instructions.

Decommissioning

UV-C lamps contain mercury and must therefore be disposed of as hazardous waste at a local waste disposal company. Disposal in non-recyclable waste is not permitted. Please observe the manufacturer's information.

Shut Down



Caution

Observe general safety instructions on page 6!



Caution

Observe the safety instructions of the respective components.

If the system is to be shut down for a longer period the instructions for the individual components must be observed. Additionally it is compulsory to observe the individual component manufacturer's information (request if necessary)!
Take the risk of freezing in winter into account in particular.

Disassembly, Disposal



Caution

Observe general safety instructions on page 6!



Caution

Observe the safety instructions of the respective components.



Caution

Ensure sufficient ventilation of the working area.

Wear personal protective equipment (respiratory mask, gloves, protective clothing and safety goggles).

Allow hot separating points (e.g. by means of separating cutter) to cool down.



Caution

Removing the grates creates the danger of falling through the exposed opening. Secure at the fixing point with a fall protection device.

Through exposed openings, objects such as tools can also fall down and endanger persons who are under the opening. Block off the endangered area, e.g. safety net.

If installed incorrectly, there is a risk of falling due to the limited load-bearing capacity of the grate.

To protect the environment and conserve resources, local regulations must be observed when disposing of components and waste.

Disassembly

At the end of its useful life, the unit must be disassembled by an authorised specialist company. To avoid personal injury or property damage when disassembling the unit, the precautions described for the individual components and the individual information provided by the component manufacturers must be observed.

Disposal

All components and operational materials (e.g. oil, refrigerant, brine, batteries) must be disposed in accordance with local regulations. Electronic waste, metal and plastic parts should be separated and recycled to save resources.

Panel profiles are made of polyvinyl chloride (PVC).

absorption material	51	burner	69
access door	31	condensate piping	25
adiabatic humidification of extract air	63, 81	discharge piping	25
air duct	18	electrical connection	29
air flow control	52	flexible	18
air pressure gauge	56, 75	heat exchanger	24
anti-freeze function	96	heating and cooling water piping	24
assembly	12	motor	43
axle base	45, 47	overflow piping	25
bacterial contamination	89	refrigerating piping	24
baffles	100	Connection	
base frame	9	Humidifier	29
bearing replacement	44	Connection	
belt deflection	47	Siphon	25
belt pretensioning force	47	Connection HE-RAC	25
belt pulleys	43, 47	Connections	
belt tension	43, 46, 47	Controlled gas system	74
BGR 500	61	contamination	50, 63
BGV D4	61	control panels	96
blow down	81	control unit	87
bolt		controlling systems	95
through bolt connection	13	cooling coil	
with thread bushes	13	CW	58
booster system	81	DX-coil	58
burner	70	HE-RAC	58
casing	7	RAC	58
certificate of conformity	1	coupling frame	9
charging		damper	40
cooling coil	58	damper regulation	71
chimney	70	dampers	
clean up	31	coupled	40
cleaning		linkage drive	41
cooling coil	60	motor driven	40
heat exchanger	64, 65	danger of fire	42, 44, 72
heat exchanger	60	data back up	97
heating coil	54	DDC-substations	95
pressure relief valve	94	decommissioning	102
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