

REMAK



Air Handling Units

AERO **MASTER** *Cirrus*

INSTALLATION AND OPERATING INSTRUCTIONS

09/2022

Application, Operating Conditions and Construction	3
Manufacturer's Notification	3
Application and Operating Conditions	3
Air-Handling Unit Construction	3
Air-Handling Unit Marking	3
Information and Safety Labels	3
Side Variability of Unit Connections	3
Goods Despatch	4
Delivery Content	4
Transport and Storage	4
Packaging	4
Transport and Handling of Air Handling Unit Components	4
Rotary Heat Exchanger Transport	4
Storage Conditions	4
Installation	5
Installation Site	5
Service Access	5
Pre-Installation Inspection	5
Identification of Air-Handling Unit Components	5
Assembly of Air-Handling Unit Sections	6
Assembly of Base Frames	6
Assembly of Individual Sections	6
Rotary Heat Exchanger Block Alignment	7
Connection of Heat Exchangers	9
Water Heat Exchangers	9
Connecting Dimensions of Water Heat Exchangers	9
Direct Evaporators	9
Connection of Direct Evaporators	9
Water Connected Air-handling Component Installation	10
Condensate Drainage	11
Other Connections	11
Air-handling Duct Connection	11
Electric Equipment Wiring	11
Wiring of Motors	12
Wiring Diagrams – Fan Motors	12
Wiring Diagrams – Electric Heaters	12
Elektromagnetická kompatibilita (EMC) elektrické instalace s frekvenčními měniči	13
Commissioning	14
Safety precautions	14
Protection against Dangerous Contact with Non-Live Parts	14
Inspection Prior the First Start-Up	14
Checking During the First Start-Up	14
Service regulations	14
Operating Checks and Service Regulations	15
Unit Operation - Service Regulations	15
Unit Operation Screening Checks	16
Regular Inspections	16
Filter Replacement	18
Spare Parts and Service	21
Spare parts, Service, Disposal	21
Complementary Information	22
Covering Roof Assembly	22
Gas Heater Section	28
Integrated Cooling Section	29
Complementary information – pool units of 2nd generation	30
Replacement of insert filter fabrics	31

General Information

- AeroMaster Cirrus air-handling units are manufactured in accordance with valid Czech and European regulations and technical standards.
- AeroMaster Cirrus air-handling units must be installed and used only in accordance with this documentation.
- The manufacturer is not responsible for any damage resulting from use other than intended, and the customer bears the risks of such use.
- The installation and operating documentation must be available for the operating and servicing staff.
- It is advisable to store this documentation close to the installed air-handling unit.
- When handling, installing, wiring, commissioning, repairing or servicing the air-handling units, it is necessary to observe valid safety rules, standards and generally recognized technical rules. In particular, it is necessary to use personal protective work aids (e.g. gloves) because of sharp edges and corners when performing any handling, installing, dismantling, repairing or checking. All equipment connections must comply with the respective safety standards and regulations.
- Any changes or modifications to individual components of the AeroMaster Cirrus air-handling units which could affect its safety and proper functioning are forbidden.
- Before installing and using the air-handling units, it is necessary to familiarize yourself with and observe the directions and recommendations included in the following chapters.
- AeroMaster Cirrus air-handling units, including their individual parts, are not intended, due to their concept, for direct sale to end customers. Each installation must be performed in accordance with a professional project created by a qualified air-handling designer who is responsible for the proper selection and dimensioning of components concerning their suitability for a given application. The installation and commissioning may only be performed by an authorized company licensed in accordance with generally valid regulations.
- When disposing of components and materials, it is necessary to observe the respective environmental protection and waste disposal regulations. In case of final device liquidation, it is necessary to follow the policy of differential waste disposal. We recommend metal parts be scrapped and other parts be disposed of in accordance with separated waste regulations.
- **The latest version of this document is available on our website: www.remak.eu**

AeroMaster Cirrus Air Handling Units

Application, Operating Conditions and Construction

Manufacturer's Notification

AeroMaster air-handling units are manufactured in accordance with valid Czech and European regulations and technical standards. AeroMaster air-handling units must be installed and used only in accordance with this documentation. The installation and operating documentation must be available for the operating and servicing staff, and it is advisable to store this documentation close to the installed air-handling unit.

Application and Operating Conditions

■ AeroMaster Cirrus air-handling units are designed for comfortable air-handling and air-conditioning in an air flow range corresponding to the air-handling unit's cross-section and required air flow velocity from 1.5-4 m/s at an air pressure difference of the fan of up to 2500 Pa. The air-handling unit is designed as a modular system with a frame and laminated construction which enables high flexibility. Thus individual modification to customer requirements is possible. Inner width (W), height (H) and length (L) are multiples of the module (N × 306 mm) and create space for the installation of built-in functional assemblies.

■ AeroMaster Cirrus air-handling units are intended for installation on floors or substructures, and are delivered with a rigid base frame mounted in the factory.

■ They are designed to transport air without solid, fibrous, sticky, aggressive or explosive impurities. The transported air must be free of corrosive chemicals or chemicals aggressive to zinc and steel, respectively aluminium.

■ They are manufactured with the same construction for inside as well as outdoor environments, including units designed for rooms with greater requirements for cleanliness. Air-handling units intended for outside environments are completed with suitable accessories (roof, louvers, etc.) ensuring correct and failure-free operation. With these air-handling units, the correct selection, localization and connection of the M&C components, including anti-freeze protection, must be ensured.

■ AeroMaster Cirrus air-handling units can be used in normal rooms (IEC 60364-5-51, resp. ČSN 332000-5-51 ed.3, ČSN 33 2000-1 ed.2) and in rooms with extended ambient temperature range from -30 °C to +40 °C without additional measures - applies to the standard version. Custom-made units with decreased -40 °C to +40 °C or increased -30 °C +50 °C temperature range of transported air can be delivered.

■ When designing the air-handling assembly, it is necessary to take into account the temperature and humidity of the inlet and outlet air in relation to the ambient temperature and humidity. It is especially necessary to analyze the relation of the unit's casing classification pursuant to EN 1886 and the risk of condensation, respectively ice build-up.

■ The device can be used for outdoor installations if equipped with a protecting roof; the device is water spray proof (rain up to 60° vertical slant) while observing the Installation and Operating Instructions. The fans are equipped with motors insulated with F class insulation of the winding.

■ The unit's noise level does not exceed max. allowed values as per Statutory Order No. 176/2008 Sb, Appendix No. 1, Article 1.7.4.2., Letter u).

Air-Handling Unit Construction

■ The air-handling unit is designed as a modular system with a frame and laminated construction. The walls consist of two layers of unified modular laminas attached to the frame. The first layer of the upper, lower and back walls has longitudinally-oriented laminas while the second layer laminas are cross-oriented. The front wall fitted with service panels has laminas oriented in the same direction in both layers. The service parts (panels) are also of laminated construction. Each panel consists of the external casing with integrated reinforcements. The panels which are expected to enable occasional service access to the internal built-in assemblies are provided with locks and grab handles to make handling easier. The panels used for regular servicing (replacement of filter inserts, cleaning of built-in assemblies, etc) are provided with hinges and locks.

■ All walls are of sandwich construction with a total insulation thickness of 50 mm. They are provided with a quality anti-corrosion surface finish. The connections between walls, panels and supporting cross-members are sealed with a seal with closed cell structure.

The seals used during the assembly of the air-handling unit's lamellar walls and casing have a closed cell structure. The non-glued replaceable sealing of the service panels is fitted in to the groove on the inner side of the panel.

■ Internal casing: Standard version - galvanized sheet steel, optionally painted sheet steel (polyester paint) or stainless sheet steel

■ External casing: Standard version - galvanized sheet steel, optionally painted sheet steel (polyester paint) or stainless sheet steel

■ Frame profiles: Standard version - hot-dip galvanized sheet steel, optionally painted sheet steel (polyester paint)

■ Insulation of the upper and side panels is made of 50 mm thick non-combustible mineral wool (Class A1 pursuant ČSN EN 13501-1).

■ Insulation of the lower panels is made of 50 mm thick PUR foam boards (Class B2 pursuant DIN 4102).

■ The joints are sealed with silicone compound.

Air-Handling Unit Marking

The complete AeroMaster Cirrus air-handling unit is divided into "structural" BLOCKS, respectively transport-installation BLOCKS. Functionally, the block is defined by the internal built-in assembly (assemblies) which is (are) fitted into the block's casing, where the casing is created with laminated walls, supporting cross-members and a combination of service panels situated on the access side of the unit.

■ The air-handling unit is then assembled from the transport-installation blocks at the installation site. At the outlet, the transport-installation blocks are fitted with an end panel or a frame to be connected to the next block.

■ BLOCK is provided with a **BLOCK type (name) plate** indicating the following data:

- Manufacturer's name (incl. logo) and address
- Type, size and marking code of the BLOCK
- BLOCK serial number
- Order number (serial number)/year of production
- Weight

Despatch

Each built-in assembly is marked with a type (name) plate situated on the service panel side. The name plate includes the technical parameters of the given built-in assembly. The user must ensure that every marking on the unit components will be readable and intact for the whole service life of the unit. If damaged, especially if safety is concerned, the marking must be repaired immediately.

Information and safety labels

AeroMaster CIRRUS air-handling units, respectively individual sections, are also labelled with information labels indicating equipment operation, wiring diagrams, energy media inlets and outlets and logos of the manufacturer.



The "Other Danger" warning label situated on the face side of the service door indicates the hazard of catching by movable parts.

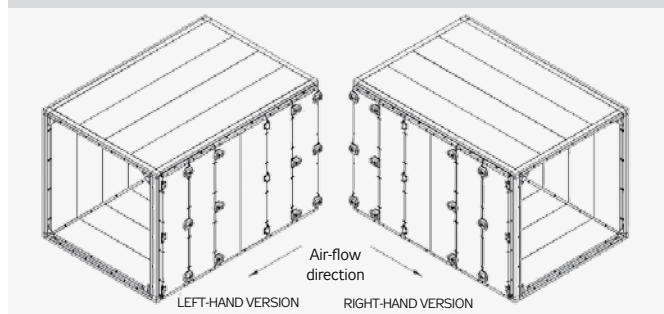


The service panels covering electrical equipment are labelled with a "Warning – Danger of Electric Shock" warning label.

Side Variability of Unit Connections

Connection side is always determined by the air-flow direction:

Figure 1 – side variability of unit connections



Delivery Contents

The following items are enclosed with every delivery of the air-handling unit:

- Accompanying technical documentation (Installation and Operating Instructions)
- Commercial and technical documentation, including air-handling unit assembly drawing
- Connecting material kit
- Installation kit
- Measuring & control components, respectively accessories in accordance with the bill of delivery

Transport and Storage

- Air-handling units with a base frame of standard height (85mm) are dispatched on a pallet or transportation prisms.
- Air-handling units equipped with a raised base frame (with supporting legs) are dispatched without additional handling means.

Packaging

As standard, the transport blocks of the Cirrus air-handling units are packed in PE foil and provided with cardboard and polystyrene protecting guards. The holes in the base frame can be used to lift the unit by a crane.

Transport and Handling of Components

Air-handling units are transported to the installation site either as transport-installation blocks or disassembled (for transport and handling of disassembled units, refer to the separate manual).

Loading, unloading and handling can be performed by a fork-lift truck, a manipulating carriage or a crane. If lifted by crane, spacer bars must be inserted between the lifting wires to protect the air-handling unit from being damaged. If air-handling unit blocks without a base frame are handled, fork-lift truck forks of a sufficient length must be used to overreach the full depth of the lifted block. If the air-handling unit block with a base frame is handled, forks of a sufficient length must be used to overreach both side beams of the base frame.

Figure 2 – Handling options

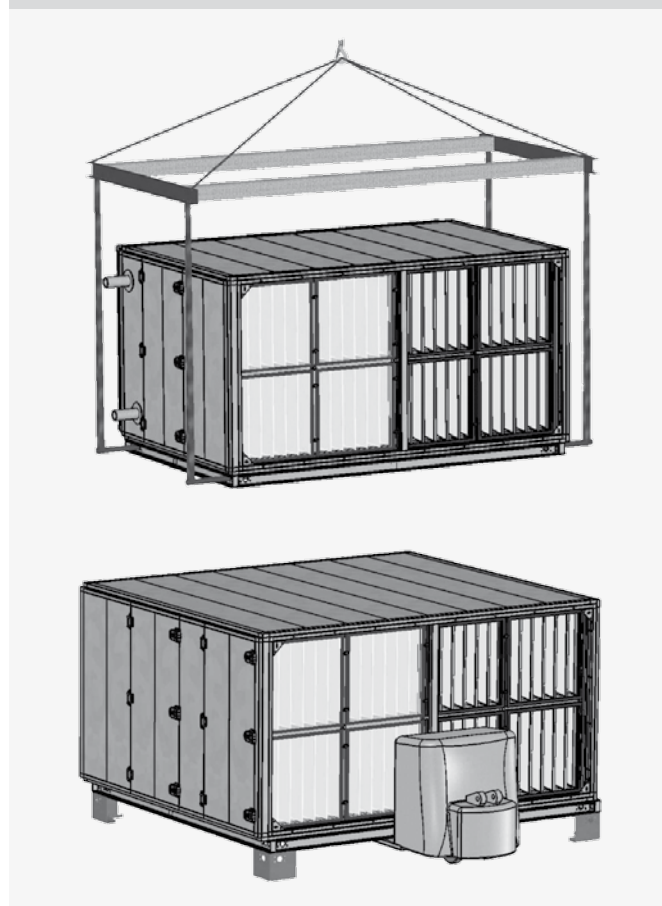
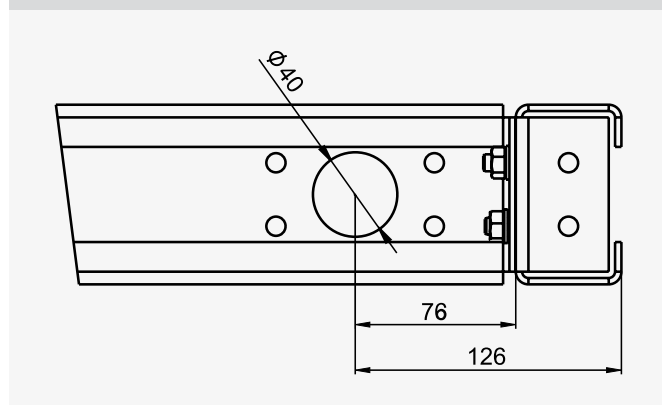


Figure 3 – Handling holes in base frame



AeroMaster Cirrus Air Handling Units

Installation

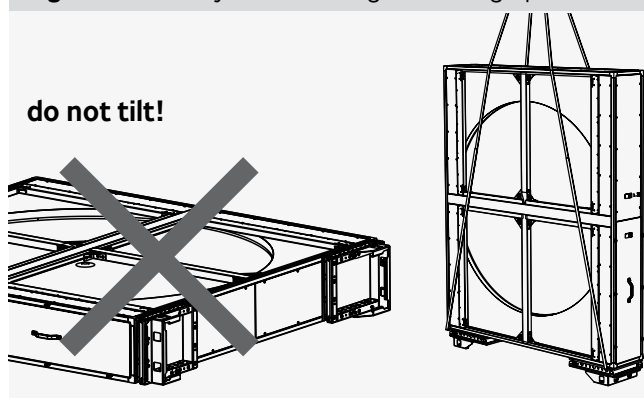
The air-handling unit blocks are packed in PE foil.

Warning: When transporting, respectively handling the air-handling unit blocks, it is necessary to pay increased attention to those parts (pipes, closure valves, etc.) projecting from the walls of the air-handling unit block. All blocks may only be transported in the same position in which they are operated!

Rotary Heat Exchanger Handling

Increased attention must be paid to the safety of persons as well as of the product when handling the rotary heat exchanger block, which due to its dimensions (tall and narrow), weight and high centre of gravity is very unstable. The manufacturer recommends always fixing the rotary heat exchanger in position by suitable roping if it is not assembled in the block assembly! The rotary heat exchanger can only be stored, transported or handled in the vertical position. Any tilting may damage the rotor flatness.

Figure 4 – Rotary heat exchanger handling options



Storage Conditions

As standard, the air-handling units are packed in PE foil. They must be stored in indoor rooms complying with the following conditions:

- Maximum relative air humidity must not exceed 85%.
- No moisture condensation.
- Ambient temperature must be in the range -20°C to +40°C.
- The air-handling units must be protected against penetration of dust and caustic vapours, or other chemical substances which could cause corrosion of the air-handling unit's structural components and equipment.
- The air-handling units must not be exposed to the direct effects of solar radiation.

AeroMaster Cirrus air-handling unit blocks may only be stored in the same position in which they are operated.

Prior to installation, the following must be checked

- Delivery completeness
- Delivery integrity
- Volubility of rotary components (fans, dampers, rotary heat exchanger)
- Parameters of the power supply and connected energy media sources

Any found fault must be removed before starting the installation.

Identification of Components

The association of blocks and built-in assemblies to the particular purchase order number is indicated on the name plate of each block and built-in assembly, i.e. device number. All blocks bearing the same device number create an air-handling unit. The manner of the blocks' assembly is apparent from the assembly drawing included in the accompanying technical documentation (respectively our offer) marked with the same order (device) number.

Air-Handling Unit Location

The surface of the site for the air-handling unit installation must be level and flat. Maximum misalignment of the floor or supporting structure intended for the air-handling unit installation must not exceed 1 mm per 1 meter. Observance of this condition is important for installation as well as for the air-handling unit operation. The air-handling unit equipped with an integrated base frame does not need any special anchoring. It is advisable to ground the air-handling unit with grooved rubber stripes.

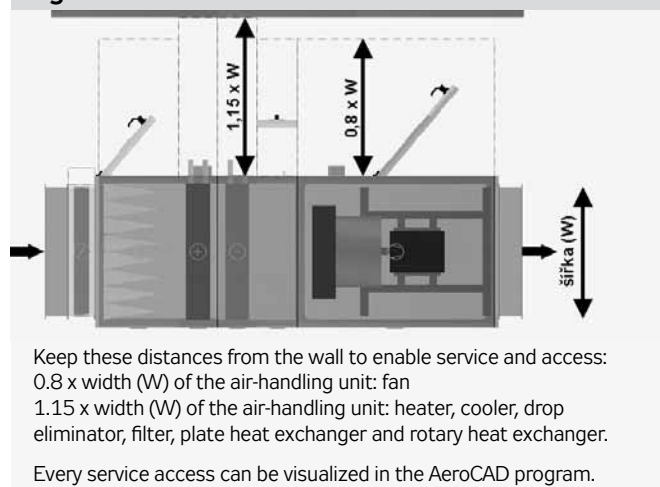
When installing the gas heater block, it is necessary to maintain safety distances from inflammable materials in accordance with national directives and standards of the state of installation (in the Czech Republic – ČSN 06 1008). No inflammable materials are allowed to be stored within the area of the gas heater block installation

Warning: The base frame or base frame and foundation height should respect the condensate drainage siphon height if not resolved in another way (e.g. embedding into the floor or installation on an additional base frame of the required height).

Service Access

When planning the air-handling unit location, it is necessary to keep sufficient space for maintenance, service and operating. The need for this space depends on the air-handling unit configuration, i.e. on the operational blocks used.

Figure 5 – service access



Particular distances for the CIRRUS air-handling units:

- Fan 0,8 x width*
- Heater, cooler, eliminator 1,15 x width*
- Filter 0,8 x width*
- Plate heat exchanger 1.15 x width*
- Rotary heat exchanger 0,8 x width*

* width of the built-in assembly

Assembly of unit blocks

Connection of Unit Blocks

The air-handling unit blocks can be assembled together by connecting their base frames and connecting the respective blocks.

Connection of Base Frames

Connection of base frames using M8x20 bolts. The bolts and other connecting materials are included in the installation kit

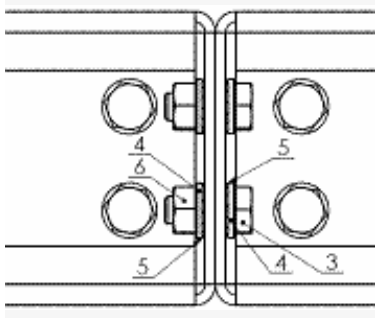
Connection of Individual Blocks

Paste the rubber sealing (19 x 4) onto the contact surfaces of the connecting frame.

Push the connected blocks against each other and screw the blocks together in the corners of the connecting frame using M8 x 40 bolts (see figure).

If the stacked arrangement of the air-handling unit blocks is used, an additional connection will be necessary - using the upper block's base frame.

Figure 6 – connection detail



Warning: When connecting the transport and handling blocks of the air-handling unit, do not remove the rear laminated walls - they are an integral part of the casing structure!

Figure 9 – Internal connection of blocks

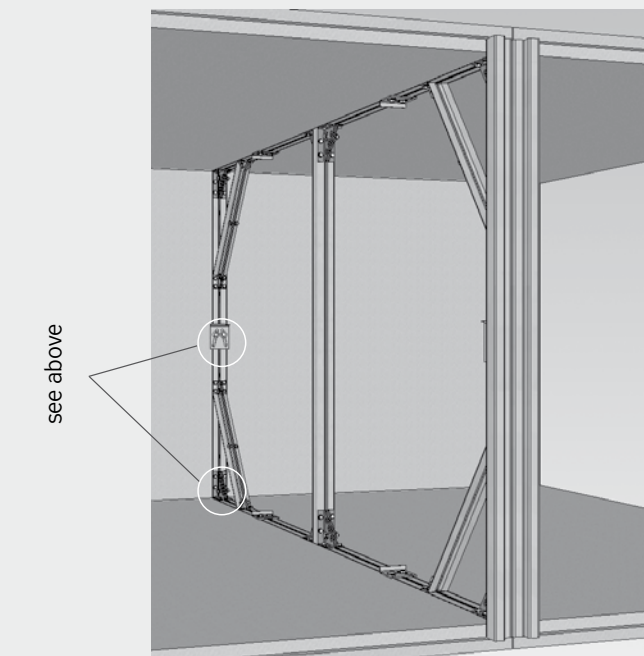
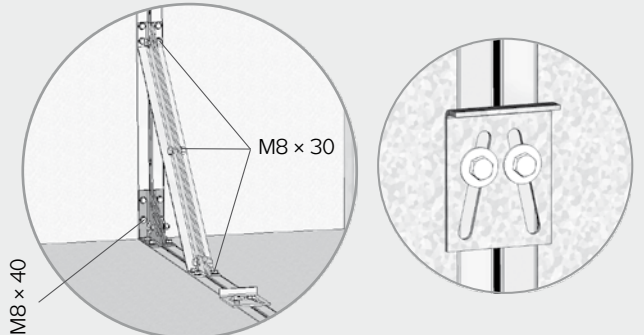
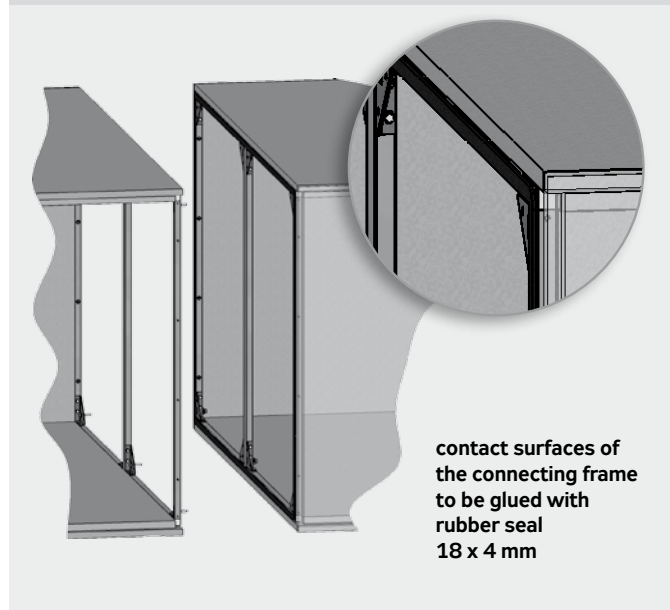


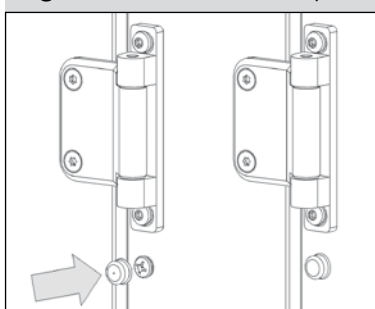
Figure 7 – Sealing between blocks



Screw Head Caps

After the air-handling unit blocks have been connected, the screw head caps have to be fitted on all the panels on the air-handling unit service side.

Figure 8 – Screw Head Caps



AeroMaster Cirrus Air Handling Units

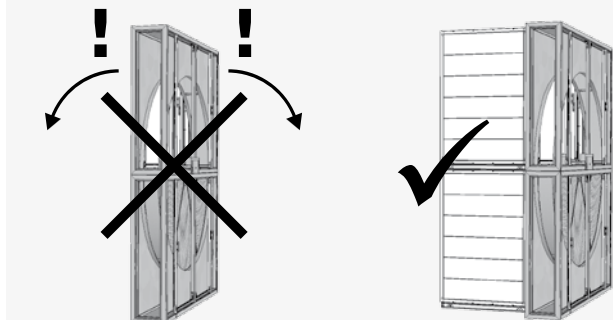
Rotary Heat Exchanger Block Alignment

Alignment procedure

Attention!

- Due to its dimensions, the rotary heat exchanger is very easy to roll over! Even the slightest impact or rocking can cause the exchanger to fall.
- Make sure the assembled heat exchanger is not left without being secured against fall.
To secure the heat exchanger, use fastening straps or connect the adjacent chambers to the exchanger.

Figure 10 – Exchanger securing and risk of falling



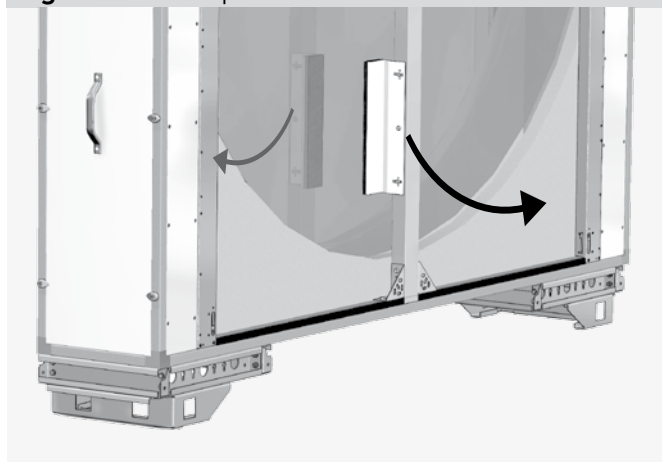
- The rotary heat exchanger can be transported using common transport means while the rotary heat exchanger must always be secured in the vertical position (i.e. the axis of rotation is in the horizontal position).

It is advisable to start with this (the heaviest) block when placing the assembly blocks in position. Immediately connect the rotary heat exchanger to the adjacent chamber to prevent it falling. Before connecting it to the adjacent chamber, place the seal on the connection frame (see figure # 7).

Warning:

- The rotary heat exchanger is equipped with a transport brake which secures the rotor against free movement during transport and handling. This brake must be removed!
- Depending on the air-handling unit base frame height

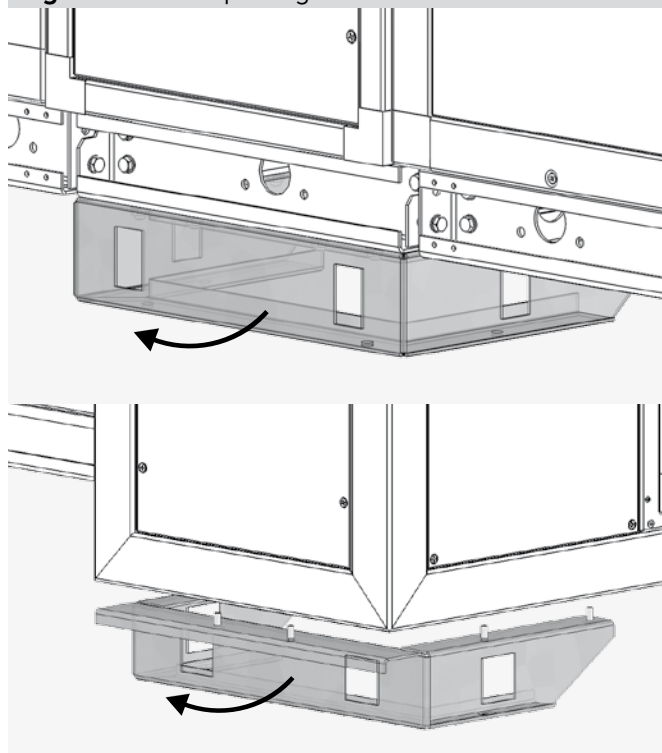
Figure 11 – Transport brake removal



and heat exchanger size, the heat exchanger can be equipped with transport legs to make its handling easier.

These legs must be removed before heat

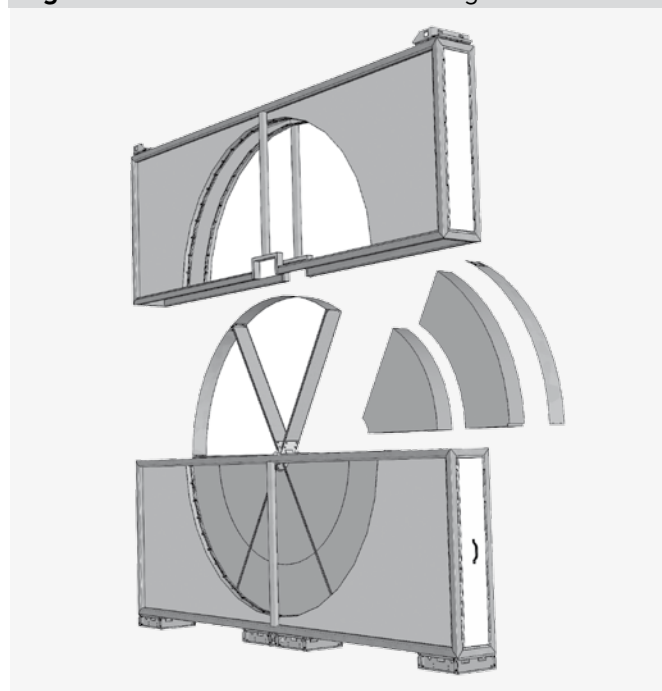
Figure 12 – Transport legs



exchanger alignment!

- Larger heat exchangers are transported disassembled. The delivery includes separated lower and upper half of the frame and segments of the rotor. Installation and commissioning of the device can only be performed by a professional installation company trained or authorized to carry out this work by the manufacturer.
- Every rotary heat exchanger is fitted with

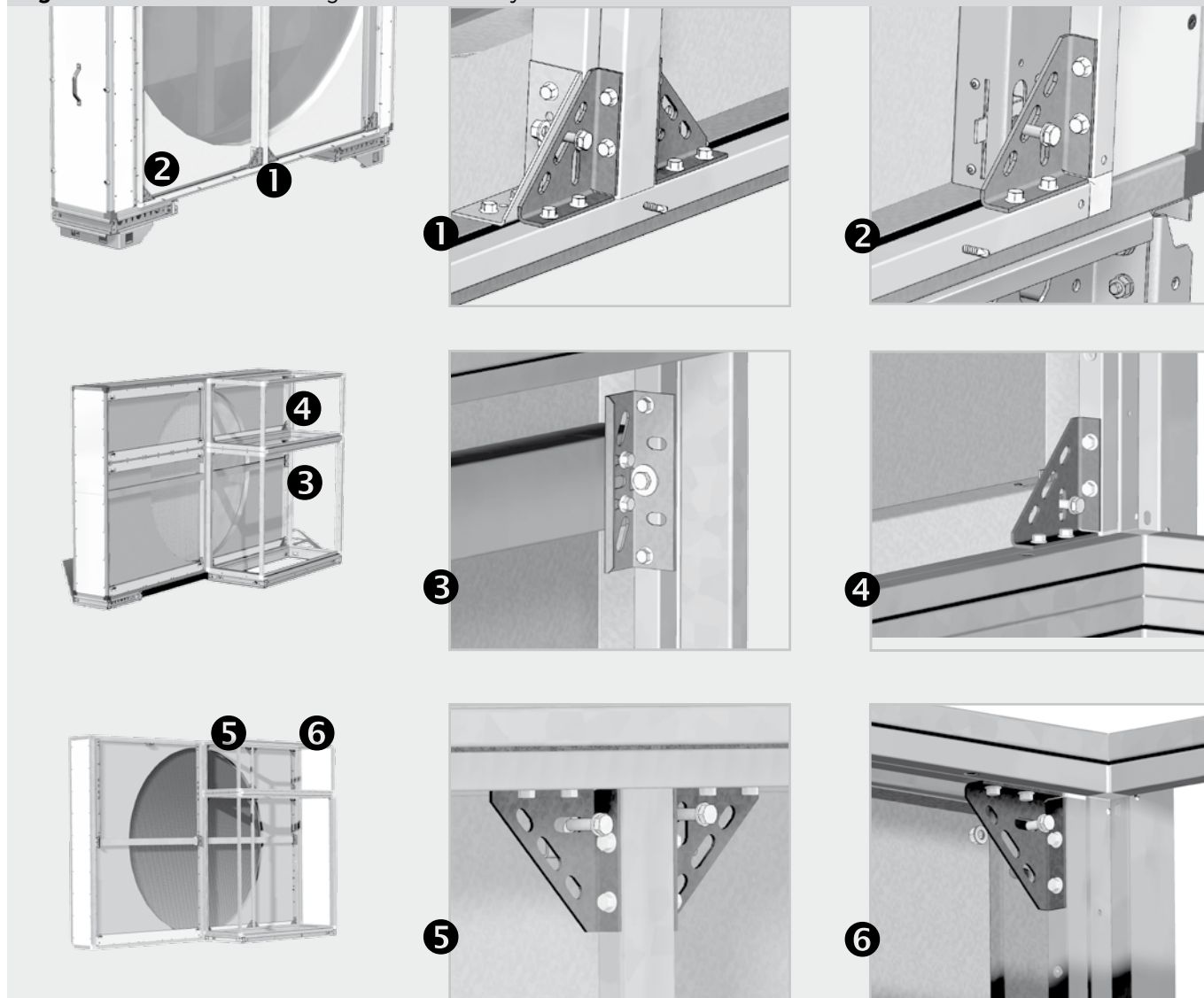
Figure 13 – Disassembled Heat exchanger



“THIS SIDE UP!” and “FRAGILE” labels

Rotary Heat Exchanger Block Alignment

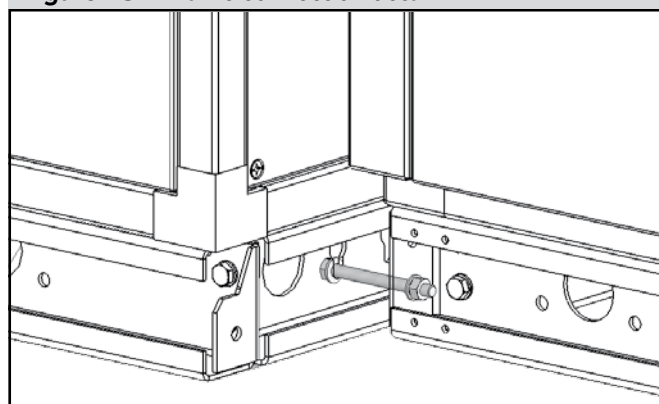
Figure 14 – of the heat exchanger to the assembly



Warning:

Poor and/or incorrect installation of the rotary heat exchanger block can result in costly repairs. It will result in rotor displacement, which will influence the tightness and service life of the assembly. Misalignment can be caused by improper handling during transport or failing to observe the conditions for correct installation. To check heat exchanger rotor fouling, it is necessary to perform regular monitoring of the heat exchanger rotor pressure loss. The heat exchanger rotor pressure loss must not exceed 15% of the pressure loss value measured on a new rotary heat exchanger. To enable regular servicing, maintenance, guarantee and post-guarantee service, it is necessary to provide a service access from both sides of the heat exchanger's rotor.

Figure 15 – Frame connection detail



AeroMaster Cirrus Air Handling Units

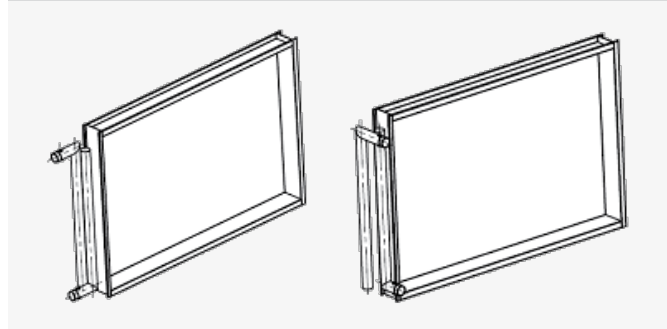
Connection of Heat Exchangers

Water and Glycol Heat Exchangers

The heat exchangers can be delivered in versions to be connected:

- a) through the fixed side panel of the air-handling unit b) into the inner cross-section:

Figure 16 – Heating and cooling media feed



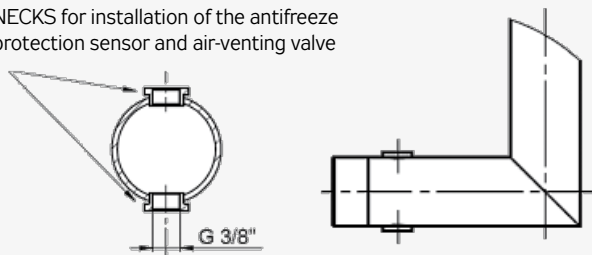
The corresponding connection points are marked with labels on the unit side panel (heating water inlet, heating water outlet, coolant inlet, coolant outlet).

The connection diameter corresponds with the heat exchanger and given type parameters, and it is specified in the air-handling unit documentation. Available dimensions are from G1" to G3".

The headers are equipped with G3/8" necks for the air-venting valve in the upper part of the heat exchanger; these necks also enable an antifreeze protection sensor to be installed (on the exchanger outlet header) or the heat exchanger to be drained.

Figure 17 – Anti-freeze protection sensor

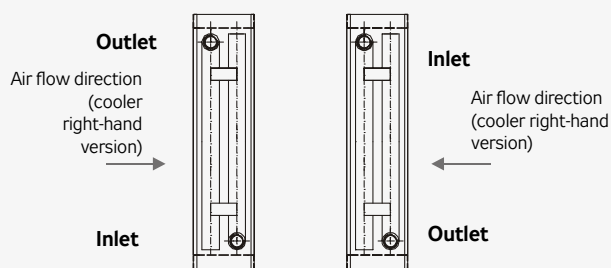
NECKS for installation of the antifreeze protection sensor and air-venting valve



Connection of Water Heat Exchangers

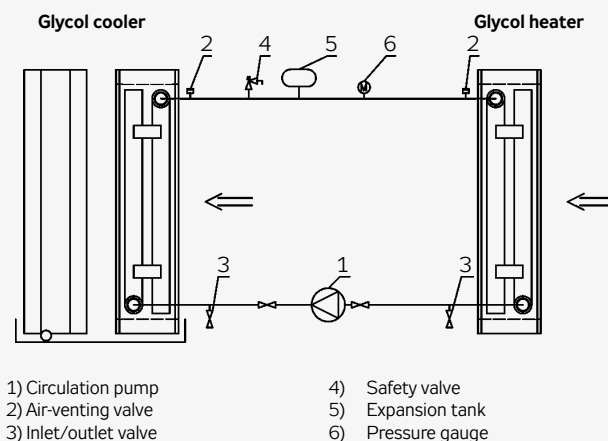
The counter-current connection of the heat exchangers is necessary to achieve maximum output. When connecting the feeding fittings to the heat exchangers, use two wrenches to tighten the screws to avoid wresting of the exchanger's headers.

Figure 18 – Heat exchanger connection



After connecting the water heat exchangers (heaters and coolers, including mixing sets) to the distribution piping, it is necessary to pressurize (fill with water) and vent the entire circuit, including the heat exchanger, and then to perform leak-tightness checks of all pipe joints and of the exchanger itself (including inspection of the water exchanger block interior). The manufacturer does not provide any guarantee covering any damage resulting from liquid leakage from leaky joints or damaged exchangers.

Figure 19 – Glycol circuit connection

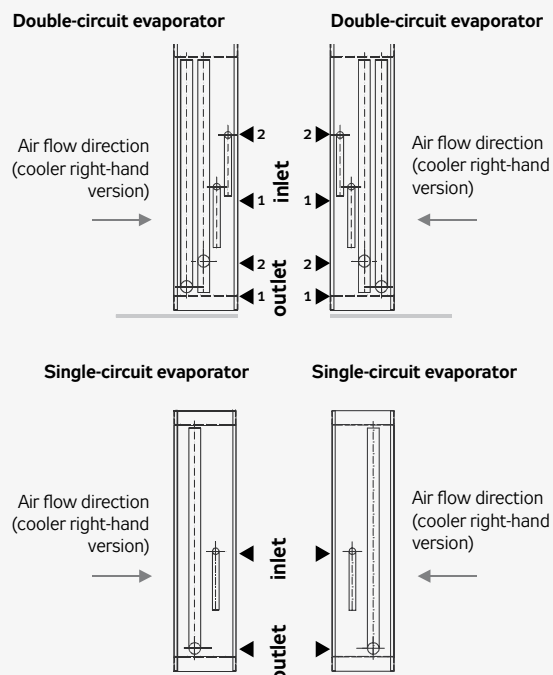


Direct Evaporators

Direct evaporators must be connected by a specialized contractor authorized to install refrigerating equipment. The direct evaporators can be delivered in versions to be connected through the fixed side panel of the air-handling unit or into the inner cross-section.

The direct evaporators are filled with nitrogen in the factory. They can be delivered in single or multiple-circuit versions.

Figure 20 – Connection of evaporators



Connection of Heat Exchangers

Water Connected Air-handling Component Installation

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

- A good water quality – e.g. salt and lime-free drinking water – increases the

lifetime and efficiency of the heat exchanger.

- Check the limiting values shown in the table annually to prevent damage to

the hydraulic system and its components.

- If necessary inhibitors must be added.

Note:

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

Description	Symbol	Values	Effects in vent of deviation	
Hydrogen ion concentration	pH	7,5 - 9	< 7 > 9	Corrosion Fouling
Calcium and magnesium content	Hardness (Ca/Mg)	4 – 8,5 °D	> 8,5	Fouling
Chloride ions	Cl ⁻	< 50 ppm		Corrosion
Carbon dioxide	Fe ³⁺	< 0,5 ppm		Corrosion
Iron ions	Mg ²⁺	< 0,05 ppm		Corrosion
Carbon dioxide	CO ₂	< 10 ppm		Corrosion
Hydrogen sulphate	H ₂ S	< 50 ppb		Corrosion
Oxygen	O ₂	< 0,1 ppm		Corrosion
Chlorine	Cl ₂	< 0,5 ppm		Corrosion
Ammonia	NH ₃	< 0,5 ppm		Corrosion
Ratio of carbons/ sulphates	HCO ₃ ²⁻ / SO ₄ ²⁻	>1	<1	Corrosion

1/1,78 °D = 1 °Fr, with 1°Fr = 10 g CaCO₃/m³

ppm = parts per million (mg/l)

ppm = parts per billion (µg/l)

AeroMaster Cirrus Air Handling Units

Connection of Heat Exchangers, Duct, Wiring

Steam Humidification

For a detailed description of installation, commissioning and prescribed inspections of the steam humidification built-in assembly, refer to the separate manual which is a part of the accompanying documentation of the AeroMaster Cirrus air-handling unit.

When installing the steam humidification assembly, observe the following recommendations:

- Air ducts leading through cold areas must be insulated to avoid condensation.
- The assembly must be situated in a non-freezing area.
- The steam generator can be noisy (switching of solenoid valves); therefore, it is advisable to install it away from quiet areas.
- 100°C hot and heavily mineralized water is drained from the steam humidifier.
- The following minimum distances (distances between the steam humidifier and the following air-handling unit components, where H represents the minimum evaporating distance calculated for the given conditions) must be observed to ensure proper operation of the steam humidifier and the entire AeroMaster Cirrus air-handling unit:
 - Humidistat piping, humidity sensor, temperature sensor: 5x H
 - Very fine filter: 2.5 x H
 - Heating elements, filter: 1.5 x H
 - Duct branch piece, duct elbow, air outlet, fan: 1x H

Note: If the H value is not known, it is advisable to make the calculation with a minimum value of 1.0 m.

Condensate Drainage

Cooling, plate heat exchanger and steam humidification blocks are equipped with stainless condensate draining trays which terminate in an outlet for the condensate draining kit connection. The diameter of the neck for Cirrus air-handling units is 32 mm. The condensate draining kits are available as optional accessories. A separate condensate draining kit must be used for each individual block.

The siphon height depends on the total pressure of the fan, and ensures its proper functioning. The type of condensate draining kit must be designed in the course of the air-handling unit calculation. The condensate draining piping must end in free atmosphere, i.e. it must not end directly in the closed sewerage system.

Before operating the air-handling unit or after being out of operation for a longer period, it is necessary to fill the siphon with water. The air-handling unit can also be equipped with a siphon with a disconnecting trap and a ball valve (only negative pressure blocks). This type of siphon need not be filled with water before putting it into operation. If there is a risk of freezing, it is necessary to insulate the siphon and condensate draining piping, respectively keep the ambient temperature above freezing point, e.g. with an electric heating cable!

The gas heater block is provided with a condensate drainage outlet (1/2" pipe) to drain the condensate from the combustion chamber.

Air-handling Duct Connection

The air ducting must be connected to the air-handling unit via an elastic element to avoid the transfer of vibrations and eliminate misalignment of the duct and inlet of the air-handling unit. The connection must be performed so that no loading from the air duct will be transferred to the inlet panel of the air-handling unit and no deformation of this panel will be possible. The accessories must be installed in accordance with the air-handling unit specification and the Installation Instructions of the manufacturers of such accessories.

No other structures must obstruct the unit inspection door opening, or unit operation and maintenance.

Electrical Equipment Wiring

- Connection of the internal electrical equipment of the air-handling unit can be made via the wiring grommets which are situated on the service side of the air-handling unit casing (the service side according to the designer's specification).
- All unused grommets must be blinded to maintain the degree of protection.
- The wiring and installation of the measuring & control system elements must be performed by qualified professionals authorized to perform wiring of the given type of devices. The wiring must be performed in accordance with the directives and standards of the country of installation, and in accordance with the Installation and Operating Instructions of individual pieces of equipment (frequency converters, pressure and temperature sensors, etc).
- Before putting the air-handling unit into operation, a wiring inspection must be performed.
- Conformity of the power supply voltage, frequency and protection with the data on the type plate of the connected block and cross-section of the connecting cables must be checked before connecting the electrical equipment to the power supply.
- The connecting cables must be long enough to allow free movement (e.g. when tightening the V-belts).
- Properly fix all cables and keep minimum bending radiuses.
- If additional grommets are to be installed, avoid installation of grommets and cables close to the doors, access panels and connections of the air-handling unit's blocks.
- The cables must never obstruct routine operation and servicing. Please respect the reserved servicing space.
- Screw connections and grommets must not cause air leakage.

Figure 21 – condensate drainage

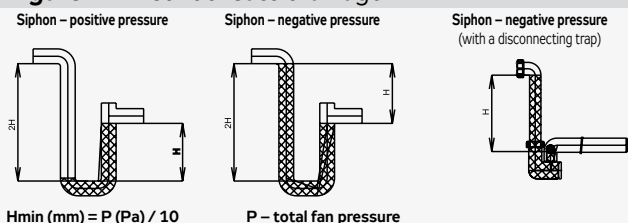


Figure 22 – cable wiring grommet design

The wiring grommet consists of a PG grommet, distance piece and sealing



Wiring

Wiring of Motors

To ensure correct operation of the air-handling unit, the motors must be connected so that they will rotate in the correct directions.

EC and PMBlue motors are equipped with electronics that monitors fault conditions, in the event of a fault, the fault is signalled by a fault contact. AC motors are equipped with thermistor protection or thermal contacts that protect the motor from damage. The protections must be connected in accordance with the prescribed wiring.

The fan built-in assembly can be equipped with a service switch. The service switch is delivered as an optional accessory separately, not installed on the unit. The service switch connection must be performed in accordance with the directives and standards of the country of installation, and in accordance with the Installation and Operating Instructions.

The service switch (supplied as optional accessory) on the device serves to disconnecting the fan from the power supply and from the voltage supplied to the thermocontacts.

This prevents the unintentional start and presence of voltage on the thermocontacts during maintenance.

The switch is not a main switch or an emergency stop switch.

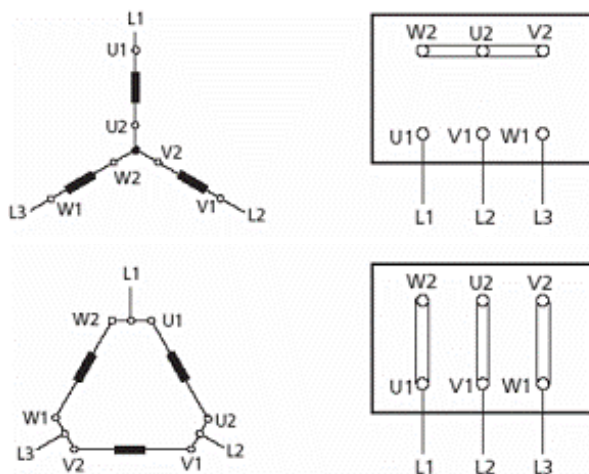
After re-activating the service switch, it is necessary to check the status of the STE, STD or STD protection relay respectively status of master control system and reset the thermocontacts fault caused by switching off the service switch.

Caution: Always unplug the appliance from the power supply when carrying out maintenance or repairs!

The fan assemblies of some dimensional ranges (74, 84, 94) are equipped with two independent fans. The fan motors must be connected separately. 2 frequency converters are delivered to control these fans.

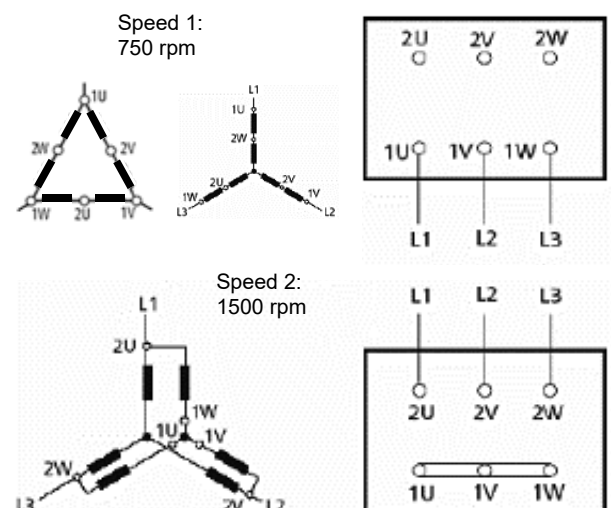
Single-Speed AC Motors – Wiring Diagrams

- Rated voltage and wiring for motors up to 3 kW, including: 230 VD / 400 VY
- Rated voltage and wiring for motors above 3 kW: 400 VD / 690 VY



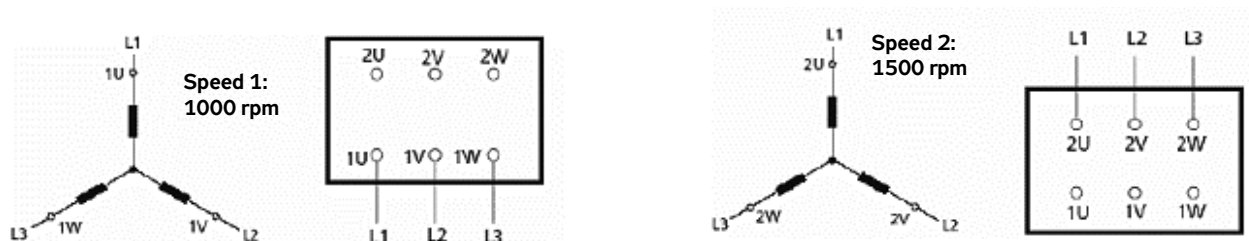
Two-Speed AC Motors – Wiring Diagrams

- 8/4 pole motors – Dahlander D/YY (or Y/YY – according to motors plate; output, respectively speed ratio 1:2)

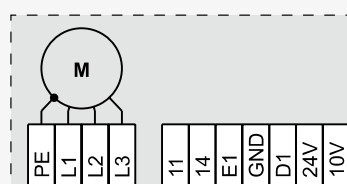


Two-Speed AC Motors – Wiring Diagrams

- 6/4 pole motors – two separate windings Y/Y (output, respectively speed ratio 2:3)

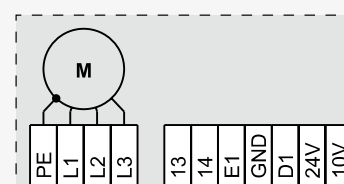


Three-phase EC motor



PE, L1, L2, L3
– power supply clamps of the triple-phase motor 3ph.-400V/50Hz
11, 14 – fan summary fault
E1 – analogue input 10 V DC
GND – ground
D1 – digital input (on/off)
24 V – 24 V DC voltage source
10 V – 10 V DC voltage source

Three-phase PMBlue motor



PE, L1, L2, L3
– power supply clamps of the triple-phase motor 3ph.-400V/50Hz
13, 14 – fan summary fault
E1 – analogue input 10 V DC
GND – ground
D1 – digital input (on/off)
24 V – 24 V DC voltage source
10 V – 10 V DC voltage source

Wiring

Electric Heaters

The electric heater connection must be performed following the instructions included in the enclosed documentation, the wiring diagram.

Rotary Heat Exchangers

The rotary heat exchanger is equipped with a single-speed motor. The connection must be performed following the chapter Wiring of Motors (see above).

Additional Electrical Equipment

Additional electrical equipment, which is not specified in this manual, must be connected in accordance with the applicable documentation, a wiring diagram, which is included in the equipment delivery.

Electromagnetic compatibility (EMC) of electrical installations with frequency converters

■ Frequency converters (hereinafter „FC“) are by their nature a significant source of interference to the mains and also the generated voltage for the powered electric motor is not a pure (single-frequency) sine wave. Basic interference suppression is usually implemented by frequency converter manufacturers, but electrical installations with frequency converters require special attention and professional installation to ensure trouble-free installation operation – meeting the requirements of technical regulations and standards for electrical compatibility of equipment (EMC interference), but also to avoid faults in electric motors of fan installations, event. even with the frequency converters themselves.

Motor damage during operation with FC can be caused by increased voltage stress on the winding insulation and by the occurrence of harmful bearing currents.

■ **It is always necessary to solve this issue with regard to the project and specific conditions, certain standard measures – general principles, it is always necessary to observe.**

FREQUENCY CONVERTER OUTPUT SIDE

■ Shielded power cables between motor and FC must always be used on the output side of the FC, the shielding must be grounded at both ends of the cable. For good RF current dissipation, grounding should be done in a large area (with 360 degree contact – EMC socket on the FC side and using a special EMC bushing in the motor terminal box). Also, any installed devices between the converter and the motor (eg. emergency switches, junction boxes) must also be shielded and grounded.

It is also advisable to always carry out the circuit of the thermo contacts from the FC to the motor using shielded cables

■ Also, the individual unshielded connection wires in the motor terminal box and in the controller must be as short as possible. In doing so, the distances between the leads, power and signal wires must be as large as possible.

■ It is advisable / recommended to limit the high voltage slope and voltage peaks that increase the stress of the motor winding insulation when operating with a frequency converter with output filter elements – a motor choke with the same clock as the switching frequency of the frequency converter or using appropriate output filters (dU/dt filter).

These help to form a waveform closer to the sine wave from the rectangular signal at the converter output.

By filtering the output current, it also has a very beneficial effect on reducing the radiation from the motor cable (eg. interference to acoustics). At the same time, they compensate – reduce the capacitive currents that additionally load the power part of the FC when using long cables (unless the FC is directly on the housing).

■ To eliminate (as far as possible reduce) the negative effects of not only the winding voltage stress but also the bearing currents on the motor bearings, we recommend using sinusoidal filters acting on all poles. These filters reduce voltage slopes and capacitive currents and replace the output (motor) chokes for even greater efficiency.

The sinusoidal filter is the most efficient output interference suppression device. Almost completely eliminates the disturbing effects of pulse width modulation, ie at the output of the sine wave filter, the voltage and output current have a substantially sinusoidal waveform.

When using sinusoidal filters acting on all poles (between all phases and to the neutral), it is not necessary to use electric supply to the motor via shielded cables (and EMC bushing) and the electromagnetic noise of the motor from higher harmonic currents is also reduced.

■ The line from the converter to the filter should be as short as possible (centimeters).

FREQUENCY CONVERTER INPUT SIDE

■ The control cables (MODBUS line or 0–10V signal) between the frequency converter and the control unit should always be shielded (see also wiring schemes for VCS control units).

■ External EMC filters or EMC filters must usually be used for increased EMC requirements (sensitive industrial, residential, commercial and light industrial environments). so called mains (commutating) chokes on the input side of the converter.

■ Mains reactors reduce the harmonic effect on the mains and extend the service life of the rectifier and, above all, the capacitors of the converter - which is why they are also highly recommended when connecting frequency converters close to large transformers to limit charging currents – reduces the inrush current when the converter is plugged in.

Commissioning

Safety Measures

- The blocks with built-in assemblies which can generate certain injury hazards (electric shock, rotating parts, etc.) and connection points (heating water inlets/outlets, air flow direction, etc.) are always labelled with warning or information labels.
- It is forbidden to start the fans of the air-handling unit if the panels are open or removed, or without fixed protecting guard covers. The hazard of trapping by movable parts is indicated by a label situated on the service door of the air-handling unit. Service doors must always be closed during air-handling unit operation.
- Before starting any work on the fan block, the main switch must always be turned off and secured to avoid accidental starting of the motor during service work on the fan block.
- When emptying the heat exchanger, the water temperature must be below +60 °C. The connecting piping of the heater must be insulated so its surface temperature will not exceed +60 °C.
- It is forbidden to remove the service panel of the electric heater if energized.
- It is forbidden to operate the electric heater without the outlet air temperature control and without ensuring a steady flow of transported air.
- Controlled run-down of the fans must be ensured upon gas heater burner shutdown to avoid the exchanger overheating, and simultaneously, the outlet air temperature behind the gas heater, respectively the ambient temperature of the burner, must not exceed 40 °C.
- After being set by an expert, the parameters of the gas heater block must stay unchanged to maintain safe and trouble-free operation.

Protection against Dangerous Contact with Non-Live Parts

The inner parts of the sections, which contain the electrical element, are conductively connected. Additional protective connection is not made on the unit. When installing the unit, consider the environmental requirements and the location of other electrical components around the unit. The frame of the unit structurally connects the individual sections to each other. If the sections are painted and are on top of each other, they are not conductively interconnected.

Inspection Prior to First Start-Up

The service panels are provided with hinges and external closures. The closure simultaneously serves as a handle. A special tool – a wrench - is needed to open/close the closure. This wrench is delivered with each fan section and can also be delivered as a spare part (code Z03410058).

Figure 23 – hinges and external closures



General Routines and Checks

- Check alignment of the air-handling unit.
- Check whether all components of the air-handling unit are installed and connected to the air distributing ducting.
- Check whether all cooling and heating circuits are connected, and whether energy media are available.
- Check whether all electrical appliances are connected.
- Check whether all condensate drainage kits are connected.
- Check whether all M&C components are installed and connected

Electrical Wiring

- Check the proper wiring of all individual electrical components of the air-handling unit according to the corresponding wiring diagrams

Filter Built-in Assemblies

- Check the condition of the filters.
- Check the mounting of the filters.
- Check the settings of differential pressure sensors

Water and Glycol Heater Built-in Assemblies

- Check the condition of the heat-exchange surface.
- Check the condition of the inlet and outlet piping.
- Check the condition of the mixing set.
- Check the condition, connection and installation of antifreeze protection components

Electric Heater Built-in Assembly

- Check the condition of the heating coils.
- Check the connection of the heating coils.
- Check the connection of the emergency and operating thermostats

Water and Glycol Cooler and Direct Evaporators Built-in Assemblies

- Check the condition of the heat-exchange surface.
- Check the condition of the inlet and outlet piping.
- Check the connection of the condensate drainage.
- Check the connection and elements of the cooling circuit.
- Check the drop eliminator condition

Plate Exchanger Block

- Check the condition of the exchanger vanes.
- Check the bypass damper functionality.
- Check the drop eliminator condition.
- Check the connection of the condensate drainage

Gas Heater Block

- Check the connection of the condensate drainage.
- Check the wiring and functionality of the sensors and thermostats.
- Check the gas burner connection.
- Check the air-venting of the gas distribution system.
- Check the gas-flue connection.
- Check the bypass damper functionality

Rotary Heat Exchanger Block

- Check the rotor and exchanger's frame alignment.
- Check the rotor for free rotation.
- Check the belt tension
- Check the sealing brushes for close fitting (a 1.0mm gap must remain between the rotor and sealing.)
- Check the motor for correct wiring.

AeroMaster Cirrus Air Handling Units

Commissioning, Service Regulations

Autonomous Rotary Heat Exchanger Washing System

- Installation and commissioning of this device may only be performed by a supplier or a specialized assembling company with the relevant expert qualifications.
- Do not activate this device prior to settings being implemented by an expert!
- If the washing system is not set according to the supplied instructions, the control unit will not have it under full control and the system can be damaged!

Fan Built-in Assembly

- Check the fan impeller for integrity and free rotation.
- Check the tightening of the Taper-Lock collets.
- Check the assembly screw connections for tightening.
- Check the protective covers for integrity and mounting.
- Check the fan impeller, inlet and outlet for cleanliness and foreign objects.

Extra checks for fans with a belt drive:

- Check the belt tension.
- Check pulley alignment.
- Check the V belts for integrity

Until the air-handling system is adjusted, the air-handling unit can only be put into operation when the regulating damper in the air-handling unit inlet is closed. Operating the air-handling unit while the air-handling system is misadjusted can cause motor overloading and permanent damage. If the second stage of filtering is included in the air-handling unit, it is advisable to run the testing operation with the second stage filter inserts removed.

Checks During First Start-Up

- Check the proper direction of the impeller rotation following the direction of the arrow on the impeller or fan casing.
- Check the proper direction of the rotary heat exchanger rotation following the direction of the arrow on the rotor (from the service panel side always upwards) and free rotation without dragging.
- Check the input current of connected equipment (it must not exceed the maximum permissible value stated on the rating plate).
- After 15 minutes of operation, stop the air-handling unit and check the temperature of the bearings and the tension of belts (belt-driven fans only). This check may only be performed if the fan is switched off!
- Check the water level in the condensate drainage kit siphon. If the water has been sucked off, it will be necessary to increase the height of the siphon.
- Check the mounting of the filters

During the testing operation, it is necessary to check the air-handling unit for unusual noises and excessive vibrations. The testing operation must last at least 30 minutes. After the test operation has finished, the air-handling unit must be inspected. Pay special attention to filters and check them for damage, as well as the fan block, check the belt tension, the tightening torques of threaded pins of Taper-Lock collets (refer to the Table of Taper-Lock collet tightening torques), and proper functioning of the condensate drainage kit.

If the unit vibrates too much, it is necessary to again check the fan assembly and perform vibration intensity measuring, if necessary. If the vibration intensity of the fan assembly with an overhung impeller exceeds 2.8 mm/s, measured at the motor bearing shield on the impeller side, the fan must be checked and balanced by professional staff. During the testing operation, it is necessary to adjust (regulate) the entire air-handling system.

Before putting the air-handling unit into permanent operation, it is recommended to replace or regenerate the filter inserts.

Service Regulations

- Before putting the air-handling device into permanent operation, the supplier (installing company) in collaboration with the designer must issue service regulations in accordance with local legal regulations. We recommend including the following in these service regulations:
 - Air-handling device assembly description, its intended use and a description of its activities in all operating modes.
 - Description of all safety and protective elements and their functions.
 - Health protection principles, safety and operating rules to be observed when operating the air-handling equipment.
 - Requirements for operating staff qualifications and training, a nomenclature list of personnel authorized to operate the air-handling device.
 - Detailed emergency and accident instructions to be followed by the operating staff.
 - Operating particularities during different climatic conditions (e.g. summer or winter operation).
 - Inspection, checking and maintenance schedule, including a list of checking steps, and their recording.
 - Records of operating staff training, operation, inspections and cleaning of the rotary heat exchanger (subject to guarantee validity)

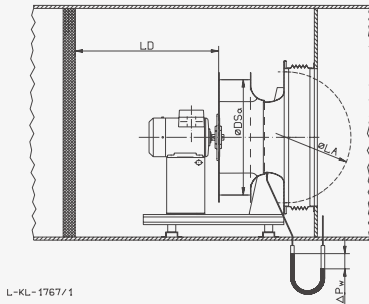
Warning:

- **If work on the air-handling unit requires door opening, the air-handling unit must be disconnected from the power supply, and measures preventing accidental start of the unit must be taken.**
- **It is forbidden to operate the air-handling unit with open service doors or dismantled service panels**

Air Flow Rate Determination for Fans with Overhung Impeller

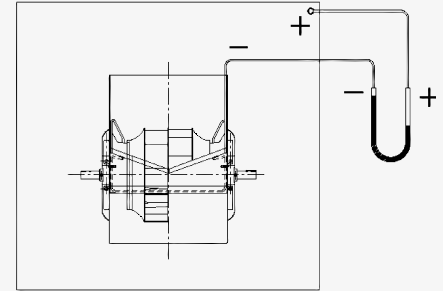
After the system has been installed and activated, it is possible to regulate the air flow through the unit equipped with a fan with overhung impeller using the simple method of measuring in the diffuser. This method eliminates to some extent errors in results determined by speed measurements in a wind tunnel, which are caused mainly by turbulent and non-linear air flow. For the diagram of the measurement determination of the difference in the static pressures in front of the inlet fan diffuser and in the fan diffuser, refer to figure 24. The air flow rate is related to the difference in static pressures in front of and in the fan with overhung impeller; refer to the measurement diagram.

Figure 24a



L-KL-1767/1

Figure 24b



Impeller type	Cpro	C	C	CATEX with suction grill
impeller material	plastic	steel	steel	steel
impeller color	blue	blue	black	black
impeller designation	k factor			
RH/GR/ER 25 C	–	47	–	–
RH/GR/ER 50 C	60	60	55	53
RH/GR/ER 28 C	75	75	69	66
RH/GR/ER 31 C	95	95	87	83
RH/GR/ER 35 C	121	121	111	106
RH/GR/ER 40 C	154	154	141	135
RH/GR/ER 45 C	197	197	181	173
RH/GR/ER 50 C	252	252	231	221
RH/GR/ER 56 C	308	308	284	271
RH/GR/ER 63 C	381	381	350	334
RH/GR/ER 71 C	–	490	450	429
RH/GR/ER 80 C	–	620	569	543
RH/GR/ER 90 C	–	789	724	691
RH/GR/ER 10 C	–	999	916	875
RH/GR/ER 11 C	–	1233	–	–

Impeller type	ZAbuefin
impeller material	steel
impeller color	blue
impeller designation	k factor
RH/GR/ER 71 I	530
RH/GR/ER 80 I	670
RH/GR/ER 90 I	850
RH/GR/ER 10 I	1050
RH/GR/ER 11 I	1250

qv – air flow rate

k – fan factor (provided by the fan manufacturer)

Δp_w – static pressure difference (measured value)

ρ_{op} – air density at operating temperature

Impeller type	k factor
ADH-E_0160	137
ADH-E_0180	178
ADH-E_0200	203
ADH-E_0225	246
ADH-E_0250	282
ADH-E_0280	353
ADH-E_0315	441
ADH-E_0355	504
ADH-E_0400	684
ADH-E_0450	811
ADH-E_0500	1090
ADH-E_0560	1283
ADH 630	1568
ADH 710	1776
ADH 800	2443
ADH 900	2939
ADH 1000	4182

Impeller type	k factor
RDH-E_0180	112
RDH-E_0200	64.8
RDH-E_0225	86.2
RDH-E_0250	123
RDH-E_0280	157
RDH-E_0315	207
RDH-E_0355	277
RDH-E_0400	379
RDH-E_0450	505
RDH-E_0500	634
RDH-E_0560	875
RDH 630	1091
RDH 710	1306
RDH 800	1571
RDH 900	1904
RDH 1000	2542
RDH 1120	3367
RDH 1250	4193
RDH 1400	5260

The (fan) air flow rate can be calculated according to the following relationship:

$$\dot{V} = k \cdot \sqrt{\Delta p_w} \cdot \rho_w$$

If the fan is operated at temperatures higher than 20°C, the air flow rate will be calculated using the following relationship:

$$\dot{V} = \sqrt{\frac{\rho_{20}}{\rho_{op}}} \cdot k_{20} \cdot \sqrt{\Delta p_w}$$

Operating Checks

Unit Operation Screening Checks

The operating staff's checking activities must be focused on the following:

- The air-handling unit operation and functioning, leak tightness of connections, inspection doors and service panels, temperature of energy media and transported air.
- The condition and operation of systems associated with the air-handling unit, whose proper functioning is needed for proper operation of the air-handling unit as well as for operation of the entire air-handling system.
- Wiring
- M & C system
- Water heater system – circuit, pump operation and water filters (also in SUMX)
- Cooling system
- Sanitary installation – condensate drainage
- Gas heater system

Regular Inspections

The user will determine the intervals for regular inspections of the air-handling unit according to the operating conditions, however, at least once every three months. Within the framework of the inspection, check the following:

Overall Check

- Clean all parts of the air-handling unit

Fan Inspection

- Check the fan operation (strange noises and excessive vibrations of the unit) and, if needed, balance the fan, refer to the section Unit First Start Inspection.
- Check the impeller for cleanliness.
- Check the tightening of the hub threaded pins.
- Check the impeller for integrity and free rotation.
- Check the assembly screw connections for tightening.

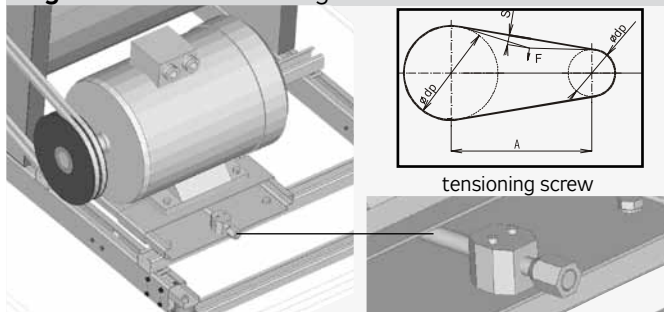
AeroMaster Cirrus Air Handling Units

Operating Checks

- Check the silent blocks for condition (damage).
- Check the fan assembly elastic sleeves.
- Check the motor and fan bearings in the fan case.
- Check the fan belts for wear (if necessary, all fan belts must be replaced).
- Check the tension of the fan belts (if used)

Turn the tensioning screw to set the proper belt tension. Excessive belt tension can cause overheating of the beatings and damage or overloading of the fan motor.

Figure 25 – belt tensioning



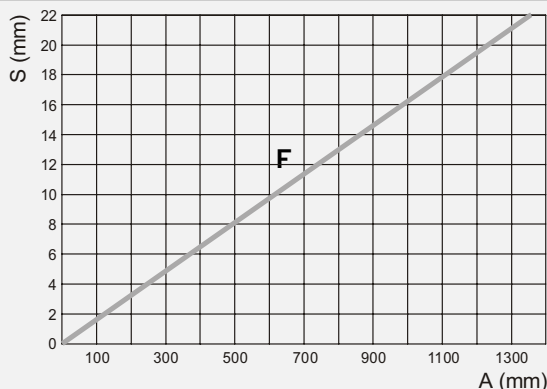
Too low a belt tension can cause belt slipping and premature wear. The following table indicates force "F" to measure the belt tension in relation to the smaller pulley type and diameter. The following chart shows the relationship between the belt slack "S" and the distance between the pulley axes "A".

Table 2 – Belt tensioning forces

Belt profile	Small pulley diameter	Recommended force to deflect the belt [N]*	
		min.	max.
SPA	mm		
	80–140	20	27
SPB	140–200	27	35
	112–224	35	50
	236–315	50	65

*The force needed to deflect the belt to achieve 16 mm belt slack at a distance between pulley axes of A = 1000 mm

Chart 1 – Belt slack „S” and pulley axes distance „A” relation



After replacing and tensioning the belts or pulleys, it is necessary to check the alignment of the pulleys (use a metal ruler).

Figure 26 – Pulley alignment

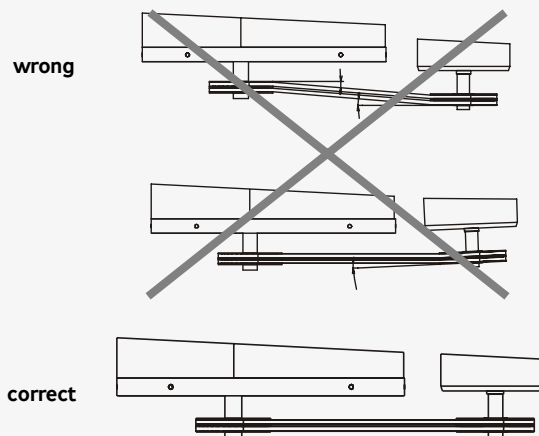


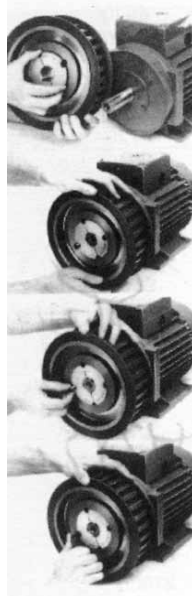
Table 3 – Tightening torques for metric screws

M4	M5	M6	M8	M10	M12
2,8 Nm	5,5 Nm	9,5 Nm	23 Nm	46 Nm	79 Nm

Taper Lock collets enable alignment of the pulleys.

Figure 27 – Taper Lock® collet

Assembly



Before collet and pulley assembly, carefully clean the inner collet opening and taper surface.

Insert the collet into the pulley hub so that the threaded openings will check with the openings without thread.

Tighten the fixing screws by hand.

Carefully clean the shaft, and place the pulley in the required position. Tighten the fixing screws alternately with the prescribed tightening torque.

Disassembly



Loosen the fixing screws, and insert one or two of them as force-off screws (according to the collet size) into the withdrawal openings. Knock slightly on the pulley. Keep tightening the force-off screws until the collet is released from the pulley.



Table 4 – Taper-Lock collet tightening torques

1008	1108	1210	1610	1615	2012	2517	3020	3030	Taper-Lock	3525	3535	4030	4040	4535	4545	5040	5050
5,6	5,6	20	20	20	30	50	90	90	Tightening torque (Nm)	115	115	170	170	190	190	270	270

Operating Checks

Maintenance and lubrication of ADH-RDH double-inlet fans equipped with a spiral fan casing and belt drive

All maintenance operations and lubrication must be performed using suitable tools and implements.

First check the bearings by listening to them. If the bearings are in good condition they will generate a slight and constant noise while defective bearings will generate a loud and irregular noise. A low metallic noise, which is caused by the standard allowances between components, especially at low speed, is normal. Excessive vibrations and increased temperature of bearings indicate a possible defect. It is also necessary to check the mounting of the fan bearings in their casings for integrity and also for excessive lubricant leakage. Moderate leakage of lubricant, especially during fan commissioning, is normal and has no negative influence on fan operation. Estimated mechanical service life of bearings installed in the ADH/RDH Nicotra fans is 40000 hours providing the fans were selected considering their operating limits, the environment and planned drive size.

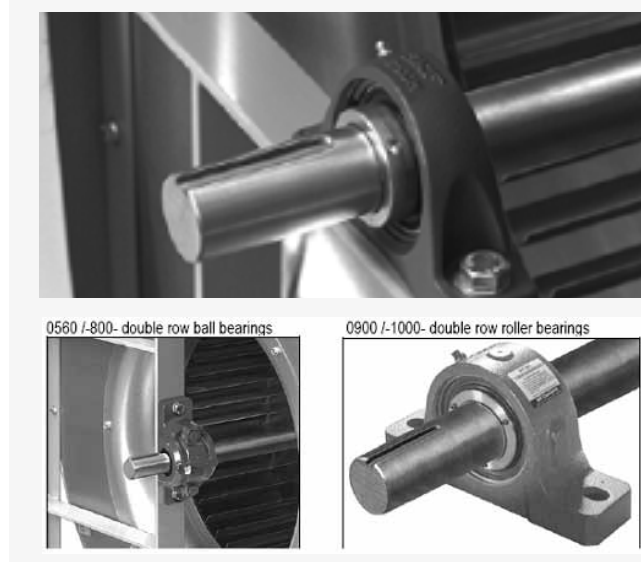
The service life of the bearing lubricant can be shorter than the service life of the bearings. Bearings mounted in rubber silent blocks or in casings without lubricating nipples are not intended to be additionally lubricated. Bearings equipped with lubricating nipples are used with fans intended for heavier duty operation and working conditions. Regular lubrication of the bearings is essential to reach the bearings' service life. Only bearings of ADH/RDH "K" and "K1, K2" fans need to be lubricated.

Lubricating Bearings

There are many factors influencing the lubricating interval of fan bearings - bearing type and size, working speed, ambient temperature, diameters of pulleys, installed input, type of lubricant and working environment. Therefore, information based only on statistics can be provided.

For normal operating conditions, it is recommended to lubricate the fan bearing at least once a year. If the operating temperature exceeds 50 °C, this time period must then be reduced by a half for each 15 °C above this threshold. For ADH/RDH K, K1 fans, it is necessary to refill the lubricant until it comes out.

Figure 28 – Lubricant types



For additional lubrication, we recommend for example the following lithium-type lubricants:

Manufacturer	Lubricant type
FINA	MARSON HTL 3
SHELL	ALVANIA FeH3
ESSO	BEACON 3
MOBIL	MOBILUX 3
SKF	LGMT2/S

Table 5 – recommended amount of lubricant

ADH/RDH	560	630	710-800	900-100
amount of lubricant	30g	30g	35g	15g

Inspection of dampers

- Check the dampers for cleanliness.
- Check the damper flaps for free rotation.
- Check the damper flaps for full closing.

Filter Inspection and Replacement

- Check the filters for condition and fouling (if fouled, the filter inserts must be replaced).
- The used filter inserts must be disposed of in an ecological way.
- Check the sealing for integrity.
- Check the mounting of filter walls and inserts.
- Check the settings of differential pressure sensors

Table 6 – Recommended final pressure loss

Filtration class/standard	Pressure loss
G3, G4	150 Pa
M5, M6, F7	200 Pa
F8–F9	300 Pa

Table 7 – Max. (designed) pressure loss

Filtration class/Filter	Bag (CRVFAyy)	Compact (CRVFByy)	Frame (CRVFCyy)	Insert (CRVFDyy)	Metal (CRVFEyy)	Grease (CRVFFyy)
G3, G4	250 Pa		300 Pa	300 Pa	150 Pa	150 Pa
M5	400 Pa	-	300 Pa	-	-	-
M6–F9	400 Pa	450 Pa	-			
Spare kit (code)	CRNA0-yyxx	CRNB0-yyxx	CRNC0-yyxx	CRND0-yy03	CRNE0-yy03	CRNF0-yy03

xx ... filtration class, yy ... AeroMaster Cirrus unit size

AeroMaster Cirrus Air Handling Units

Operating Checks

Table 8 – Dimensions and numbers of filter inserts*

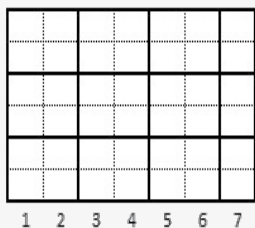
Modules		A	E	Filter inserts – number	
Width	Height	Inner Width mm	Inner Height mm	592 x 592	287 x 592
6	4	1893	1227	6	-
7	4	2199		6	2
8	4	2505		8	-
9	4	2811		8	2
4	6	1281	1839	6	-
5	6	1587		6	3
6	6	1893		9	-
7	6	2199		9	3
8	6	2505		12	-
9	6	2811		12	3
6	8	1893	2450	12	-
7	8	2199		12	4
8	8	2505		16	-
9	8	2811		16	4

Filter inserts sized 592x592 mm (supporting frame 610x610 mm) are used; with odd air-handling unit module widths, the half filter insert (supporting frame 305x610 mm) is added.

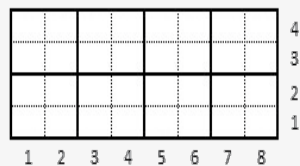
*(The air-handling unit cross-section range is marked by modules – module 306 mm.)

Figure 29 – Filtering wall arrangement examples

air-handling unit cross-section range 7x6



air-handling unit cross-section range 8x4



Different types of filter mounting are used depending on the filter type and filtration class. When replacing filter inserts, always check the condition of the sealing; if damaged, replace the sealing with a new one. When checking or replacing the filters, observe the following procedures:

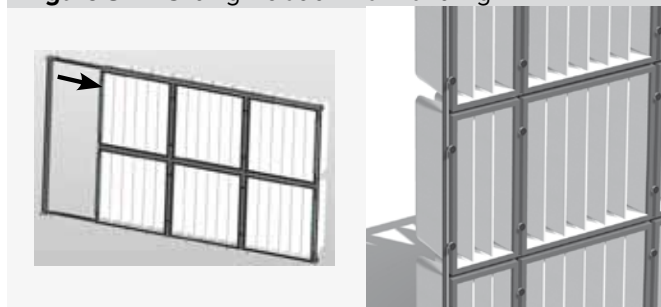
1) The frame and insert (G3) filter inserts are inserted into the guiding rails. The individual inserts are interconnected using the clips so all inserts can be removed together. Before the filtration walls can be removed, the front pressure element must be removed.

Figure 30 – Mounting of insert and frame filters



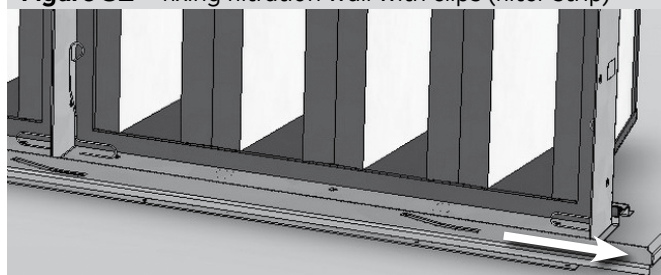
2) Bag, compact and metal filter inserts are fitted in separate fields of the filtering wall. The filters are replaced from the "dirty" (pressure) side. To change the filter insert, unscrew the locking closures and replace the inset with a new one. Before inserting the new filter inserts, check the sealing. Check the filter insert centring in the frame field before tightening the locking closures.

Figure 31 – Sliding filtration wall handling



3) In some cases, the filter inserts are fitted into the filtration walls created from mounting frames. The filters are fixed to these frames using the clips situated in the mounting frame corners.

Figure 32 – fixing filtration wall with clips (filter strip)



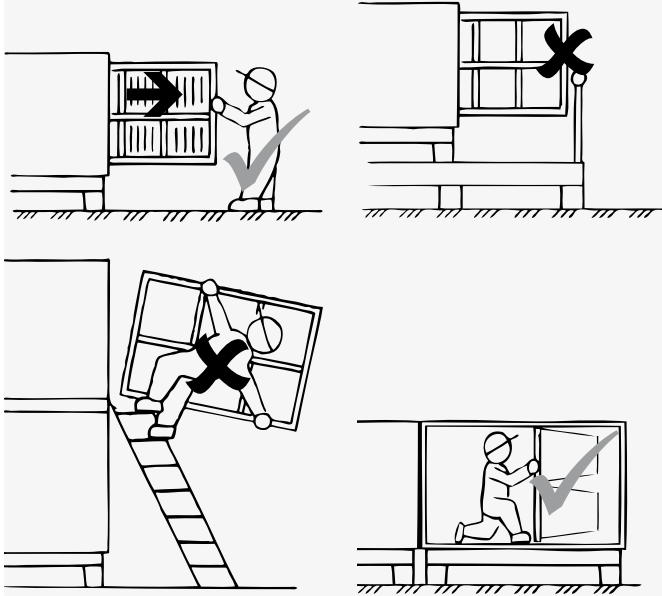
Depending on the space arrangement, the wall can be designed as a sliding or fixed (non-sliding) wall with access to inside the unit.

In some cases, the filtration wall can be designed as a sliding wall (the wall can be slid out towards the unit's service side). Special safety precautions must be applied when handling the filtration wall. We recommend the filtration wall to be pushed out from the unit in steps so that the accessible filter inserts can be gradually removed. New filter inserts are installed in the reversed order of steps. Due to its size and weight, never handle the filtration wall completely fitted with filter inserts outside the air handling unit.

Replacement filter inserts can only be ordered as a complete kit. When placing an order, use the code from Table 7 and follow the instructions in the chapter Spare Parts.

Operating Checks

Figure 33 – Sliding filtration wall handling



Active Carbon Filter Cartridge Check

- There is no pressure loss change in the active carbon filter cartridge due to fouling.
- The most effective way to check the saturation of filter cartridges is by weighing them. After reaching their maximum capacity, i.e. their net weight has increased by about 20% to 50 % (depending on the type of carbon and filtered gas; ask the manufacturer for precise information), the carbon cartridge must be reactivated. If this limit is exceeded, the filtering efficiency will be diminished. The total weight of the clean standard, 450 mm long, active carbon filter cartridge is 2,500 g, the weight of the filling is 2,000 g (max. recommended increase in weight is 400 to 1,000 g).
- The carbon cartridge is reactivated as a whole. It is advisable to possess a spare set of filter cartridges.
- Subsequent intervals of cartridge replacement can be scheduled on the basis of the above-mentioned checking measurements.

Checking the Exchangers (Heaters, Coolers)

- Clean the dirty heat exchange surfaces using a vacuum cleaner or hot-water cleaning machine.
- Be very careful when cleaning the exchanger's vanes to avoid mechanical damage.
- It is important to check the air-venting of the exchangers.
- Permanently check the functionality of the condensate draining system (coolers).

Important: If taking the exchanger out of operation during the winter season, the water must be completely drained from the exchanger, and possible water residuals must be removed, e.g. by blowing out the exchanger with pressurised air; or the exchanger must be filled with a safe antifreeze solution of water and glycol.

- Water residuals can freeze in the exchanger and damage the copper pipes.

Steam Generator Check

- All prescribed checks are included in the Installation Instructions attached to the steam generator. Please follow these instructions, Especially in the first hours of operation: Check the water conductivity (min. 5 refills per water exchange cycle, sparking and max. current checking); check the cylinders for condition (water leakage) and operation; check the tightening of electrical connections.
- Every three months of operation: Check the steam generator operation (number of water refilling switchings per cycle) and the condition of the cylinders (water leakage, condition of electrodes and inner casing of the cylinder).
- Yearly or every 2500 service hours: Replace the boiling cylinders; check the condition and shape of hoses; check the sealing of the distributing tubes inside the chamber; check the tightening of electrical connections

Warning: Electrical equipment! The steam generator cylinder can be hot. In case of water leakage, the hazard of burning and/or electric shock exists! The intervals of inspections and service life of parts can vary depending on the water quality and operating conditions.

Checking the Electric Heater

- Check the heating coils for fouling; vacuum the heating coils if necessary.
- Check the functionality of the safety thermostats

Rotary Heat Exchanger Inspection

Rotary heat exchanger condition inspections must be performed regularly; checking the rotor for cleanliness is the most important part of these inspections. The user will determine the intervals for regular inspections according to the operating conditions, however, at least once every 3 months. At the same time, the user must perform the following checks:

- Check the functionality.
- Check the rotor for cleanliness.
- Check the sealing brushes for tightness.
- Check the rotor condition and tension of the driving belt.
- Check fouling of filters; inlet and outlet.
- Connection tightness

If fouled or damaged, the filters must be replaced with new ones immediately. If any fouling of the rotor is found, the user must ensure its expert cleaning. The rotary heat exchanger rotor can be cleaned by pressurized air, steam or pressurized water. Failure to perform maintenance can result in permanent damage to the rotary heat exchanger rotor and very expensive repairs.

With divided rotors, the manufacturer recommends the rotor perimeter casing be slightly tightened, including adjustment of the sealing elements, after 80 operating hours (the tightening must be performed all along the perimeter of the rotary heat exchanger so that it will not cause ovality of the rotor).

AeroMaster Cirrus Air Handling Units

Spare Parts and Service

Plate Heat Exchanger Inspection

- Check the plate heat exchanger for fouling.
- Check the functionality of the condensate drainage.
- Check the bypass and mixing damper flaps for free rotation.
- Check the damper flaps for full closing

Gas Heater Block Check

The gas heater inspection must be carried out once a year, including burner adjustment and flue gas measurement!

Verification Measurements

After completing the regular inspection of the air-handling unit, it is necessary to verify and record its actual performance parameters.

Overall check

Clean all parts of the air-handling unit:

- Min. 1x per year or more frequently, if needed (recommended cleaning solution – 10 parts of a dish washing cleaner, 45 parts of Isopropanol, 45 parts of water – pH 5–9, do not use cleaners containing active chlorine). Max. 50°C when steam cleaning equipment is used.
- When high-pressure cleaning equipment is used, there is a risk of paint damage, especially in the elbows
- Don't use brushes or similar abrasive tools and cleaners
- First, probe on a little surface area
- Use the same technique on the entire surface area to prevent differences in colour in some areas

Spare Parts and Service

Spare parts are not included in the air-handling unit delivery. If any spare parts are needed, they can be ordered from REMAK a.s. or the regional distributor. In your order, specify the unit serial or purchase order number, and the parts needed.

Spare Filter Inserts

A complete set of filter inserts can be ordered. Specification of the filter type (bag, compact, insert, or grease/metal filter), XP air-handling unit size and filtration class will do. There is no need to specify the types of individual filter inserts of the filter.

Active Carbon Cartridges

The active carbon cartridges are designed for a specific composition of filtered gases. The carbon cartridge is reactivated as a whole. Active carbon which contains toxic substances, radioactive impurities or PCB cannot be reactivated!

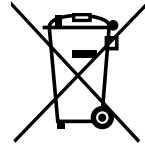
Service

Guarantee and regular servicing can be ordered from REMAK a.s. or the regional distributor.

The manufacturer can authorize trained service providers to perform this service; their list can be found at

www.remak.eu

Disposal and Recycling



Information for disposal in other countries outside EU

Observe the applicable local environmental protection and waste disposal regulations.

For users from EU countries

When disposing of components and materials, observe Directive No. 98/2008/EU and its subsidiary Directive No. 2012/19/EU, applicable national and local environmental protection and waste disposal regulations.

Installation of Covering Roof



When installing this, it is necessary to observe valid safety rules, standards and generally recognized technical rules.

All parts and connecting material needed for the installation are included in the air-handling unit delivery. Check the delivery completeness and intactness before starting the installation. Any found fault must be removed before starting the installation. The roof can only be installed once the air-handling unit has been aligned. There is no need for special tools to install the roof.

Warning: The roof must not be used as a catwalk. The roof must not be loaded with the weight of any components.

Stand-alone units or vertically arranged units

The roof system respects the air-handling unit's "lamellar" concept. The roof slope is created by bending it over the central roof girder.

Installation of Carrying Elements, Mouldings and Gutters

- Longitudinal parts are delivered in unified lengths of 1 m / 2 m / 3 m. Before installation, these parts must be cut to the required length using sheet-iron shears or a circular saw.
- First, install the roof girders using 6.3 x 19 mm self-tapping screws.
- Install the Frame covers and gutters using 6.5 x 19 mm roofing screws with rubber washers.

Figure 1

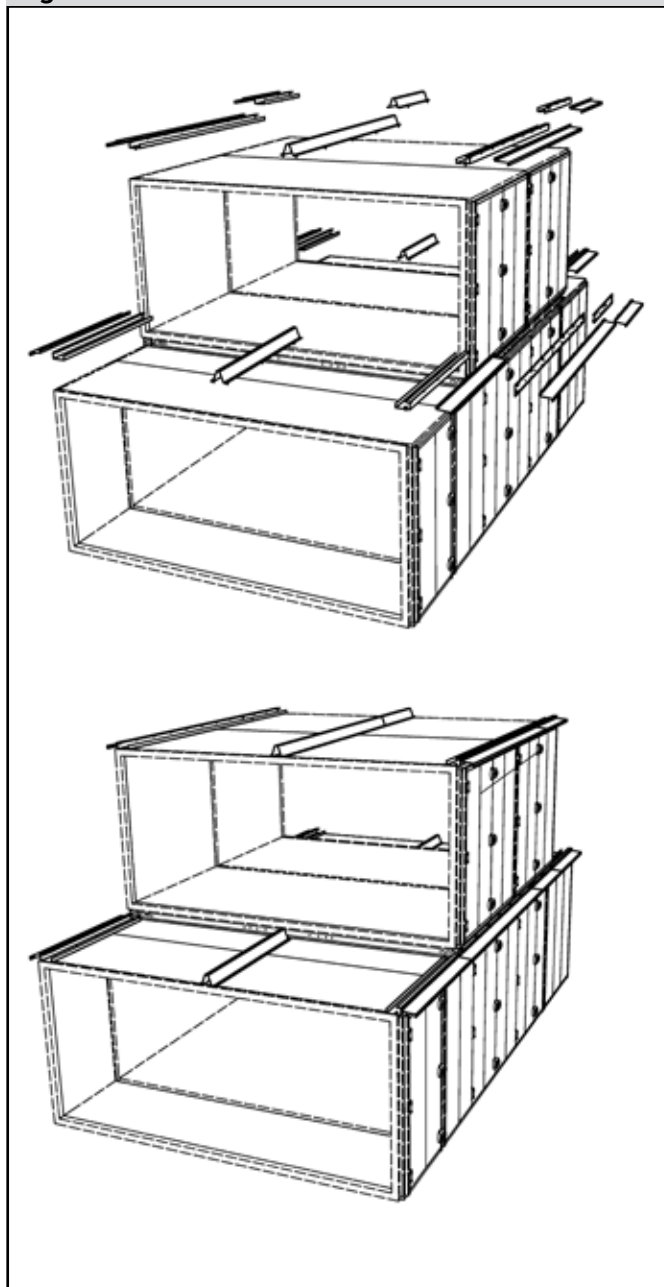


Figure 2

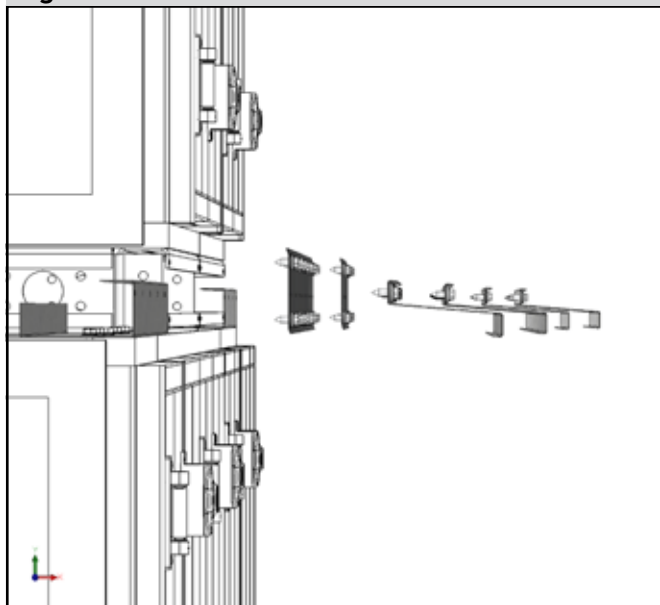
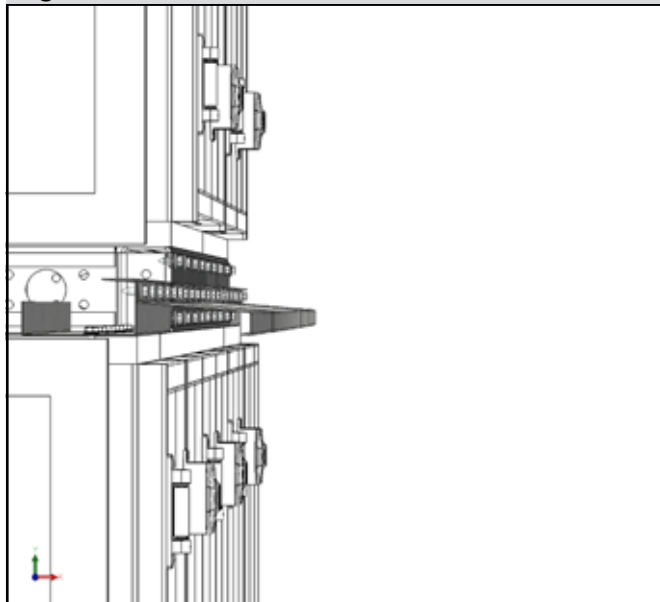


Figure 3



AeroMaster Cirrus Air Handling Units

Installation of Covering Roof

Figure 4

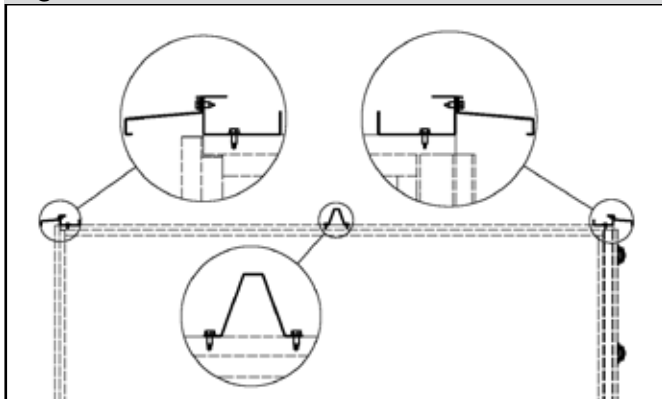


Figure 5



Installation of Roof Segments (bending)

- For the roof segment installation sequence, refer to the figure.

Figure 6

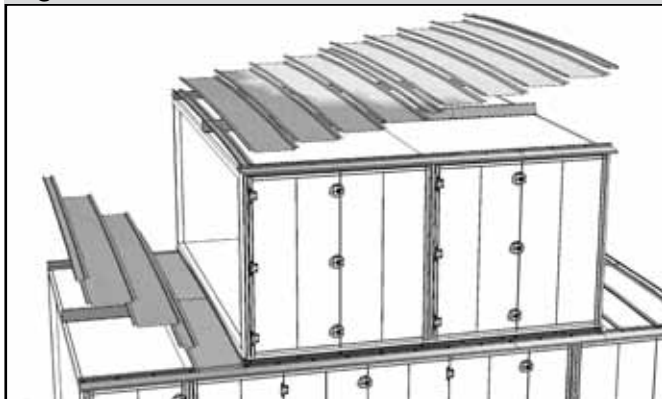
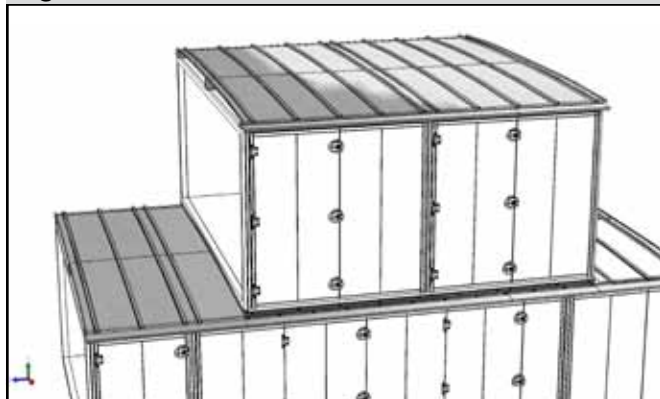


Figure 7



- The roof segmentation corresponds with the following:
 - a) module – modular length of the casing (module length = 306 mm)
 - b) termination - at the air-handling unit's front and end
 - c) transitions – block connection or vertical transition

Figure 8

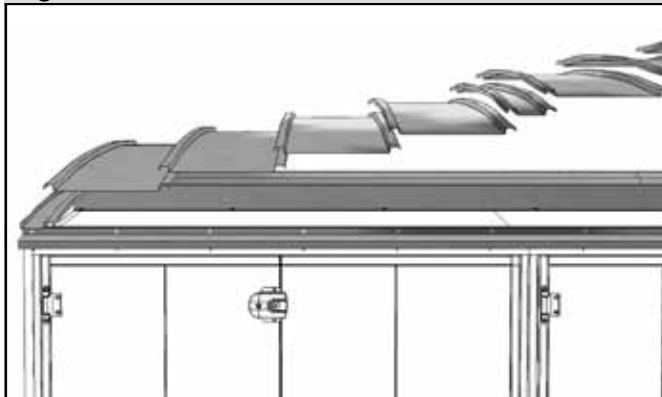
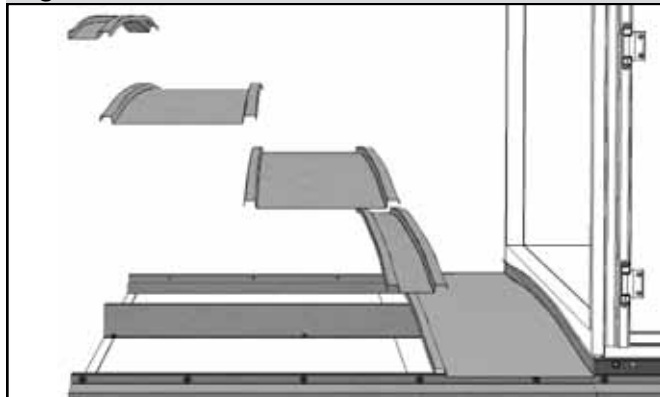


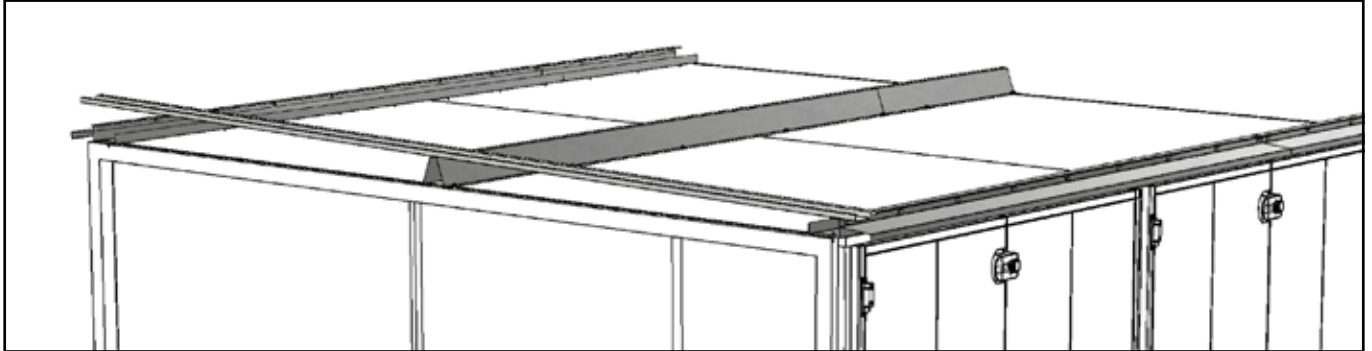
Figure 9



Installation of Covering Roof

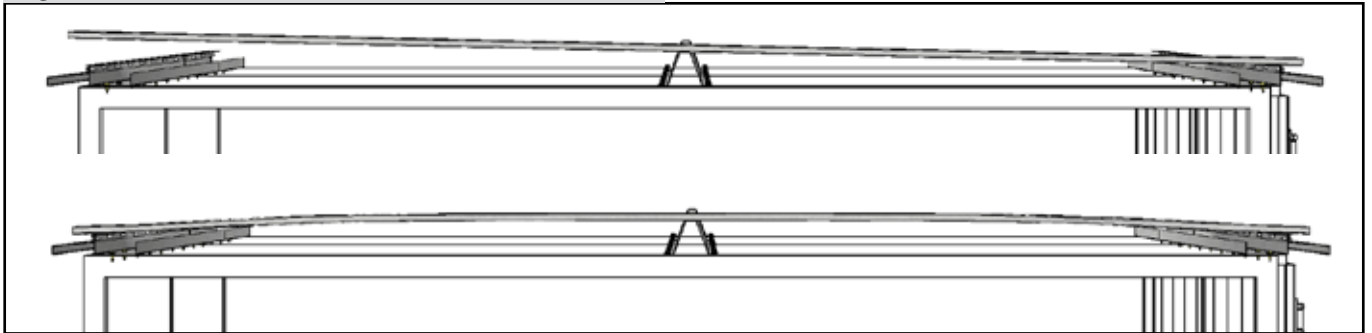
- Install the cross-members using 6.5 × 19mm roofing screws with rubber washers.
- Attach one side of the roof segments to the side roof girders and then in the centre to the central roof girder.

Figure 10



- Bending and attaching the other roof segment end creates the roof slope (bending) required for draining rainwater.

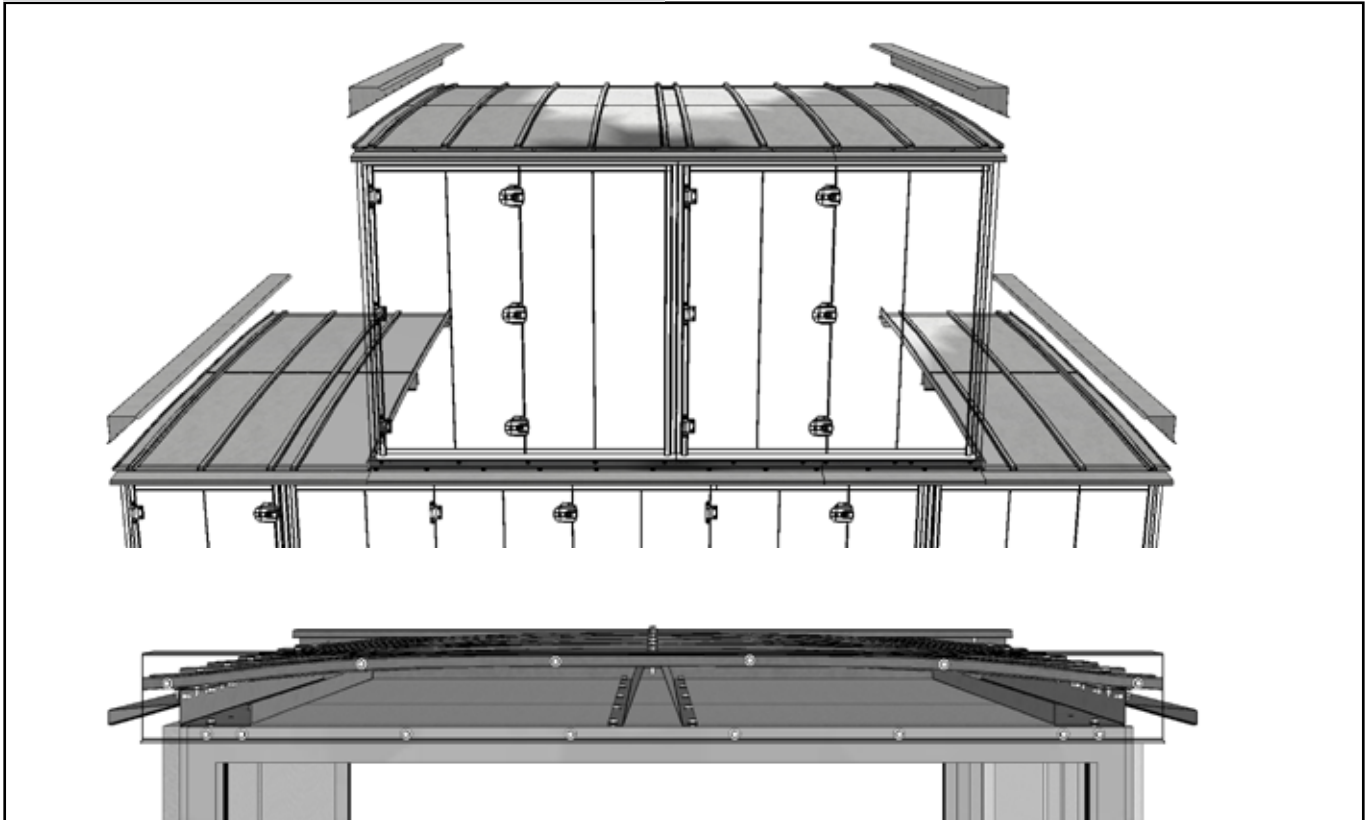
Figure 11



Installation of Terminal Elements (closure ends)

- Install the ends using 6.5 × 19 mm roofing screws with rubber washers.

Figure 12



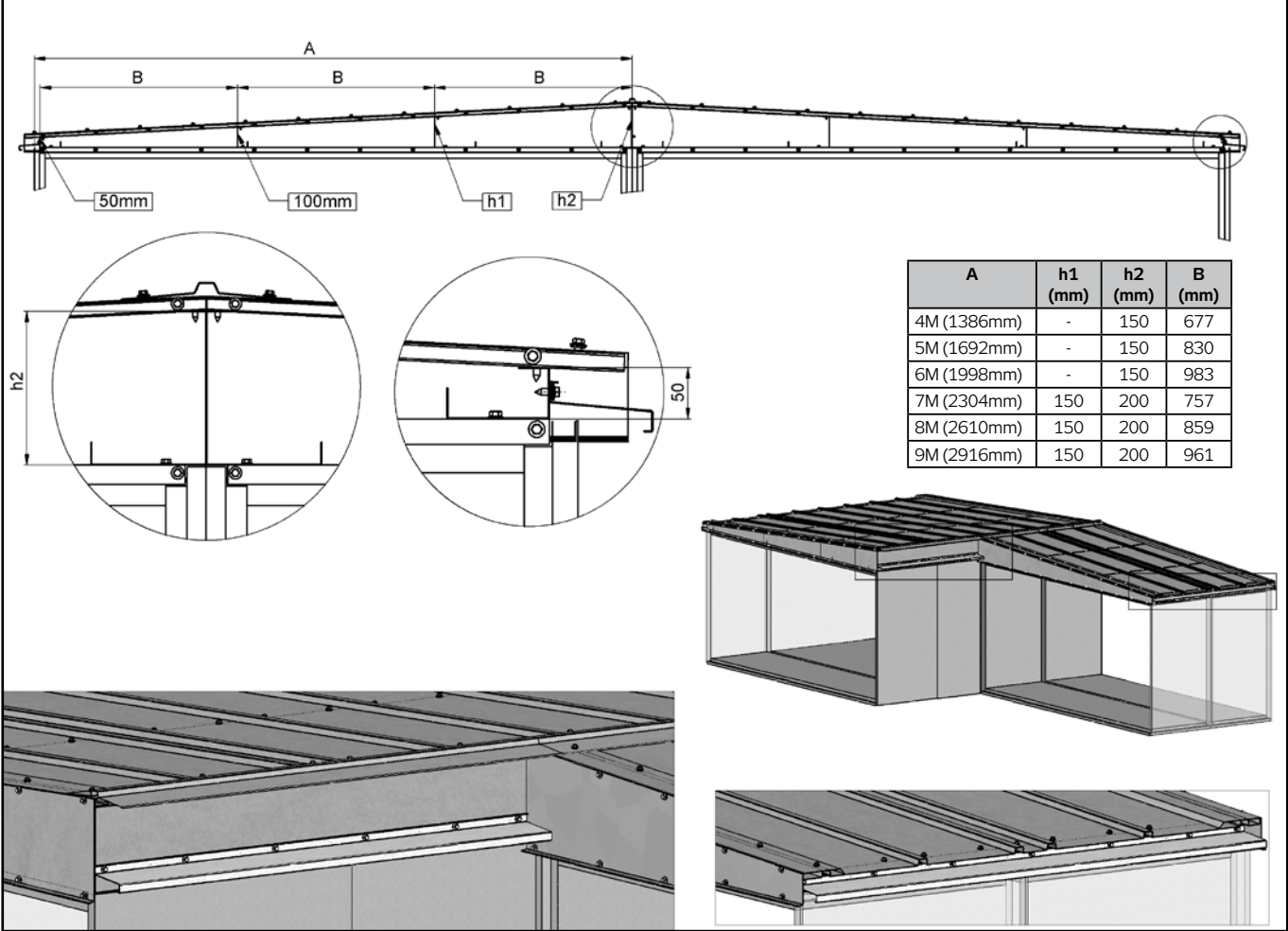
AeroMaster Cirrus Air Handling Units

Installation of Covering Roof

Horizontally Arranged Units

- The roof slope for draining rainwater is created in the same way as with normal sloped roofs.
- The roof girders are combined according to the air-handling unit width and the required height (h1/h2) and spacing (B)

Figure 13



Covers for Overlapping Components

- Install the covers using 6.5 × 19mm roofing screws with rubber washers.

Figure 14

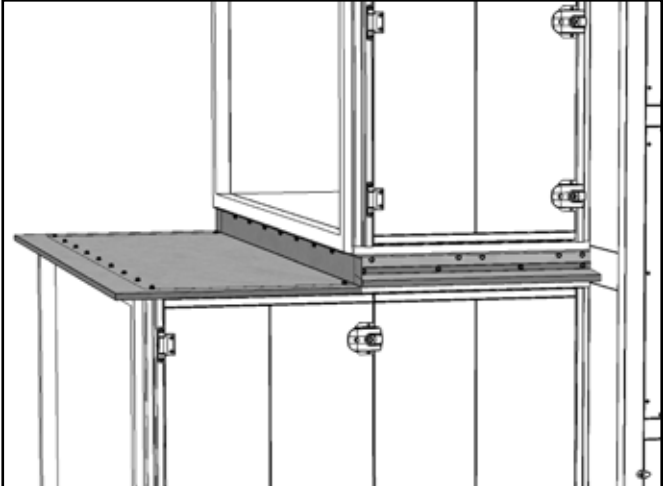
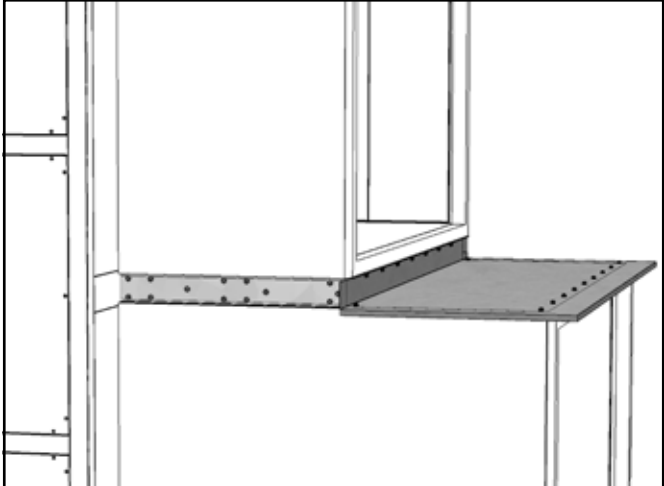


Figure 15



Installation of Covering Roof

- a) lower block off-set – lower to upper block off-set of 1 to 2 modules.
- b) heat exchanger – the part protruding over the air-handling unit ground contour is covered by a flat roof.

Figure 16

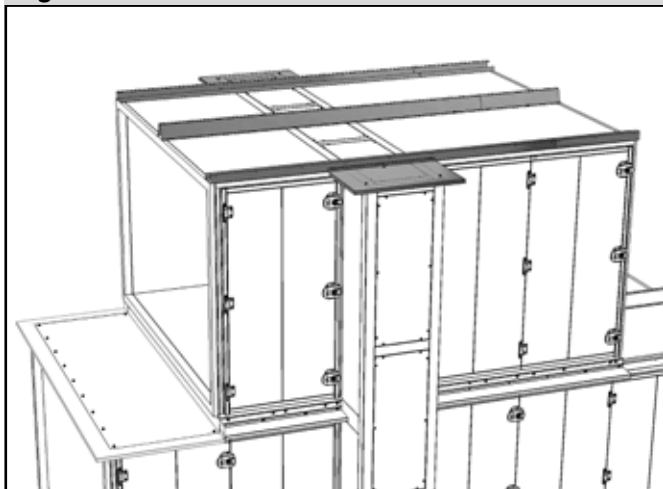
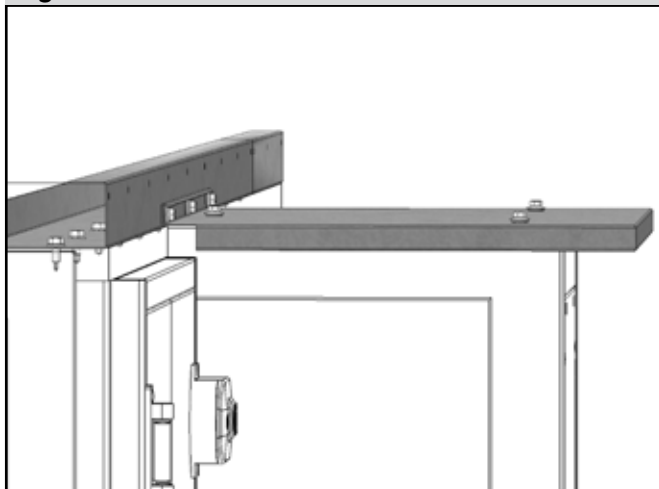


Figure 17



Vertical Outlet

- The roof slope must be interrupted at the outlet opening..

Figure 18

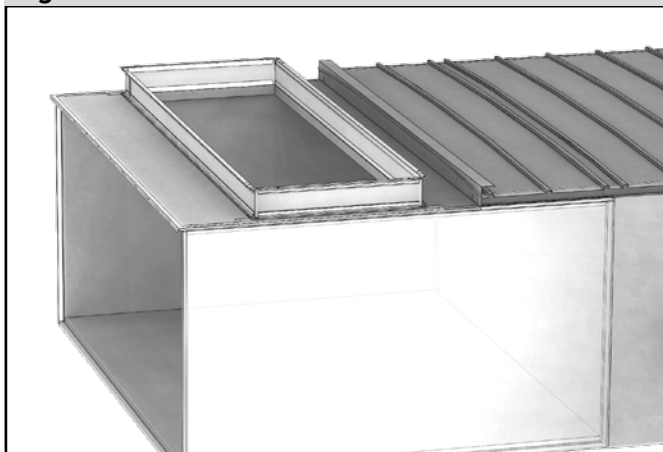
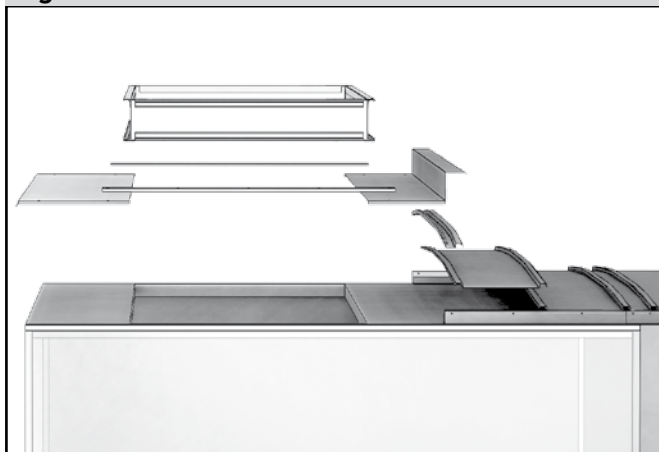


Figure 19



Gas Heating (chimney passage through the roof)

- For the flue-gas passage design, refer to figures 20 and 21.

Figure 20

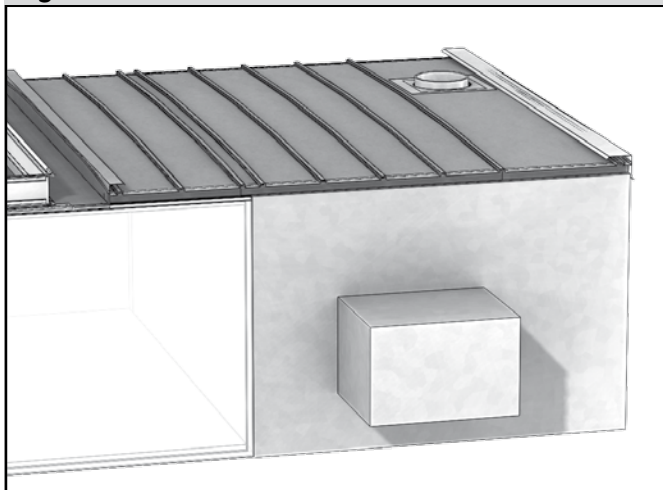
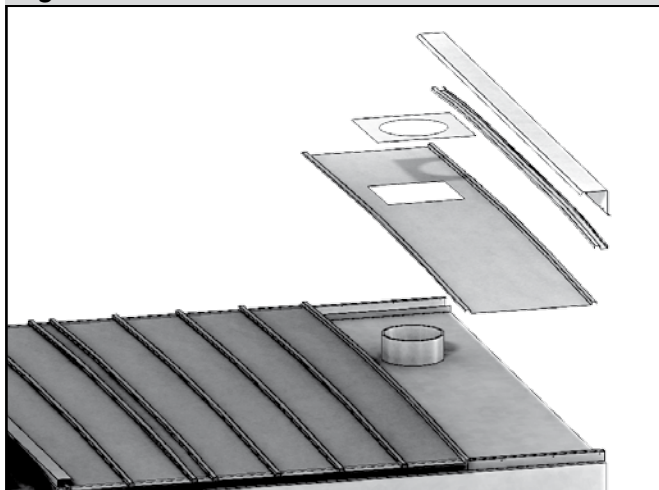


Figure 21



AeroMaster Cirrus Air Handling Units

Installation of Covering Roof

Rotary Heat Exchanger

- The rotary heat exchanger is higher than the air-handling unit, it will be covered with a flat roof.

Figure 22

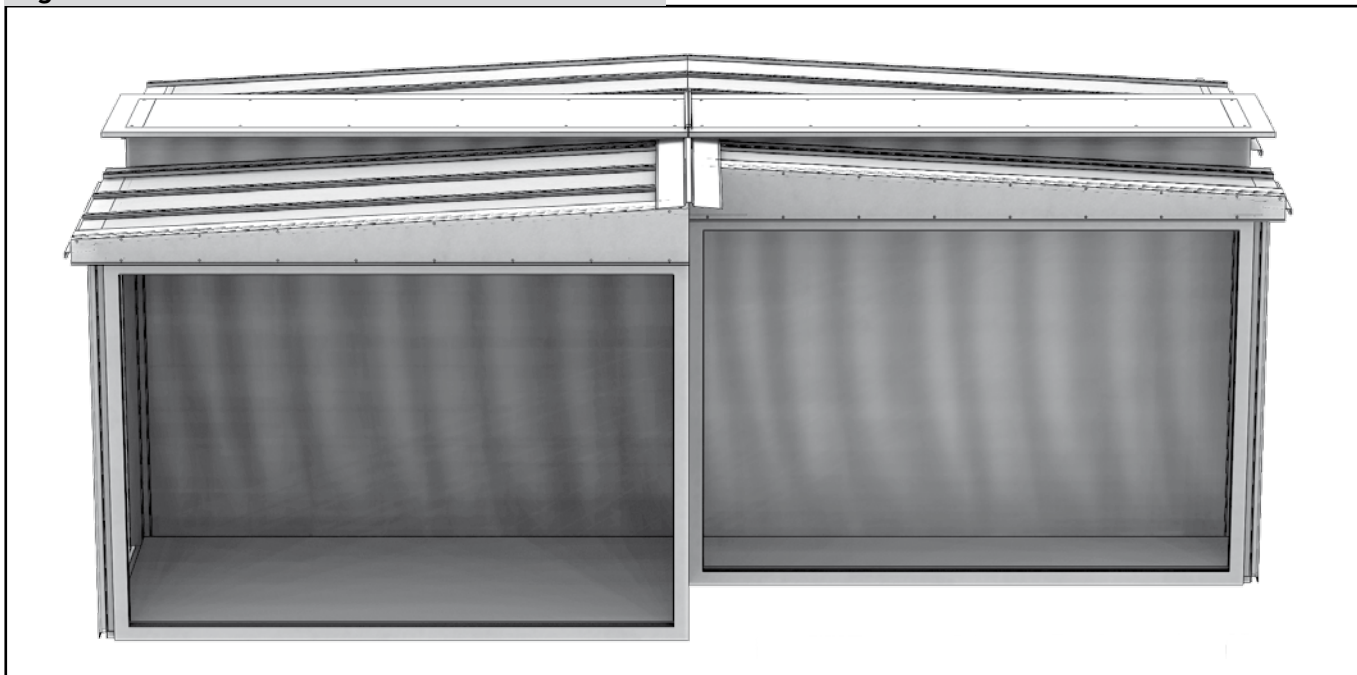
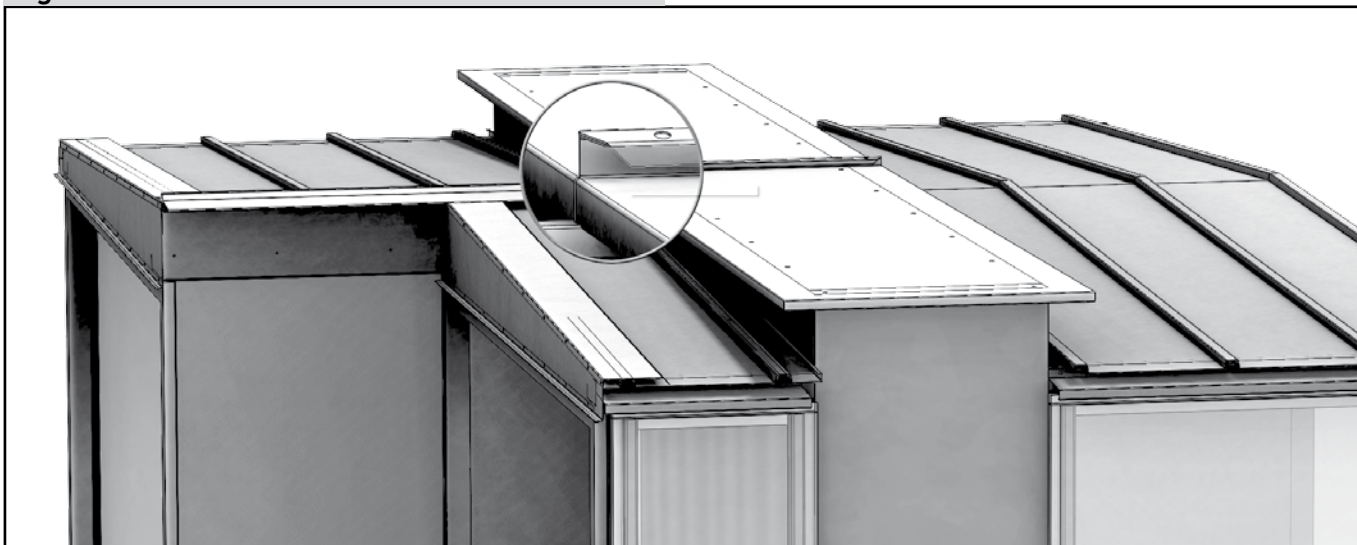


Figure 23



Check the integrity and secure attachment of all installed elements before finishing the installation. Every gap and leak must be sealed with silicone compound.

Gas Heater Section (CRVBG)

Section description

The casing of the section is made of aluminium frame sections and 50 mm thick thermally insulated panels.

The air is heated by flowing around the combustion chamber and its tube plate.

A flange for the burner mounting is situated on the front (service) side of the heat exchanger. The flue gases are drawn off via the chimney outlet (optionally on the rear side of the section). Sections are manufactured in two versions - either with or without the bypass. The bypass version is equipped with a damper to regulate air flow. Furthermore, the gas heater section is provided with a condensate drain outlet (1/2" pipe).

Table 1 – included M&C components

Component	Place of installation	
Pt100 – flue-gas temperature sensor	to the flue-gas exhaust (flue-gas duct)	it must be installed during device assembly
ESD3J – triple thermostat	gas heater section (behind the heat exchanger, following the airflow direction)	installed by the manufacturer
TH 167 – emergency thermostat	just preceding the gas heater section	it must be installed during device assembly

This section can be delivered for indoor as well as for outdoor use. The burner and triple safety thermostat of the outdoor version are protected by covers.

A burner operated in an outdoor environment up to -20°C must be provided with a heating cable switched by the thermostat. As standard, this set is included in deliveries marked as TKW 53 for burners WG 10, WG 20, or as TKW 88 for burners WG 30, WG 40.

A burner operated in an outdoor environment from -20°C to -40°C must be equipped with a special heated cover of the burner and a burner flange for the external air inlet

Burner closed heated cover installation

The external air inlet to the burner's extension is made from a Spyro hose. An aperture in the burner cover for the hose must be created in the appropriate location; the hose must be sealed in this aperture. Inlet air must come from the heated room.

The TBW 500 heating equipment will be attached on the heater panel under the burner valve block using a holder (enclosed, including 4 screws). Electrical connection will be made using a seven-pin connector at the burner. The heating power supply is ensured directly from the burner; therefore, the burner's "L" terminal must always be under voltage.

The thermostat of the burner cover is set to 5°C. If the cover's temperature drops below the pre-set temperature, the heating is switched on.

Connection of Gas Heater

The XPTG gas heater section must be connected to the air duct via a dilatation insert heat resistant up to 200 °C. The gas-flue ducting must comply with all applicable directives and standards of the state of installation (for CZ - ČSN 73 4201 and ČSN 73 4210), and must be performed by a specialized provider. For information on installation, commissioning and inspections of the gas indirect heater and burner, refer to the special Installation and Operating Instructions which are included in the accompanying documentation of the air-handling unit.

Safety and control elements delivered with the section must be connected to ensure proper, reliable and safe operation.

Gas Heater Section Start-Up

The gas heater is a special gas device which is characterized by a special activation procedure (commissioning). After completing the air-handling unit installation, it is necessary to place a separate order for the gas burner activation with the gas heater manufacturer or their representative. In addition to the gas burner adjustment, the interconnection of safety thermostats and the control circuits of the gas burner and air-handling unit (fans) must be checked during the gas heater commissioning. A commissioning report, which also includes settings of the gas heater temperatures and the results of testing of emergency and safety components, must be drawn up upon putting the gas heater into operation.

Separate documentation from the combustion chamber manufacturer is delivered with this section.

Never start up the gas heater section if the air-handling unit is stopped, otherwise the hazard of local overheating of the air-handling unit will occur, which can damage some components (e.g. drop eliminator).

AeroMaster Cirrus Air Handling Units

Gas Heater Section (CRVBG)

Figure 1 – Burner heated cover dimensions

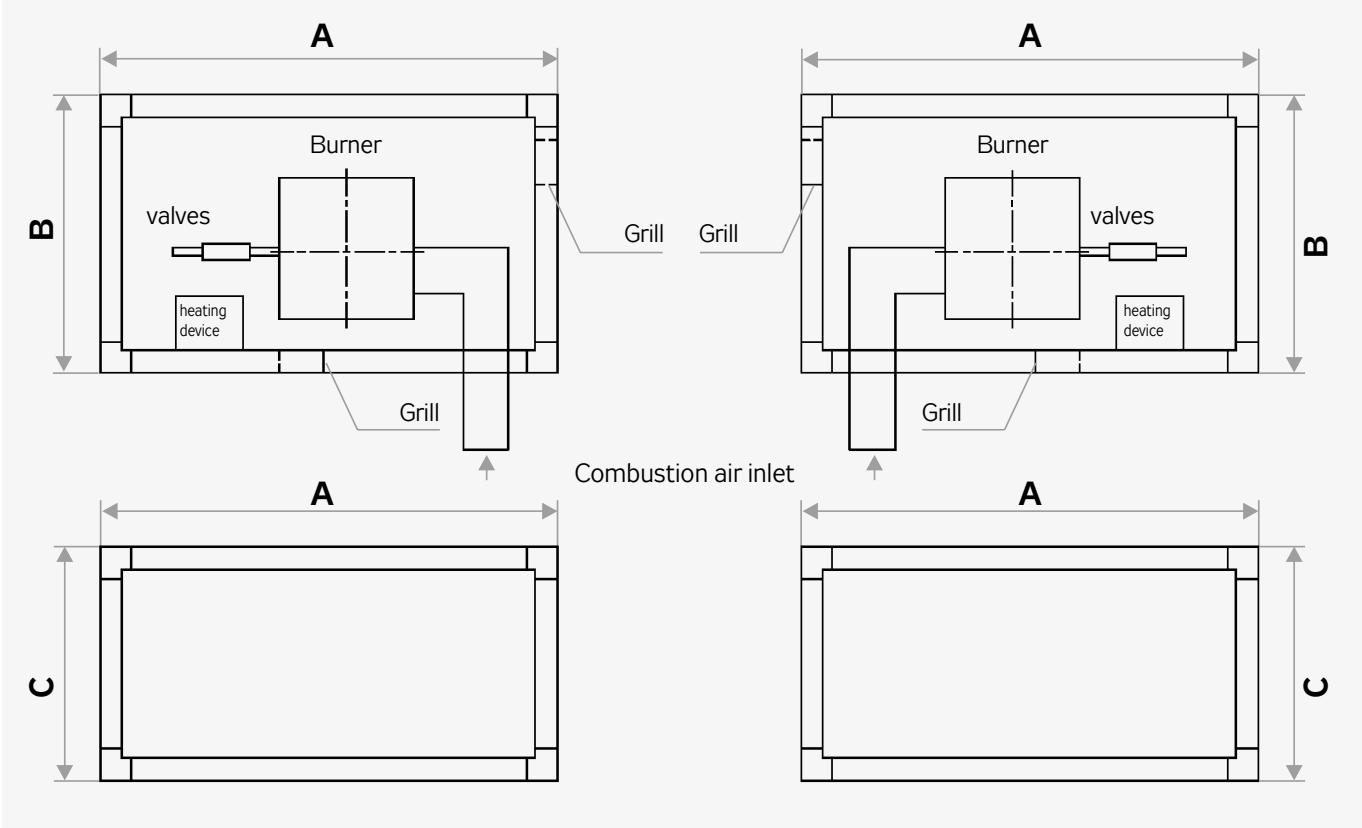


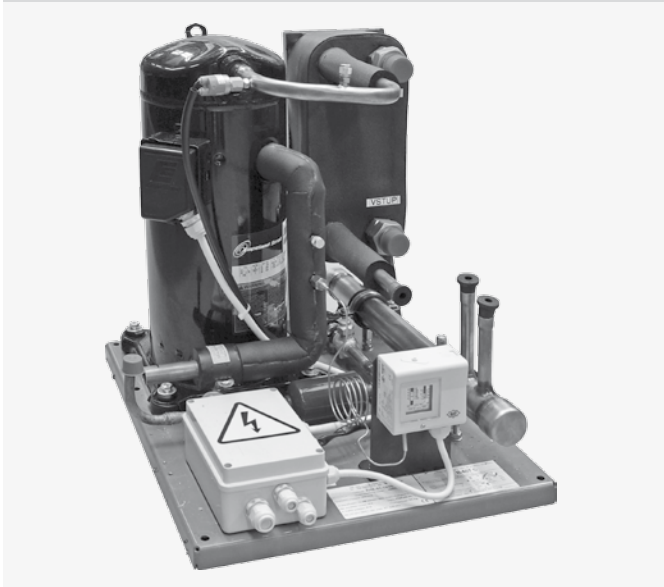
Table 2 – Burner heated cover dimensions ad weights

Burner type	A [mm]	B [mm]	C [mm]	Weight [kg]
WG 10 and WG 20	1020	620	520	cca 50
WG 30 and WG 40	1590	790	820	cca 110
G5	1590	790	1000	cca 125

Integrated Cooling Section

Separate documentation is delivered with this section. This documentation is available to download form at our website: www.remak.eu

Figure 1 – Integrated Cooler Section



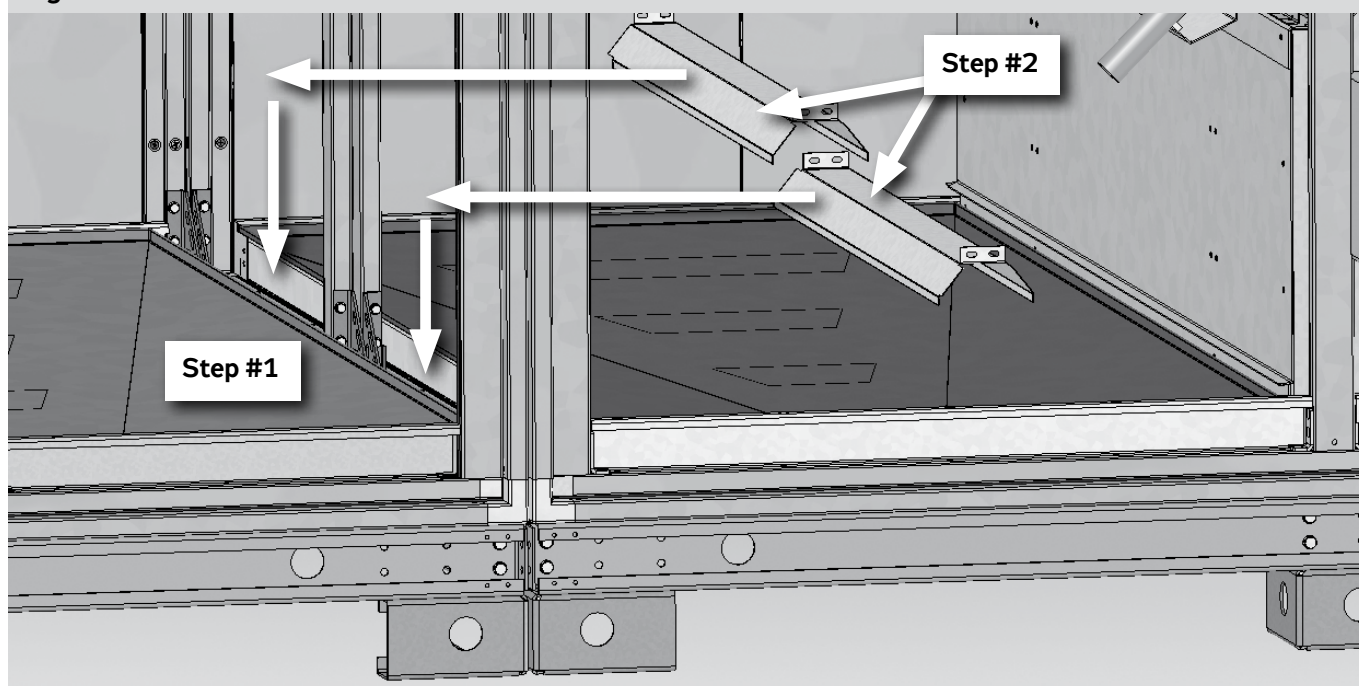
Complementary information – pool units of 2nd generation

Surface finish – corrosion protection

When transporting, handling and operating, it is necessary to pay special attention to not damage the surface finish. Maintaining the integrity of the surface is a prerequisite for durability. Any damage to the surface must be repaired immediately when it occurs. Repairs carried out:

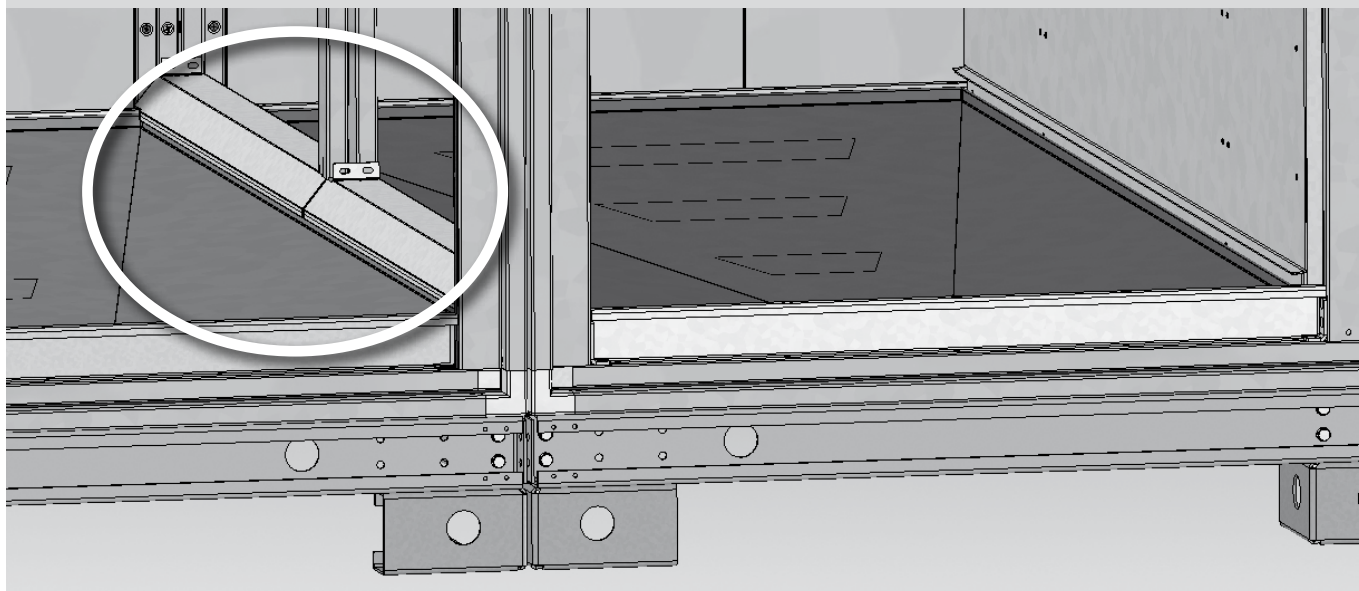
- 1x HEMPATANE TOPCOAT 55210 paint (glossy two-component acrylic polyurethane topcoat) with CURING AGENT 95370.
- The mixing ratio of 7: 1 (volume) (resin 55219: curing agent 95370).
- Tint: RAL 3020
- Thinner: HEMPEL'S THINNER 08510
- INTERCONNECTING THE SECTIONS AND TRAY COVERING
- **Step #1:** connection of sections in the standard way at the corners and at the centre.
- **Step #2:** tray covering with sheet metal parts

Figure 1



- After mounting, apply silicone glue to avoid leaks and leakage outside the condensate tray.

Figure 2

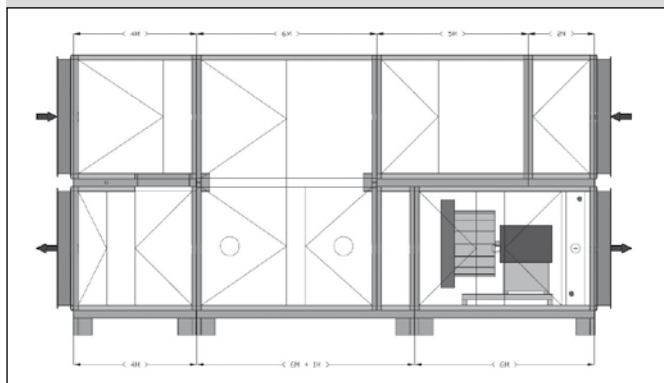


AeroMaster Cirrus Air Handling Units

Complementary information – pool units of 2nd generation

Interconnecting the sections – fan assembly

Figure 3



- **Step #1:**
Loosen the screws
fixing the fan damper.
- **Step #2:**
Loosen dividing plate screws.
- **Step #3:**
Eject the fan dividing plate.

Figure 4



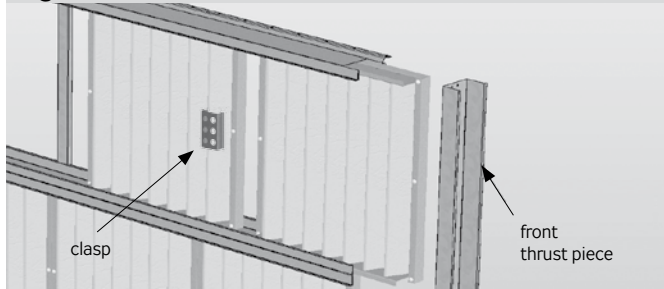
Replacement of insert filter fabrics

Replacement procedure

Filter inserts filters of frame and insert filters (G3) is inserted into the rails. Individual inserts are mutually closed with a clasp to be removed all at once.

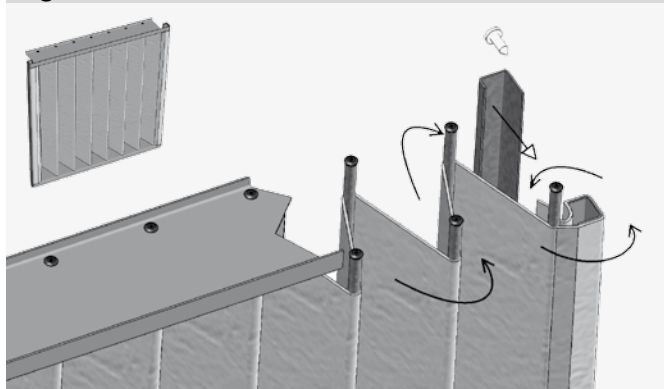
Step #1: Remove the front thrust piece of filter wall.

Figure 1



- **Step #2:** Remove the clogged fabrics from the metal structure

Figure 2



Always observe local laws and regulations.

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