

ZHK

Instruction manual



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We care for better air

In addition to the instructions in this guide, subject-specific standards, as well as local, national and international regulations must be observed.

The complete instruction manual, which includes all chapters from 1 to 12 is available online, see QR-code beneath.

The full version of the instruction manual must be downloaded, read, and understood by the personnel in charge of the respective work before starting any work (unloading, transport, erection, assembly, installation, electrical connection, commissioning, maintenance).

The online-version always contains the updated version.



After completion of the work, please give this instruction manual to the operating staff. Please keep the complete instruction and operating manual filed with your other documents.



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- Original Instructions -

1 Introduction

1.1 Supplementary instructions to this instruction manual

This is the instruction manual for an air handling unit, hereinafter designated as 'AHU'. This instruction manual is provided as part of the AHU to enable the safe and correct use of an AHU constructed by EUROCLIMA. The target group of this instruction manual are all persons who are directly involved with transport, assembly, commissioning and installation, operation, maintenance, troubleshooting and disassembling (see also **chapter 2.5 (Staff selection and qualification)**). This instruction manual must be kept in the immediate vicinity of the AHU and must always be accessible to personnel. The fundamental requirement for safe and effective operating is that all safety and handling instructions provided in this instruction manual are observed and implemented. This includes local occupational health and safety regulations and general safety regulations for the area of application of the AHU.

1.2 Copyright

This documentation, including all tables and figures, is protected by copyright and pertains only to an AHU of EUROCLIMA.

Passing on content, copying content, publishing content, filming content, editing content in electronic systems, translating content, as well as each further utilization of this documentation outside of the copyright law, also in part and communications of contents without the express consent of EUROCLIMA is inadmissible.

1.3 Limitation of liability

EUROCLIMA assumes no liability or warranty for damages or consequential damages due to the following:

- Non- observance/ adherence to the instruction manual and / or other applicable documents
- Non intended use or misuse
- Use of untrained personnel
- Unauthorized structural changes
- Technical changes
- Use of non-approved spare parts

1.4 Type key

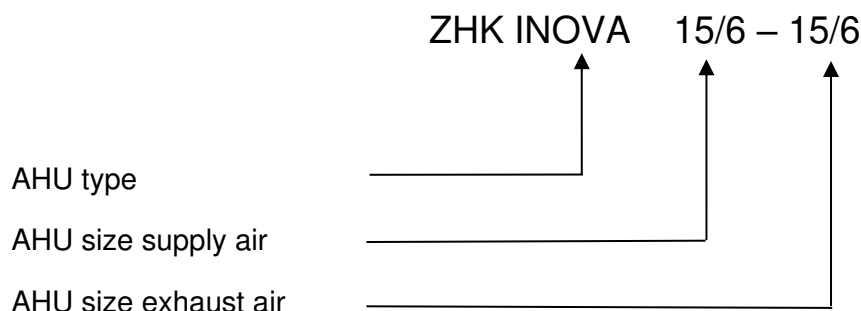


Figure 1: Example AHU type key

Legend used for AHU type

ZHK VISION	casing type with thermally decoupled version T2-TB1
ZHK INOVA	casing type with thermally decoupled version T2-TB2
ZHK 2000	casing type version T3-TB3
ZHK NANO	compact AHU series / casing type with thermally decoupled version T2-TB2
ETA XXX	key ETA: including control
ETA POOL	compact AHU for pool dehumidification with refrigeration circuit (option)
ETA MATIC	control for AHUs

Legend for the AHU size

Example 15/6: the first index (15) corresponds to the clear width, the second index (6) to the clear height. According to the following table, the dimensions in mm are → 15/6 = 1525 x 610 mm (clear width x clear height)

Index	3	4	6	9	12	15	18	21	24
Dimension (mm)	305	457,5	610	915	1220	1525	1830	2135	2440

Index	27	30	33	36	39	42	45	48
Dimension (mm)	2745	3050	3355	3660	3965	4270	4575	4880

This information applies both to the ratios of the supply air and the exhaust air.

1.5 Intended use / foreseeable misuse

1.5.1 Intended use

The AHU is used, depending on the chosen purpose for

- transportation and conditioning of air in and out of habitable buildings or vessels.
- creation of a desired room air quality in living and work spaces
- creation of an acceptable comfort or desired working conditions
- depending on the AHU type, the air conditioning is done primarily by
 - o Air change
 - o Control of air temperature and air humidity
 - o Filtration of normal polluted air, when using electrostatic filters, see **chapter 5.4.7 (Electrostatic filter)**
 - o Filtration at specific requirements (clean room and so on)

The AHU is suitable for

- operation in the range of the agreed design data
- an ambient air temperature range of – 20 °C to + 60 °C at installation site, if electrical/electronic components are mounted on the outside of the AHU, then + 40 °C maximum
- a minimum temperature of the transported air of -20 °C (if necessary, freeze protection measures must be installed)
- a maximum temperature of the transported air of +60 °C
- inside the AHU at motors and other electrical/electronic components up to +40 °C maximum

The AHU must be used as intended and in the appropriate environment, if not this is categorized as misuse of the device. If there is any case of AHU misuse, then the warranty/ guarantee becomes null and void, which means immediate expiration of the complete warranty and / or guarantee claims.

The operation within other conditions must be agreed in writing. Unless otherwise agreed, the design of the AHU is for a nominal density of the air of 1,20 kg/m³.

Design responsibility for AHUs, are built according to customer specifications

AHUs from EUROCLIMA as described in this manual are designed, built and delivered according to customer requirements and specifications. Therefore, EUROCLIMA can select and offer a number of materials and components, which are varied in quality levels.

Generally, a HVAC specialist, knowing the exact application of the AHU, generates a specification, in which customer requirements for the AHU are defined. The properties of the AHU, specified by EUROCLIMA, are agreed with the customer and are stated on the technical data sheets and drawing of the AHU.

Thus, the assessment of the suitability of the AHU for the specific application (e.g. used materials or filter classes) is not the responsibility of EUROCLIMA. Therefore, a disclaimer applies for EUROCLIMA, if the suitability of the AHU for the specific application and installation site should not be fully stipulated.

As an example, the use at highly polluted or corrosive air (e.g. close to the sea, in industry atmosphere or at contaminated/corrosive exhaust air) is mentioned. In this case, corrosion of the AHU or inappropriate filtration of the air could be a result of a planning error, for which EUROCLIMA declines and does not accept any responsibility, because the AHU is built according to the confirmed specifications.

Other applicable documents

The following documents apply in addition to this manual:

- Technical data sheets of the AHU from EUROCLIMA
- AHU drawings
- Order confirmation
- Operating and instruction manuals and, if applicable, data sheets of the supplier components or component manufacturers
- Wiring diagram and operation manual of AHUs with control
- If applicable, further drawings

Components provided by the customer

If it is planned and agreed, that EUROCLIMA installs components in the AHU, which are provided by the customer, EUROCLIMA only accepts liability, if there are significant mistakes in construction.

The warranty for proper functionality of the provided components, as well as the component concerned safety requirements, is excluded.

It is important to note, the issued EC declaration of conformity applies only for the scope of delivery from EUROCLIMA, not for components provided by the customer.

Changes of the AHU by the customer

Attention!

If there are any changes to the AHU undertaken by the customer after delivery, then the warranty becomes invalid. Subsequent changes of the AHU, which are not authorized by EUROCLIMA, are the sole responsibility of the executing person, concerning functionality as well as all safety aspects.

1.5.2 Foreseeable and considered misuse

Other than the above use, it is considered as damaging and must be excluded totally:

- The commissioning of equipment, prior to performing the steps indicated in the assembly instructions and operation with opened, unsecured service doors is a serious risk and hazard.
- Opening the AHU, without securing the main switch in the off position, represents a significant risk and hazard.

- The operation of an AHU equipped with an electric heater while the fan-motor is cut off, or if the fan is working at a limited airflow (for example, caused by closed dampers or similar and with the electric heater in operation) produces an imminent fire risk.
- The operation in combustible conditions is prohibited, as long as the AHU is not executed in accordance with the ATEX directive 2014/34/EU. Application of AHUs in ATEX execution, see **chapter 2.3.3 (ATEX AHUs)** and **chapter 11 (AHUs)**.
- Handling of air with corrosive / aggressive components.
- Pressure-sided doors can detach suddenly while opening. So, there is a significant risk of injury for the user. See chapter **5.2 (Doors)**.
- The operation in a location with high relative humidity causes condensation on the unit surfaces.
- The operation in a corrosive ambient atmosphere (e.g. salt water, etc.).

1.6 Modular design

Because of the modular AHU design, the instruction manual covers all the possible sections and components which can be delivered. The ordered range is smaller and can be viewed on the technical data sheet - see **chapter 1.7 (Documentation)**.

In this manual, stated parts/components that are not part of the delivered AHU, can therefore be disregarded.

1.7 Documentation

The AHU will be delivered with the following documentation:

Instruction manual ZHK (This document is an extract of the complete instruction and operating manual and includes chapters 1 to 4.)	There is a marked cardboard box, which contains loosely delivered parts inside of the AHU.
QR-Code for the download of the complete manual	On the AHU and in the delivered manual on page 1

Depending on AHU type and execution, the following documentation is included:

Operation and instruction manuals of components	There is a cardboard box containing loosely delivered parts inside of the AHU or can be downloaded from the homepage of the component manufacturers.
Delivery documentation and packing list (scope of delivery)	will be handed over upon acknowledgement of receipt
Operation manual control incl. data point list ETA MATIC / ETA POOL / ETA NANO_COM-PACT_FLAT	in control cabinet
AHU drawing	applied on each delivery section
Wiring diagram for ETA	in control cabinet

Depending on type of accessories, the following documentation is included:

K-value for airflow measurement	There is a cardboard box containing loosely delivered parts inside of the AHU.
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Belt drive and tension data	There is a cardboard box containing loosely delivered parts inside of the AHU.
Piping & instrumentation diagram	in control cabinet
Records for refrigeration circuit application	in control cabinet

The above mentioned documentation must always be available when working on the AHU!
You will also find stickers with danger, warning and caution labels and other instructions on and inside the AHU.

In this manual and on labels used symbols:



Indicate safety instructions – or yellow triangle with the corresponding hazard pictogram



Indication to avoid damage



WARNING!

Danger due to illegible labels!

Over time, labels can become illegible and degrade, so that dangers are not recognized, and important operating instructions cannot be followed. It is therefore vital that all safety, warning and operating instruction labels are always kept in clearly legible condition and damaged labels must be replaced immediately.

In addition to the contents of this manual, the instruction manuals of the component manufacturers must be followed. These will be delivered separately or can be downloaded from the homepage of the appropriate component manufacturer. In case of contradiction between this manual and instruction manual of the component manufacturer for safety instructions, the most technically accurate interpretation is valid. At differences between this manual and the instruction manual of the component manufacturer, the instruction manual of the component manufacturer has to be applied. In case of doubt, please contact your EUROCLIMA office.

2 Safety instructions / Guidelines to conformity to laws and directives

2.1 Symbols in this manual

The safety instructions in these operating manuals are marked by symbols. They are highlighted by key words which stipulate the severity and extent of a danger. These safety instructions must be observed and adhered to under all circumstances in order to avoid accidents, personal injury, hazards and damage to property.



DANGER!

Safety instructions with the signal word „DANGER“ indicates a hazardous situation which, if not avoided, are certain to result in death or serious injury.



WARNING!

Safety instructions with the signal word „WARNING” indicates a hazardous situation that, if not avoided, could result in death or serious injury.



CAUTION!










Safety instructions with the signal word „CAUTION” indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.



NOTICE!

Safety instructions with the signal word „NOTICE” indicates a non-immediate or potential hazard situation that, if not avoided, could result in damage of property and equipment.

In order to draw attention to special, situation-related dangers, the following warning symbols, among others, are used in the safety instructions:

Warning symbol	Type of hazard
	Warning of general danger
	Warning of electrical voltage
	Warning of pointed objects and sharp edges
	Warning of inflammable substances
	Warning of rotating parts
	Warning of hot surface
	Warning of tilting parts
	Warning of suspended load
	Warning of sudden detachment of unhinged doors


	Warning of UV radiation
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Table 1: Warning symbols of situation-related dangers

2.2 Personal protective equipment

Personal protective equipment is intended to protect people against a risk to their safety or health at work. Therefore, during the various operations on and with the AHU, personnel must wear the following personal protective equipment (pay attention to correct application!):










Symbol	Description of personal protective equipment
	Protective clothing and ensembles: Protective work clothing is used to protect against being caught by moving or rotating parts, stitches, cuts, dust, etc. Do not wear chains, rings or other jewelry.
	Head protection: Industrial helmets protect the head from falling, swinging, falling or flying objects, as well as from bumping into objects.
	Hand protection: Protective gloves protect hands from injuries caused by cutting, sawing, trapping, etc., as well as from chemical and thermal hazards.
	Foot and leg protection: Foot and leg protection, such as safety shoes, protect against bumping into objects, pinching, kicking or kneeling in pointed or sharp objects, as well as against falling or rolling objects.
	Eye and face protection: Eye and face protection are used to protect against foreign objects and solids, as well as against chemical and thermal hazards.
	Hearing protection: Hearing protection is used to protect against noise that is harmful to hearing.
	Falling protection: Falling protection is used to protect against an increased risk of falling if certain height differences are exceeded. Falling protection, such as safety harnesses, may only be used by specially trained people for this purpose.
	Respiratory protection: Respiratory protection protects against the inhalation of hazardous substances, as well as in the case of insufficient oxygen content.
	Skin protection: Skin protection serves to protect against skin diseases and skin damage.

Table 2: Symbols of personal protective equipment

2.3 Indications for minimizing specific hazards

2.3.1 General indications



WARNING!

An improperly performed maintenance can pose a danger, hazard and/or risk!

Danger due thin sheets and sharp edges, when working on AHU



WARNING!

During work on AHU (or on parts), there is a substantial risk of injury because of thin sheets and sharp edges. For example, roof sheets, fins of heat exchangers, corners and edges - Use personal protective equipment: wear protective helmet, gloves, safety shoes and long protective clothing.



Lighting

For work on AHU (maintenance and inspection work) make sure there is adequate lighting.

Firefighting in case of fire

In general, the local fire protection regulations must be observed.



WARNING!

- If the AHU is part of the smoke extraction system, then the specifications of this system have to be observed.
- Otherwise, the power supply of the AHU must be shut down immediately at all conductors. In addition, the dampers must be closed to consequently prevent oxygen supply and fire spread.

Exposure to harmful substances in case of fire



WARNING!

In case of fire, some materials can produce harmful substances. In addition, harmful vapors can escape from the AHU. Therefore, severe respiratory protective equipment is required and the danger zone has to be avoided.

Exposure to rotating parts / hot surfaces / electrocution

When working on and/or in the AHU note the following risks:



WARNING!

Indentation of body parts in moving parts (belt drive, fan impeller, external damper gear wheels ...).



WARNING!

Burns and scalds on hot AHU components such as heat registers, heat exchangers, ...



DANGER!

Electrocution on current-carrying parts such as electric motors, frequency converters, electric heaters, control cabinets, interior lighting etc.

Therefore it must be ensured that prior to working on and/or in the AHU that the following tasks are adhered to:

- all electrical and live parts, such as cable plug connections, fan motors, valves, motors and electric heaters are disconnected from the power supply by using the main switch (emergency stop) and that the switch is locked in position 'off' in order to effectively prevent the re-activation of the device during the work. The housing of the AHU interior lighting (can have separate supply) is not live/active.
- all moving parts, especially the fan wheel, motor and heat wheel have stopped completely. It is important to wait at least 5 minutes after shutting down the device before opening the doors.
- for maintenance of frequency controlled motors, a waiting time of 15 minutes is recommended – it gives time to break down the residual capacitive charge of the frequency converter.
- Remove the keys from the doors with a door lock before entering the interior of the AHU. Keep the key out of reach of all unauthorized persons.
- Check that the hot substance supply, such as steam, is interrupted and all the heat registers, heat exchangers, etc. are cooled to ambient temperature.



WARNING!

In case of standstill of the plant (e.g. power failure), make sure that the main switch is always checked. Only when it is in the off position and secured against unintentional restart, appliance doors can be opened, cable plug connections can be disconnected and work on the device can be carried out.

Start of the AHU

Ensure after the completion of work and before starting the device that:

- nobody is in the AHU.
- all protective devices are working, (optional safety devices such as the door guard and belt guard mounted again) and doors equipped with door locks are locked and the keys are removed – refer to **chapter 5.2 (Doors)**.

Storage of potential energy in gases and fluids



WARNING!

All heat exchangers can be operating up to a maximum pressure of 15 bar. If the fluid is under higher pressures, the safety and tightness cannot be guaranteed.

Preventing the risk of explosion and fire spread



WARNING!

To prevent the fire spreading, fire dampers shall be installed into the ducts between the fire compartments.

Prevention of exposure caused by antifreeze agents



WARNING!

Avoid body contact with antifreeze agents, because they may cause burns. Always wear appropriate protective clothing (e.g. gloves, goggles etc.).



WARNING!

In case of fire, avoid the danger zone and meet any safeguards and regulations. It is recommended to wear a mouth guard, because of the risk of poisoning by inhaling the vapors.

Prevention of hazards caused by steam heaters or humidifiers



WARNING!

Scalding risk from hot steam! Therefore, make sure that no steam pressure is present and the system is cooled before working on the steam piping.



WARNING!

Avoid any type of ignition source when cleaning the humidifier and the associated components and circuits by means of a descaling agent. With strong descaling agents, direct sunlight can already cause a fire.



WARNING!

Avoid body contact with descaling agents, as it can cause chemical burns and serious eye damage. When handling descaling agents, wear appropriate protective clothing (e.g. gloves, goggles etc.) and ventilate the room well.

Prevention of hazards caused by the sudden detachment of door panels while handling removable panels



WARNING!

Removable door panels can fall out suddenly after detaching the connections and can lead to injuries. Particular care should be taken when removing pressure sided doors because they can be firmly in place and then suddenly detach. The user must be able to carry the weight of the door. Two persons are needed when handling doors with a surface of $> 0.5 \text{ m}^2$

Please note the instructions on the AHU and follow subsequent instructions exactly.

2.3.2 Refrigeration circuit

Preventing the risk of exceeding the maximum operating pressures PS



WARNING!

Never exceed the maximum operating pressures PS, which are specified on the type plate (even not for test purposes). Damage may limit the security, effectiveness and lifetime of the system. Never operate the refrigeration system with a closed discharge line valve.

Risk of burns on hot surfaces



WARNING!

On the compressor casing, pipelines and circuit components and on the oil sump heater surface temperatures of far higher than $100 \text{ }^{\circ}\text{C}$ may occur, which may cause serious injuries. Wear the required personal protective equipment (protective goggles, gloves, etc.).

Prevention of risks due to contact with refrigerant



WARNING!

Physical contact with refrigerant must be strictly avoided as it can cause severe frostbite and damage the retina - temperature range, for example R407C **at ambient pressure** is approximately $-44 \text{ }^{\circ}\text{C}$!

Prevent the risk of suffocation



DANGER!

Safety refrigerants are odorless, tasteless and can contaminate the air and cause suffocation (MAK - value 1000 ppm).

- In case of refrigerant leaks, immediately leave the affected room. Enter only with breathing protection and ensure adequate ventilation.
- Refrigerant is heavier than air and will collect at the lowest room point. For small refrigerant charges, this risk is significantly reduced.
- Refrigerant and compressor oil react as soon as they come into touch with open flame toxic substances. Do not inhale!
- Do not smoke in the technical room!
- The gas sensor monitors the ambient air for refrigerant leaks. The setting of the refrigerant type and the warning and alarm thresholds are to be checked continuously according to the manufacturer's operating instructions.
- For more information refer to **chapter 8.2.3 (Refrigerant)**.

2.3.3 ATEX AHUs

If instructions differ, the ATEX-specific instructions must be given priority. In addition to the actions mentioned here, the instructions according to **chapter 11 (AHUs)** have to be observed.

General safety indications

Hazardous areas must be rated on the frequency and duration of the occurrence of hazardous explosive atmospheres (gas / air or steam / air mixtures and / or dust / air mixtures). This is described in Directive 1999/92/EC. Because of this zoning an adapt AHU must be used. The relationship between zones and category as per **Table 22 (chapter 11.3 (Supplementary notes on AHU design))** described.



WARNING!

ATEX AHUs may not be used near:

- High frequency sources (e.g. transmitter systems)
- Strong light sources (e.g. laser beam systems)
- Ionizing radiation sources (e.g. X-ray machine)
- Ultrasound sources (e.g. ultrasound echo testing equipment)

Safety indications for operation

The following instructions must be observed urgently for the safe operation of ATEX AHUs:



- Operating conditions in accordance to the intended use.
- In the immediate environment of the AHU there should be no substances according to EN 1127-1:2019-10, which are prone to spontaneous combustion, such as pyrophoric substances.
- Permanent and adequate ventilation of the installation room to prevent the creation of an explosive atmosphere, which is caused by leakage.
- Do not exceed 80 % of the maximum permitted speed of the fan, as it could otherwise lead to sparking and damage.
- Appropriate measures must be taken against all types of ignition sources that are not specific to the AHU and are not included in the Euroclima scope of delivery.

Safety indications for maintenance and repair work

In addition to the safety instructions in **chapter 2.3 (Indications for minimizing specific hazards)** and in **chapter 2.5 (Staff selection and qualification)**, the following special safety instructions must be observed:



- Work may only be performed within a clean atmosphere with no risk of explosion.
- The formation of conditions, which could create a risk of explosion need to be counteracted by adequate ventilation.
- Also, if necessary, it could be required to flush the system with fresh air, in order to remove or dilute any vapors or other air impurities, which could cause an explosion risk.
- When the system is at a standstill, the concentration of the atmosphere can change and thus increase the risk of explosion. Therefore, all types of ignition sources must be avoided during maintenance. If necessary, it might be required to carry out an assessment or air monitoring with a gas detector before starting work and during work.
- Work may only be carried out in areas where there are no ignition sources. It is particularly important to ensure that all work equipment is approved for the corresponding area (see EN 1127-1 appendix A and TRBS 2152).
- Use only suitable tools according to EN 1127-1:2019-10 to prevent sparking.
- Perform work only with conductive footwear (according to BGR 132) in order to avoid electrostatic charging.
- To prevent the formation of by stirring up dust deposits, all internal and external device surfaces must be continuously cleaned.
- To avoid static charging, cleaning work may only be performed with a wet cloth.

2.4 Conformity with directives, regulations and laws / Assembly instructions for safe and compliant operation

2.4.1 EC declaration of conformity in accordance to EC machinery directive 2006/42/EC

For an AHU (or any part thereof) supplied by EUROCLIMA, an EC declaration of conformity in accordance with the EC Machinery Directive 2006/42/EC will be issued.

When the AHU is a part of the building system. For the device's safe, practical and intended operation, it is the responsibility of the customer to make sure that all on site works are carried out before the device can commence operations. This preparation is necessary and vital for the device and system to work effectively. These types of works are described in **chapter 2.4.2 (Installation instructions for a safe and compliant installation in the building system)** and in the following chapters of this instruction manual.

The AHU must be mounted and operated professionally, according to the specifications stipulated in this instruction manual. The safe operation of the AHU in the overall building system is thus the responsibility of the customer.

The CE-conformity / EC declaration of conformity applies for the delivery state of the AHU. In the mounted state, the AHU fulfills the requirements of the specified European directives and harmonized standards only if the instructions and information in this instruction manual are carefully observed and implemented.

The issued EC declaration of conformity declares that due to its concept and type, as well as in design placed into the market by EUROCLIMA, the AHU complies with the fundamental health and safety requirements of the EC Machinery Directive 2006/42/EC.

EUROCLIMA thus follows the Eurovent interpretation of the Machinery Directive:
[Eurovent 6/2-2015 "Recommended code of good practice for the interpretation of Directive 2006/42/EC on machinery concerning air handling units", vom 19. Oktober 2015.]

Applied European directives and harmonized standards:

Every AHU by EUROCLIMA is a customized produced unit. Therefore, please refer to unit specific EC declaration of conformity of the delivered AHU for information on the applied European directives and harmonized standards.

Depending on the particular application and country-specific requirements and laws it is possible, that the AHU does not meet the valid requirements at the ordered state at delivery.

Therefore, you the customer and installer of the AHU are responsible, before commissioning of the AHU, to check the conformity of the entire system to the valid laws and directive.

If there are any doubts about the conformity of the AHU with the local (on site) valid laws and directives, the AHU is only allowed to be put into operation, if the conformity of the AHU in the system is unequivocally guaranteed.

Depending on the chosen purpose of the AHU, in addition to the EC Machinery Directive 2006/42/EC the following European directives can be applied:

- Electromagnetic compatibility directive 2014/30/EU
- Commission regulation Ventilation Units (EU) No. 1253/2014 *)
- Pressure equipment directive 'PED' 2014/68/EU
- ATEX directive 2014/34/EU

*) ErP conformity according to commission regulation (EU) Nr. 1253/2014

„Out of scope“ – AHUs according to technical data – information therefor on technical device data sheets - with the following characteristics are excluded from the area of application of the regulation (EU) 1253/2014:

Exemptions:

- Exemption 1: AHU without fan (valid in the absence of supply air fan or exhaust air fan or both)
- Exemption 2: AHU operates only in recirculation mode
- Exemption 3: AHU for cruise ships/ships
- Exemption 4: AHU for delivery outside the European Union
- Exemption 5: AHU operates only in potentially explosive air conditions, according to EU Directive 2014/34/EU (valid for supply air, exhaust air or both).
- Exemption 6: AHU operates only in toxic, abrasive or flammable air
- Exemption 7: AHU operates only with air temperatures greater than 100 °C
- Exemption 8: AHU contains a heat exchanger and a heat pump for heat recovery in accordance with regulation (EU) 1253/2014. Article 1.1 (g)
- Exemption 9: AHU with HRS system and integrated DX- system for heating purpose

The mentioned exemptions refer only to regulation (EU) 1253/2014. Basically, the instructions in this instruction manual apply. For the special requirements of the specific AHU resulting from the applicable exemption, the special agreements defined in the order clarification apply.

2.4.2 Installation instructions for a safe and compliant installation in the building system

2.4.2.1 On site assembly and installation

For the proper installation of AHU equipment and the safe operation of the system, depending on the configuration of the AHU, before the first start at least, the following points must be implemented or upgraded and is the responsibility of the client:

Assembly of delivery sections

The delivery sections of the AHU must be assembled and linked together, according to the supplied drawing. See the **chapter 4 (Foundation / erection)**.

Secure inlet and outlet openings

All the inlet and outlet openings must be connected to ducts or respectively equipped with grilles, to prevent the risk of persons accessing moving parts (such as fan wheels) during operation.

Main switch

See **chapter 7.3 (EC motors)**.

Installation of ceiling AHUs – flat AHUs

See **chapter 4.2.4 (Special guidelines for flat AHUs – ceiling AHUs)**.

Installation of filters

See **chapter 5.4 (Airfilters)**.

Temperature limitation

Ensure that a control system is fitted and that the AHU is only operated with a supply air temperature below the allowable maximum (see **chapter 1.5.1 Intended use**, when not stated otherwise in the technical data). For this purpose, the continuous monitoring of the supply air must be ensured on site.

Measures regarding noise attenuation

On request, available sound data can be used, as a basis for the measurement and calculation of sound (such as for sound attenuators). For information regarding the emitted sound power level over the openings see the technical data sheet, which is available on request – refer to **chapter 10 (Information on airborne noise emitted by the AHUs - on request)**.

Measures to minimize the risk of water damage or damage caused by similar media

See **chapter 4.2.2 (Actions to prevent potential risks)**.

Motor connection

See **chapter 7.2 (AC motors)**.

Frequency controller for Plug fans

Furthermore, if not supplied by EUROCLIMA, a frequency converter must be installed to reach the calculated operating point. For details see **chapter 7.5 (Variable, frequency-controlled drives (VFD, frequency converters))**.

Connection to an external protective conductor system

See **chapter 7.1 (Connecting to an external protective conductor system)**.

Electric heater

Installation (if not supplied by EUROCLIMA) and connection of thermostats for safety shutdown, see **chapter 7.7 (Electric heaters)**.

Plate heat exchanger

Installation (if not supplied by EUROCLIMA) and connection of differential pressure switches to protect the plate heat exchanger from damage in **chapter 7.8 (Differential pressure restriction for plate heat exchangers)**.

Siphons

Connecting according to **chapter 6.3 (Drain for condensate and excess water)**.

Dampers with external gear wheels

According to **chapter 5.5 (Dampers with external gear wheels)**.

Flexible connection

Installations (if not supplied by EUROCLIMA) refer to **chapter 6.4 (Duct connection – airside connection to AHU)**.

Heat exchanger

For all heat exchangers which are connected on-site, irrespective of the medium used (water, water-glycol mixture, aqueous vapor, refrigerant etc), it must be ensured, by the customer, that the resulting assembly meets the pressure equipment directive 'PED' 2014/68/EU.

Field equipment for roof AHUs

Onsite mounted field devices for roof AHUs, for example, damper position motors or pressure switches must be weather-protected in case of insufficient IP class. Furthermore, depending on the installation situation, possible protection against icing.

Freeze protection

The customer must ensure sufficient freeze protection measures. See indications in **chapters 4.2.1 (Potential risks that could arise at the erection site)**, **4.2.2 (Actions to prevent potential risks)**, **6.6 (Freeze protection measures)** and **7.9 (Frost protection for plate heat exchanger)**.

Venting, draining of heat exchangers

See chapter **8.1.3 (Heat exchanger)**.

2.4.2.2 ErP conformity according to commission regulation (EU) Nr. 1253/2014

The ErP commission regulation (EU) Nr. 1253/2014 (energy related products) determines minimum requirements to the efficiency of air handling units. Important points, for which the system operator is responsible, are:

Multi staged control

All AHU's, except those with double application, have to be equipped with multi staged drive or speed control for fans. See **chapter 7 (Electrical connection)**. Or in the special **chapter 7.5 (Variable, frequency-controlled drives (VFD, frequency converters))**.

Filter change indicator

If one or more filter stages belong to the AHU equipment, then they have to be equipped with an optical display or an acoustic warning in the control mechanism. They will be triggered if the pressure drop at the filter exceeds the maximum permissible value. See **chapter 9.4 (Air filters)**.

If above mentioned equipment is not included in delivery by EUROCLIMA, it must to be provided on site.

2.5 Staff selection and qualification

All persons, who are authorized to work on the air conditioner, must have read and understood the complete manual - in particular **chapter 2 (Safety instructions)**. Until this task is completed, the person should not begin to work on the AHU.

All work must be carried out by professionals who have sufficient technical training, experience and sufficient knowledge of...

- Locally applicable safety and occupational health rules
- Locally valid accident prevention regulations
- Locally applicable standards and approved rules of practice.

All professionals have to understand and assess the work appropriately and recognize and avoid potential hazards.

Execution of the assembly, installation, electrical connection, commissioning and disposal:

- by qualified electricians and AHU technicians.

Execution of maintenance / monitoring of the operation:

- by technical staff or trained personnel and qualified electricians and AHU technicians.



WARNING!

Work on optionally installed refrigeration components must be performed only by trained technicians and according to commission implementing regulation (EU) Nr. 2015/2067 certified refrigeration technicians.

Subsequently, warning triangles indicate information and procedures that must be adhered to minimize risks to persons who are entrusted with the work on the air conditioner.

3 Reception control / unloading / transportation to installation site

Note: **Chapter 3.2 (Lifting by forklift / lift truck)**, **chapter 3.4 (Over lifting of AHU sections with crane lugs)** and **chapter 3.5 (Overlifting of monoblocs)** do not apply to flat AHUs (ceiling AHUs), since they are not equipped with base frame.

3.1 Reception control

- Upon arrival of the equipment, please check immediately that the package is intact, complete and damage free.
- Loose supplied parts and assembly materials are in a nylon bag or a specific box in the AHU.
- If damage is found, immediately complete a damage report and send it to EUROCLIMA. Only then can the transport company make a claim with the insurer (It is important to note the damage on the shipping documents with date and signature in the presence of the carrier). Complaints about apparent damaged or missing parts of the delivery cannot be subsequently accepted, if procedures are not followed. In case of complaints, please inform immediately the EUROCLIMA office.
- Depending on the material used and the environmental conditions, a superficial corrosion may occur on components. For example, motor shafts, fan shafts, pulleys, clamping bushes, sheet cutting edges, and so forth. The resulting corrosion layer protects the underlying material from corroding further and does not represent a defect of the component or the device (see also **chapter 9 (Maintenance)**).



WARNING!

The packaged delivered goods may include multiple parts of the device. In this case, each part is secured against falling over. Attention: narrow parts may tip over after removing the safeguard. Secure narrow parts against tipping over!



WARNING!

Thin sheet metals and sharp edges, like roof edges or fins are a source of injury! Gloves, safety shoes and long work clothes must be used.



NOTICE!

If climbing on the AHU is unavoidable during assembly, for example, for connecting the roof plates, it must be undertaken by appropriate measures. For example, using boards, that the weight is distributed evenly, in order to avoid bending of the roof panels or causing dents and scratches



Figure 2: Do not climb on the AHU!

Differentiation of delivery

For unloading, transporting and lifting an AHU to its final installation location, two fundamentally different forms of delivery are to be differentiated.

The delivery form is agreed with the customer in the order clarification and can be:

1) Supplied in parts

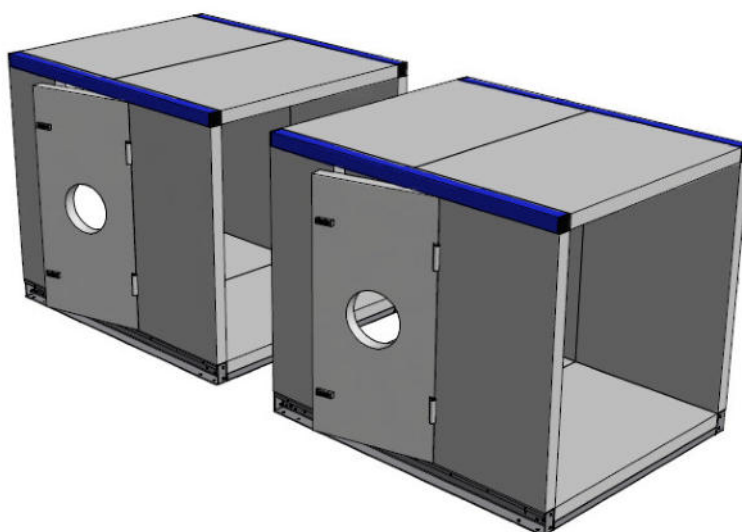


Figure 3: Delivery in parts

- Delivery in parts allow the supply of major equipment in small sections and provides better accessibility and maneuverability.
- Sections have a base frame, on which on each corner a (supplied) crane lug can be attached.
- Size and weight of the sections are indicated on the AHU drawing, see **Figure 10**.

2) Supplied as monobloc

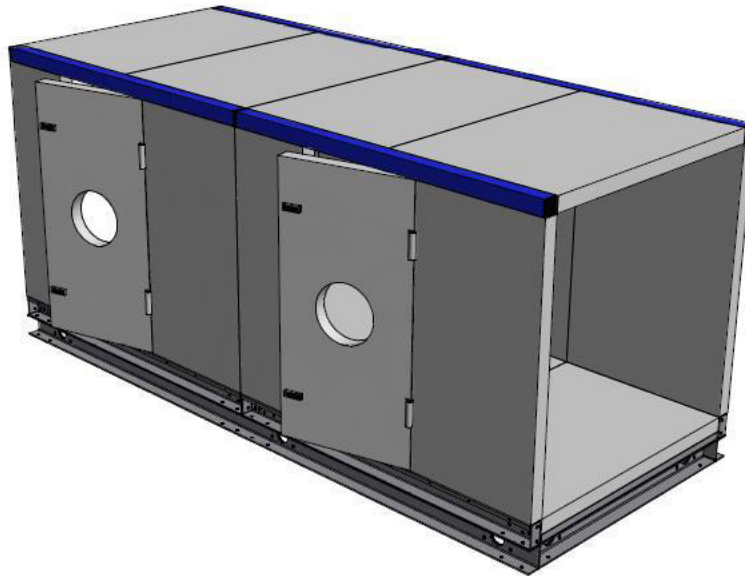


Figure 4: Delivery as monobloc

- The delivery of a whole AHU in one piece is called monobloc.
- If the space conditions allow the delivery of a monobloc, then the assembly at the installation location is much faster.
- Monobloc AHUs have an additional counter-frame on which the components are already pre-assembled.
- The counter-frame is provided with holes diameter 50 mm, which can be used for the overlifting, see **chapter 3.5 (Overlifting of monoblocs)**.
- Size and weight of the monobloc is specified on the AHU drawing and have to be considered for the determination of the load carrying equipment and hoists, see **chapter 3.5.1 (Weight details for monoblocs)**.

3.2 Lifting by forklift / lift truck

In accordance with the EUROCLIMA drawing the AHU will be delivered as monobloc or more delivery section(s). The AHU parts or the monobloc are delivered on pallets and can be unloaded and moved by forklift or lift truck. Forces must always act on the base frame, see **Figure 5**.

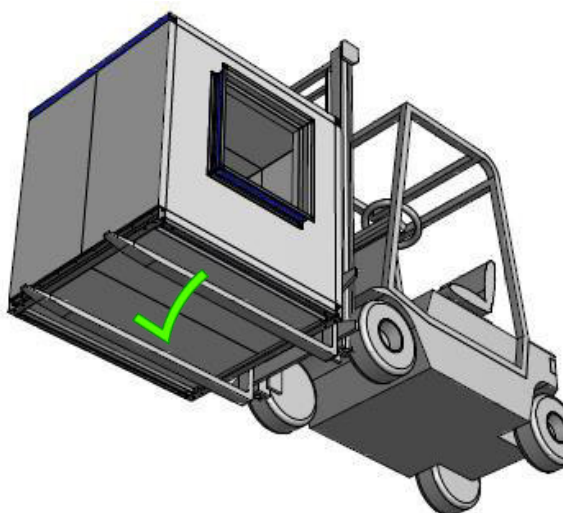


Figure 5: Transport correct

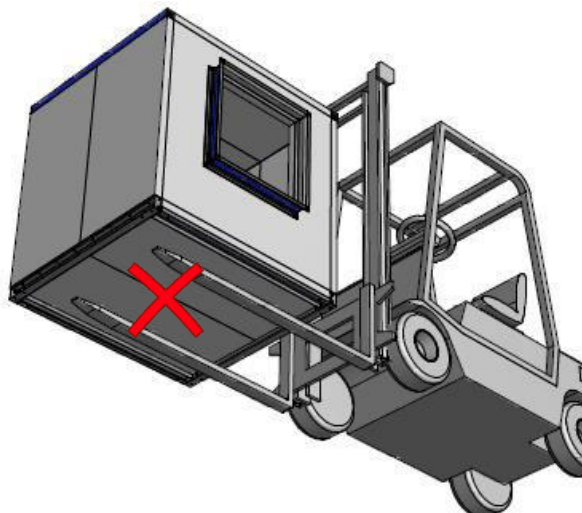


Figure 6: Transport incorrect

Center of gravity must be centrally located between the forks (see **Figure 7**). For larger parts use several lift trucks.

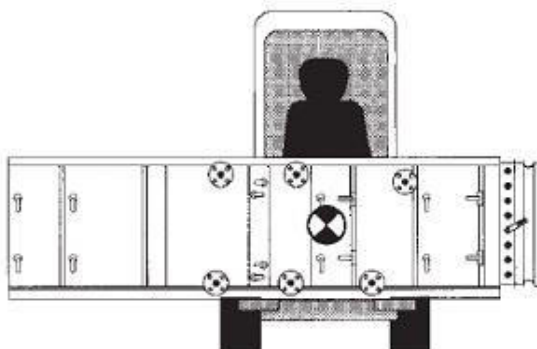


Figure 7: Center of gravity centrally between the forks



For the overlifting directly by crane from the truck, read the following **chapter 3.4 (Over lifting of AHU sections with crane lugs)** for AHU sections or **chapter 3.5 (Overlifting of monoblocs)** for monoblocs.

3.3 Further necessary actions for the overlifting of both, delivery sections on crane lugs as well as monoblocs



WARNING!

- Make sure that nobody is under the raised load.
- Before lifting, check that there are no objects on the load.
- Riding and climbing on the load are prohibited!
- The AHU sections or monoblocs must be lifted with appropriate equipment. For example, a Sling/ belt with hook.
- The ropes, hooks and crane lugs used must be suitable for the load, see chapter **3.4.1 (Control of weight limits of delivery sections)**. The influence of the temperature on the load capacity must be taken into account.
- The recommended minimum load capacity per load carrying equipment is 50% of the total weight of the delivery section or monobloc.
- Only use lifting hooks with locking device. The hooks must be securely fastened before handling.
- The length of the supporting equipment must allow a favorable and steady course. The load carrying equipment is not permitted to exceed an angle of maximum 15 ° to the vertical and must be spread apart to avoid damage to the casing, refer to **Figure 8**.
- The course of the load carrying equipment must be chosen so that overhanging attachments, roofs and so forth will not be stressed or damaged.
- Load carrying equipment shall not run over sharp edges and must not be knotted or twisted.
- The load carrying equipment must be secured against slippage.
- Before lifting, check the screw connections of the crane lugs and the correct assembly as described in chapter **3.4.3 (Mounting of base frame crane lugs)**.
- Lift the AHU very slowly and completely horizontally. When lifting, a maximum lifting speed of 10 m/min is permissible.
- After the section is lifted slowly from the floor for a few centimeters, stop the operation. Now check the correct course of the load carrying equipment and that the lifting and fastening elements are all secure and safe.
- Before recommencing the lift, make sure that there are no detected malfunctions on the suspension mechanism and that the load is safe.
- Avoid jerky lifting.
- Loads are to be lifted and lowered in such a way to avoid unintentional overturning, destruction, sliding or rolling of the load.
- Loads can tip or fall over if the load-bearing equipment is not guided correctly or if force is applied incorrectly. Before lifting, it is therefore important to ensure that the load-bearing equipment is correctly routed and that the force is applied evenly, see **chapter 3.4.4 (Lifting by crane lugs), 3.5.2 (Lifting of monoblocs) and 3.6.2 (Lifting of heat wheel or plate heat exchanger)**.
- Never lift AHU sections or monoblocs on heat exchanger connections or other attachments.

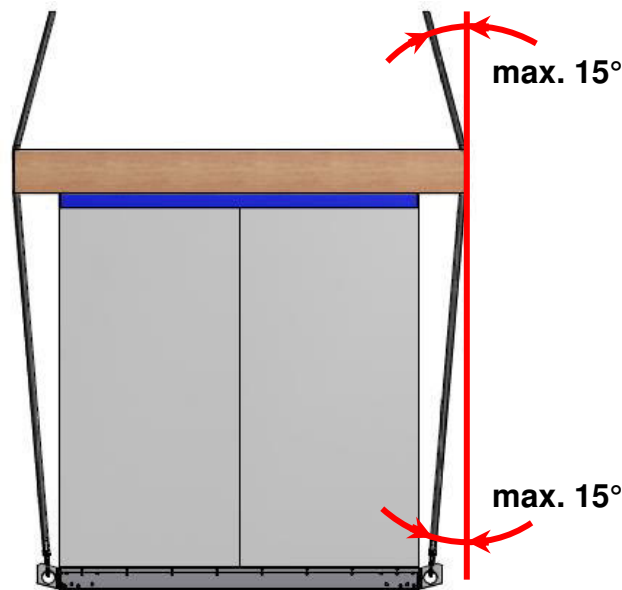


Figure 8: Permitted angle for load carrying equipment guidance

3.4 Over lifting of AHU sections with crane lugs

Chapter 3.4 is only valid for the delivery form “**Delivery in parts (delivery sections)**”.
 For overlifting of AHUs delivered as “Monobloc”, see **chapter 3.5 (Overlifting of monoblocs)**.



- In addition to the actions mentioned here, the instructions according to **chapter 3.3 (Further necessary actions for the overlifting of both, delivery sections on crane lugs as well as monoblocs)** have to be observed.
- Parts of the AHU may only be lifted with lugs individually – never bolt parts together before lifting.

3.4.1 Control of weight limits of delivery sections



Depending on the base frame height (see **Figure 9**), delivery sections may be lifted with lifting lugs up to the following weight, refer to **Table 3**.

Base frame height H (mm)	Max. section weight (kg)
80	1.500
100	1.500
200	4.000

Table 3: Maximum AHU part weights for lifting by crane lugs

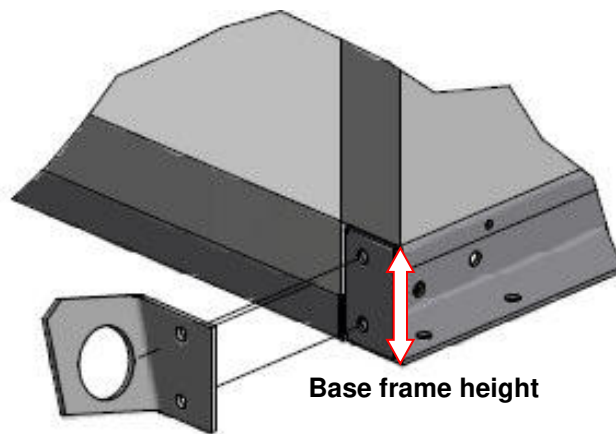


Figure 9: Base frame height

The weight of single delivery sections is shown in the attached drawing (on each delivery section). The delivery sections are marked with L1, L2, L3, etc. on the drawing and with the same number corresponding on the section itself. Example, refer to **Figure 10**: Delivery section L5 = 601 kg

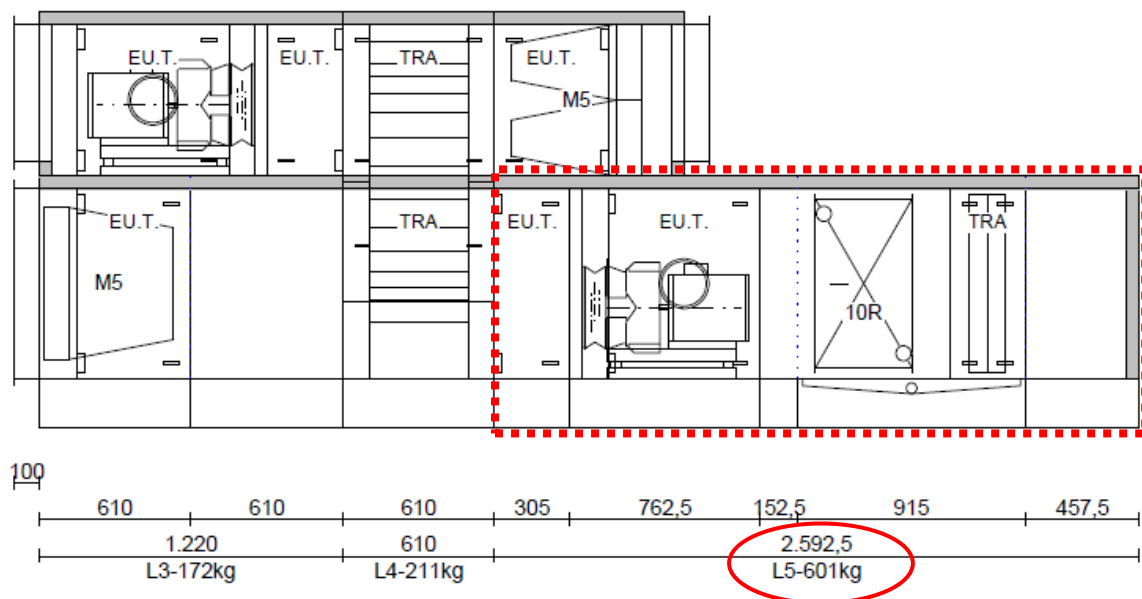


Figure 10: AHU section drawing with weight details

3.4.2 Necessary actions before lifting delivery sections with crane lugs

The delivered and attached accessories such as dampers, flexible connections, hoods, etc. must be removed before lifting, see the **following examples**. This equipment must be lifted separately on a pallet and then be reinstalled.

Example 1:



Figure 11: Delivery section with mounted damper

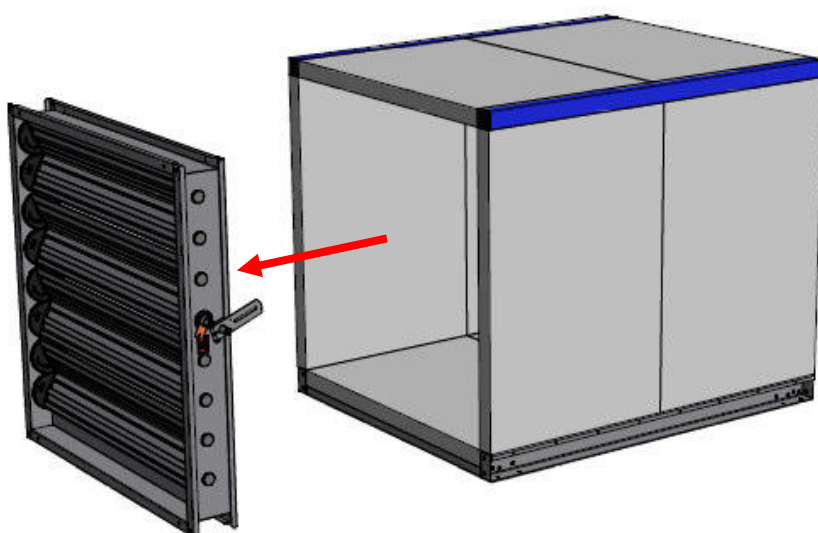


Figure 12: Delivery section with dismounted damper

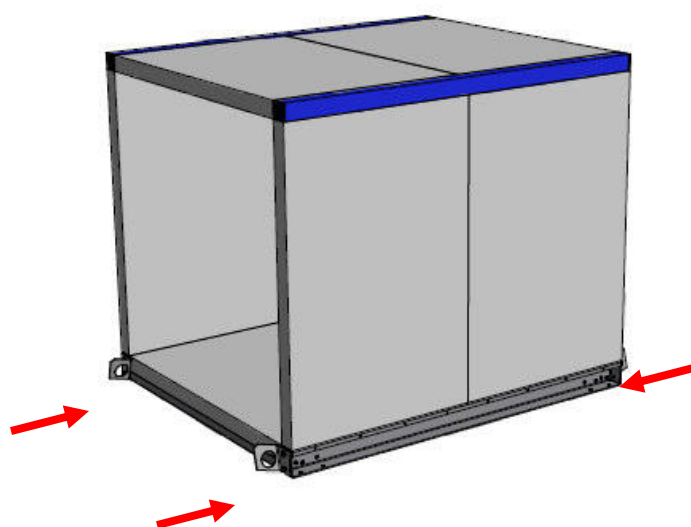


Figure 13: Delivery section with mounted crane lugs

Example 2:

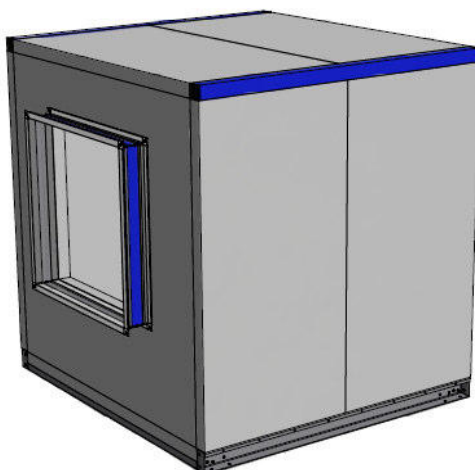


Figure 14: Delivery section with mounted flexible connection

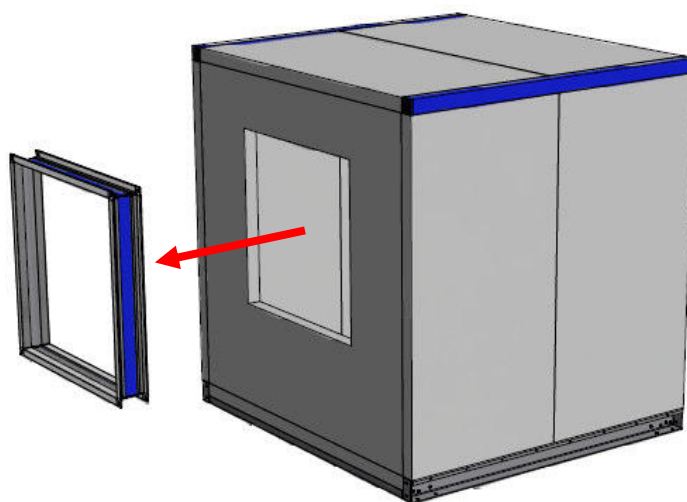


Figure 15: Delivery section with dismounted flexible connection

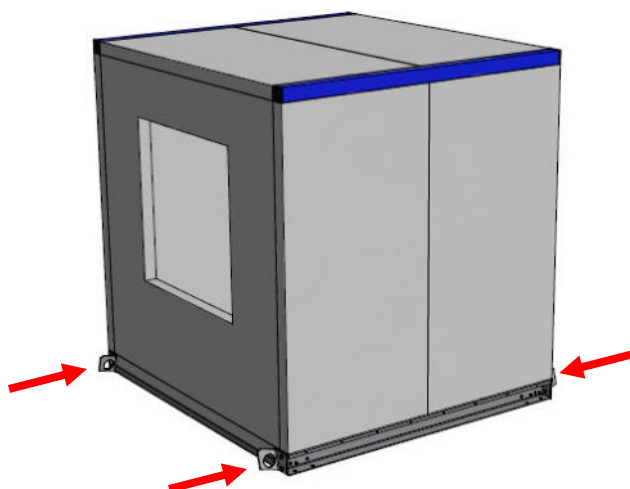


Figure 16: Delivery section with mounted crane lugs

3.4.3 Mounting of base frame crane lugs



WARNING!

For mounting crane lugs on AHU casing sections when plate heat exchanger and heat wheel parts are delivered disassembled see **chapter 3.6 (Lifting when heat wheel or plate heat exchanger casing is delivered in parts)**.

Base frame crane lugs are supplied in two versions and will be attached on the front side of the respective delivery section in accordance with the necessary preparations, described in **chapter 3.4.2 (Necessary actions before lifting delivery sections with crane lugs)**.

Execution of the lifting lugs (see **Figure 17**):

1. Right-side type
2. Left-side type



WARNING!

Attention to correct mounting of the base frame crane lugs according Figure 18:

- blunt corner must point upwards
- bending edge must point toward the center of gravity of the section

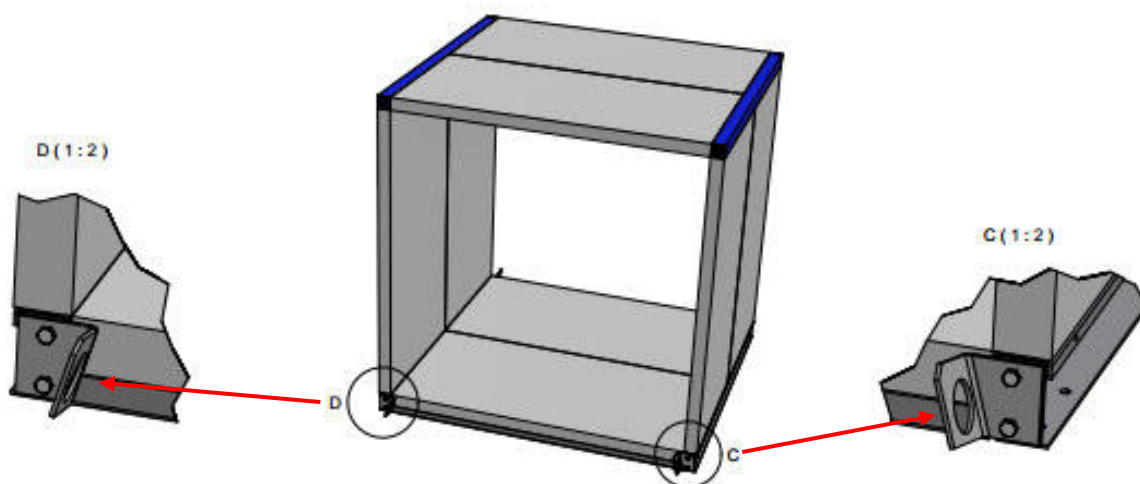


Figure 17: Left-side type and right-side type of crane lugs

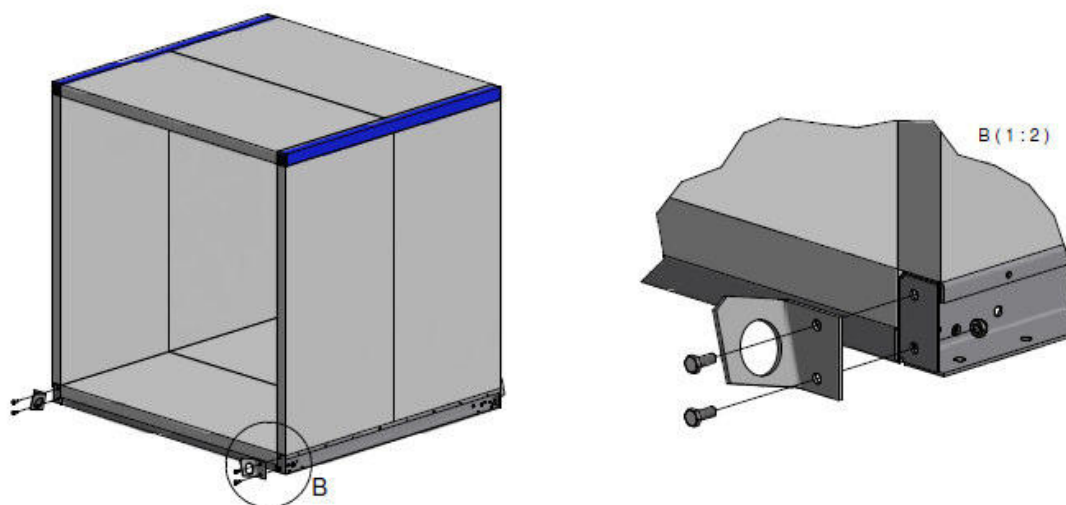


Figure 18: Mounting of base frame crane lugs

Bolts and nuts are delivered with the lifting lugs and must be tightened with the torque according to **Table 4**. If the lifting lugs are already mounted by EUROCLIMA, the screws must be checked before lifting of the AHU.



Base frame height H (mm)	Screw type	Nm	Strength class
80	M8x20	10	min. 8.8
100	M8x20	10	min. 8.8
200	M12x30	30	min. 8.8

Table 4: Tightening torque for screws

3.4.4 Lifting by crane lugs

- The load carrying equipment must not run over the operating side of the AHU, but it must run over the opening or the front side of the AHU see **Figure 19**.
- The force effect must take place uniformly across all four crane lugs of a delivery section.
- After the pre-positioning of the delivery section at the desired position, remove the lifting lugs and use them for the next delivery section.

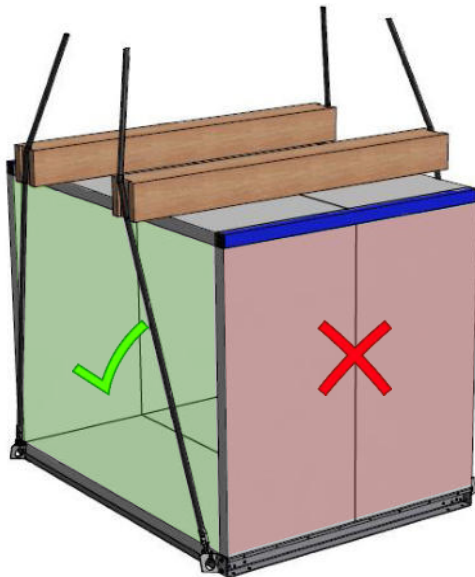


Figure 19: Load carrying equipment guided over front side

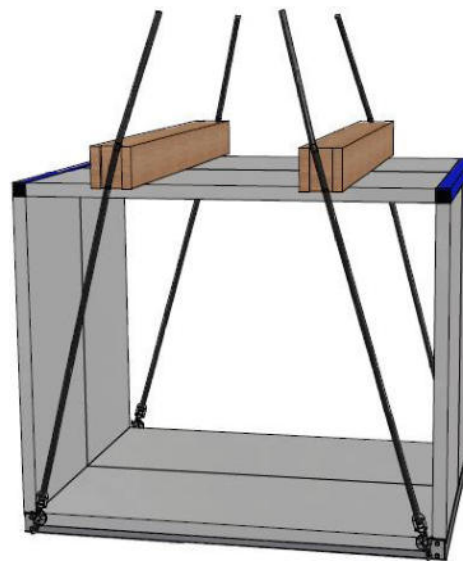


Figure 20: Uniform force effect

3.5 Overlifting of monoblocs

Chapter 3.5 is only valid for the delivery form "Monobloc".

For overlifting of AHUs delivered as "Delivery in individual parts (delivery sections)", see **chapter 3.4 (Over lifting of AHU sections with crane lugs)**.



WARNING!

In addition to the actions mentioned in this chapter, the actions according to **chapter 3.3 (Further necessary actions for the overlifting of both, delivery sections on crane lugs as well as monoblocs)** have to be performed.

3.5.1 Weight details for monoblocs

The weight of the monobloc is specified on the AHU drawing. This weight must be considered at choosing appropriate transportation means.

3.5.2 Lifting of monoblocs

- Monoblocs are generally delivered with a perforated counter-frame – hole diameter 50 mm – for inserting suitable tubes/rods, where the AHU is lifted, see **Figure 21** and **Figure 22**.
- The tubes/rods are not included in the delivery scope, but have to be provided by the company, which is responsible for the lifting operation.
- Two, three or more holes per side of the monobloc are available according to the length and weight of the AHU. Consequently, two or more tubes/rods can be used.
- The determination of the number and the dimensions of the tubes/rods and the load carrying equipment are the responsibility of the performing company.
- We recommend verification of the suitability of the selected tubes/rods by a structural engineer.
- The force effect has to take place uniformly across all tubes/rods.
- The load carrying equipment must be secured to prevent slipping off, e.g. see **Figure 23**.

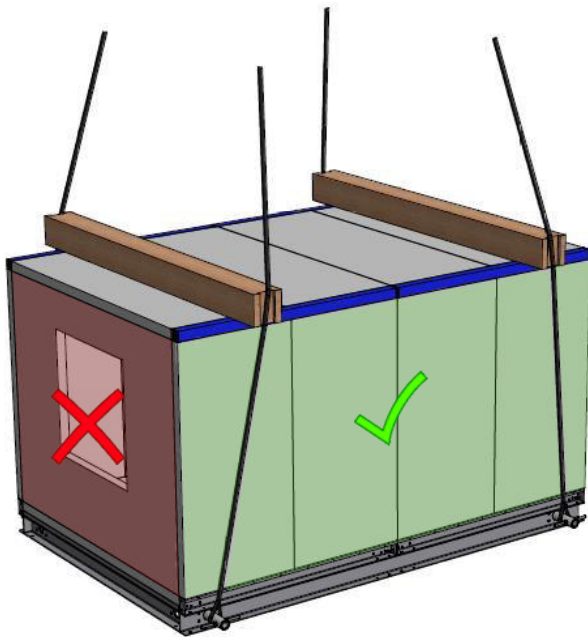


Figure 21: Guiding of load carrying equipment (monobloc)

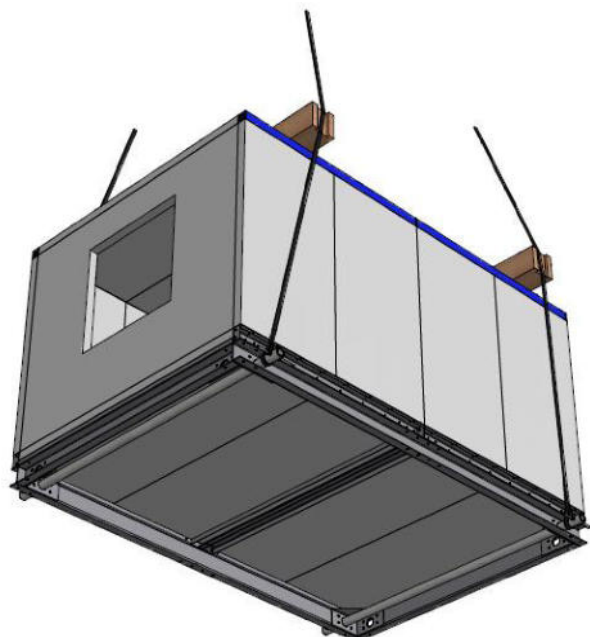


Figure 22: Uniform load of the form tubes



Figure 23: Securing against slippage of the load carrying equipment

Lifting with monobloc crane lifting lugs

- In the counter frame are drilled holes for mounting monobloc crane lifting lugs with bolt connections. The bolts will be mounted already by EUROCLIMA, if this option is agreed. (**Figure 24**).
- The crane lugs are included in the scope of delivery of EUROCLIMA, if the lifting of the monobloc by crane lugs is agreed.
- In accordance with the length and the weight of the monobloc AHU 2, 3 or more crane lifting lugs have to be mounted at each side of the AHU.
- The weight must be applied evenly over all monobloc crane lugs.
- Remove the crane lugs after pre-positioning the AHU.



Figure 24: Factory-made preparation for monobloc lifting lugs



Figure 25: Positioning of the monobloc crane lifting lug at the counter frame



Figure 26: Fixing of the metal sheet and the monobloc crane lifting lug with nuts



Figure 27: Monobloc crane lifting lugs mounted



WARNING!

The lifting of monoblocs is just permitted for the case described above, with the particular crane lugs delivered by EUROCLIMA.

3.6 Lifting when heat wheel or plate heat exchanger casing is delivered in parts

According to the agreed AHU drawing, the casing of the heat wheel or plate heat exchanger section is delivered disassembled.

3.6.1 Assembly order of disassembled delivered casing parts

The following instructions and order must be observed when lifting or assembling the crane lugs of these casing parts (see also **Figure 28**):

1. Lifting of the bottom casing part: only base frame crane lugs are allowed be assembled on the bottom casing part (see **chapter 3.4.3 (Mounting of base frame crane lugs)**).

2. Lifting of heat wheel or plate heat exchanger: for assembling the crane lugs supplied by the component manufacturer and for lifting the heat wheel or plate heat exchanger, the lifting instructions and specifications of the respective component manufacturer must be followed. When positioning the heat wheel or plate heat exchanger in the bottom casing part, ensure that it fits exactly on the profiles provided for this purpose. This specifically applies, if the heat wheel or plate heat exchanger has been delivered in several individual parts. For instructions on the lifting procedure, see also **chapter 3.6.2 (Lifting of heat wheel or plate heat exchanger)**.
3. Lifting of the top casing part: on the top casing part use the supplied flat crane lugs (see **chapter 3.6.3 (Assembly of flat crane lugs)**).

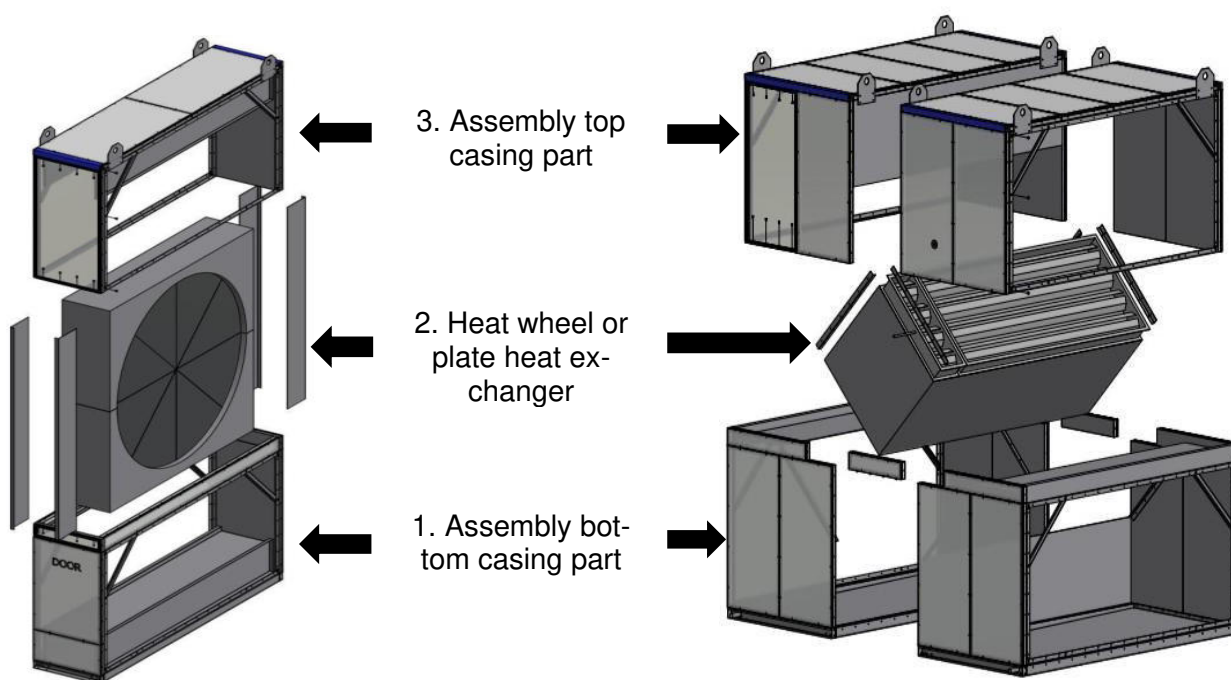


Figure 28: Assembly order of disassembled heat wheel or plate heat exchanger casing section

3.6.2 Lifting of heat wheel or plate heat exchanger

In general, when lifting plate heat exchanger, it must be ensured, that the lifting accessories are aligned vertically. See **Figure 29**.

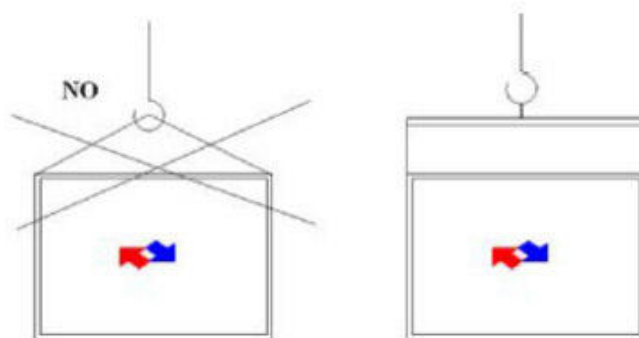


Figure 29: Correct alignment of the lifting accessories when lifting plate heat exchangers

3.6.3 Assembly of flat crane lugs

4 flat crane lugs are supplied loose. These lugs must be assembled as shown in **Figure 31** at the **top casing part** of the AHU.

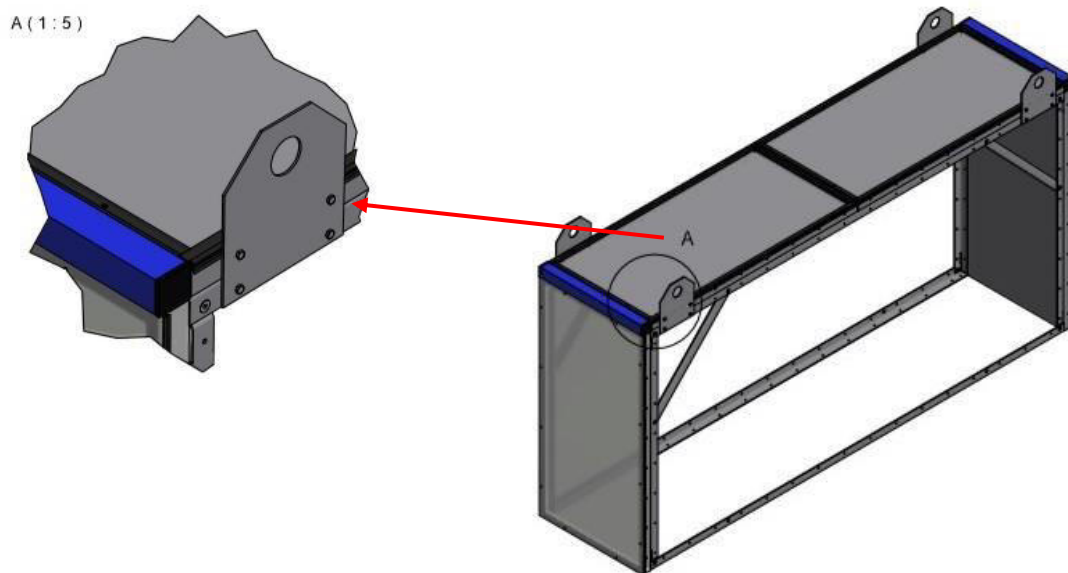


Figure 30: Flat crane lugs

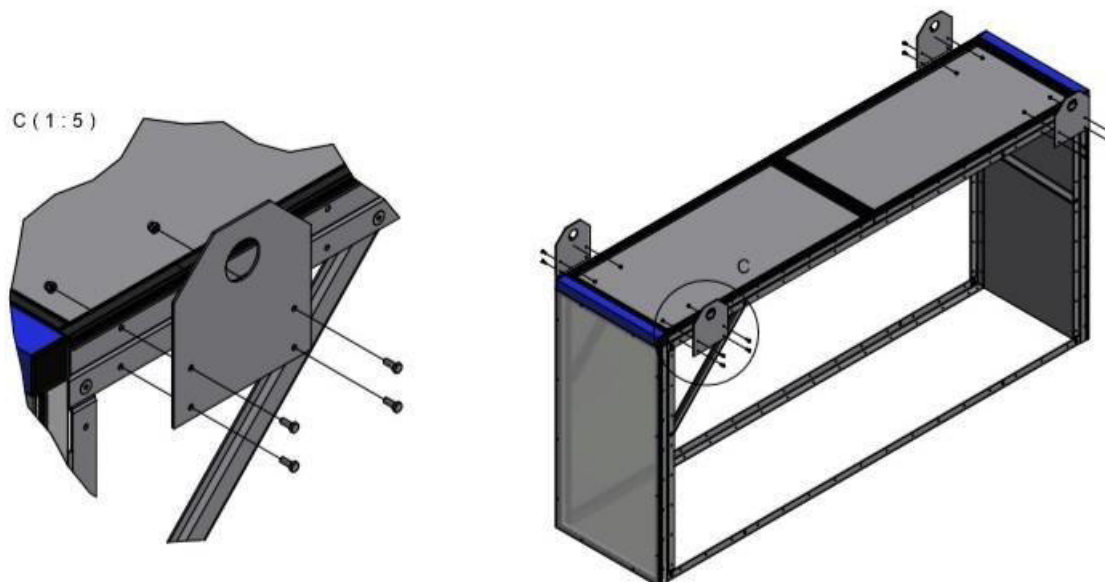


Figure 31: Assembly of flat crane lugs

Bolts and nuts are delivered with the lifting lugs and must be tightened with the torque according to **Table 5**. If the lifting lugs are already mounted by EUROCLIMA, the bolts must be checked before lifting of the AHU.



Bolt type	Nm	Strength class
M6x16	7-8	min. 8.8

Table 5: Tightening torque for bolts



WARNING!

ATTENTION on correct assembly of the flat crane lugs: The flat crane lugs must only be used to lift the top parts of the casing when the heat wheel or plate heat exchanger casing is delivered in parts, as shown in **Figure 31**. The use of the flat crane lugs on all other AHU parts, in particular the lifting of an independent casing part including mounting parts is **not permitted**, see also **Figure 32**!

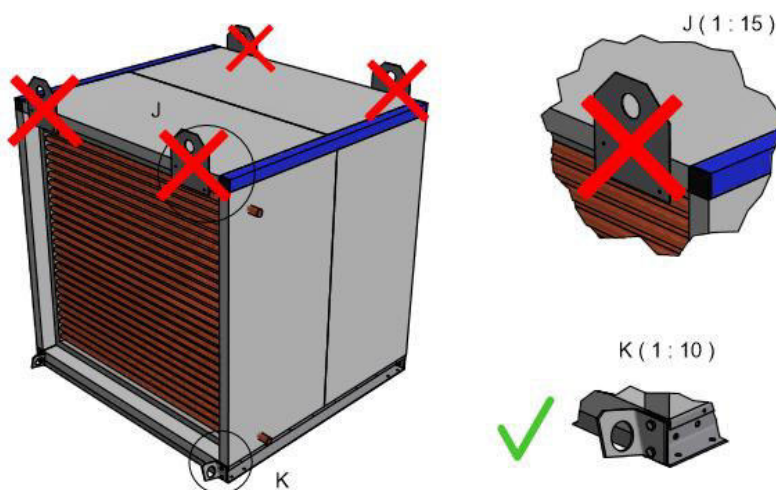


Figure 32: Impermissible assembly of crane lugs

3.7 Storage

The delivery sections are generally packed in nylon. This package is only suitable to protect the AHU during loading and unloading from bad weather, but not for outdoor storage. After unloading, move the device immediately to a storage facility in a dry, well covered area. This is essential for the preservation and protection of the AHU.

Standstill maintenance



NOTICE!

Prolonged standstill times can cause damage on motors, fans or pumps.

To avoid damage on bearings, the rotors should be moved manually a few turns about once per month. If the period between delivery and commissioning is more than 18 months, then the bearing must be replaced. Also components, such as belts, must be checked and if necessary replaced.

Removal of nylon packaging



Remove the nylon packaging after delivery and place the AHUs in a dry, weather protected area: the risk of corrosion due to the lack of ventilation in combination with a higher humidity under the nylon packaging is possible. For example, white rust could form within a short time on galvanized surfaces. It is possible that an excessively high temperature is created under the packaging, which can also cause damages to the components.

If you would like to satisfy everyone, including yourself, the planner, the owner and other observers of the AHU, then we strongly recommend covering to protect the AHU against dirt and damage during the installation and commissioning process. This is always advisable and good practice and site management. see **Figure 33**.

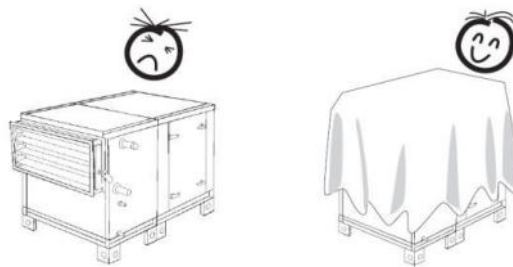


Figure 33: Protection against dirt

4 Foundation / erection

Space requirements:

At the location, for proper maintenance and installation of components there should be adequate space for the devices. Therefore, a free working space of AHU width + 300 mm needs to be available.

At the rear of the machine, a 600 mm width passage should remain free between the machine and the fabric of the building.

According to EN 13053 and VDI 3803 it is not permitted, that the bottom of the AHU replaces the building roof. Furthermore, it is not permitted that the AHU substitutes any part of the building.

4.1 Foundation

Recommended are solid foundations of reinforced concrete, as shown in **Figure 34** left, or strip foundations, as shown in **Figure 34** right. For strip foundations, concrete or steel beams shall be used, see **Figure 34** bottom-right. Steel beams constructions must have an appropriate stiffness in relation to the AHU size. The foundation must be flat and leveled, it should have gradients in any direction or uneven surfaces.

Following conditions must be fulfilled:

- The height difference of the foundation may be **1 mm per meter maximum**. For the entire AHU length and width, a height difference of **5 mm maximum** is acceptable.
- If the conditions mentioned before are not fulfilled due to uneven foundations or sagging of the foundation, measures for rectifying the conditions must be taken (e.g. distance sheets with appropriate thickness).

Attention!

If these structural conditions are not met, this could be the cause problems including of jammed doors and dampers and other problems with the AHU.

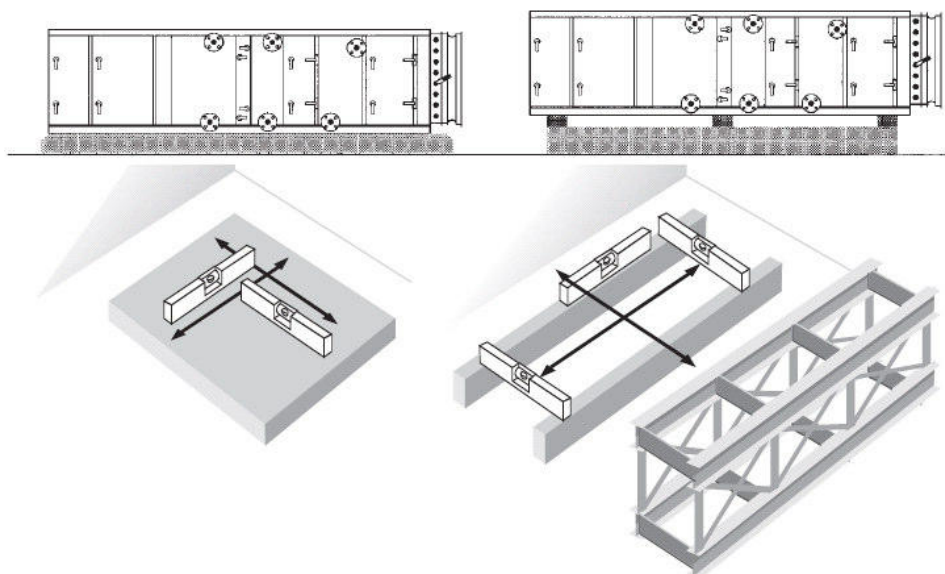


Figure 34: Solid foundation and strip foundation

AHUs must weigh down the foundation on the base frame in longitudinal and cross direction either in strips or points. It is important to distinguish whether the AHU is resting on the base frame, or whether it is equipped with device feet supplied by EUROCLIMA.

Depending on the customer-specific design of the AHU, EUROCLIMA unit feet can be supplied in three versions:

- height-adjustable without rubber base, see **Figure 35**
- height-adjustable with rubber base, see **Figure 36**
- without height adjustment, see **Figure 37**



WARNING!

A stiffening bracket is always required for height-adjustable unit feet (with and without rubber base), see **Figure 35** and **Figure 36**! If this is not included in the EUROCLIMA scope of delivery, the stiffening bracket must be retrofitted by the customer on-site before erection the AHU.



Figure 35: Height-adjustable unit foot with stiffener without rubber base



Figure 36: Height-adjustable unit foot with stiffener and with rubber base



Figure 37: Unit foot without height adjustment



WARNING!

Exact information regarding the correct unit foot version to be mounted on the respective AHU can be found in the corresponding unit drawing (see **Figure 38** and **Figure 39**) or in the technical data sheet.

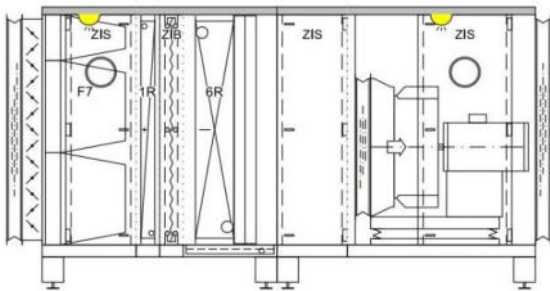


Figure 38: AHU drawing with unit feet with height adjustment

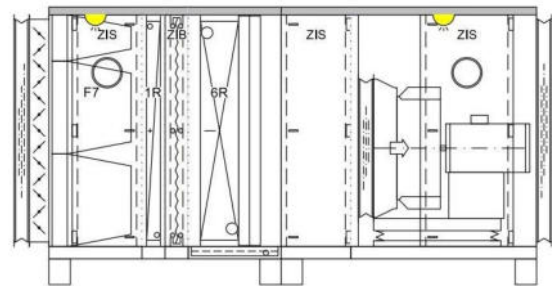


Figure 39: AHU drawing with unit feet without height adjustment

The maximum permissible load limits per unit foot must not be exceeded and are as follows:

per unit foot with height adjustment with stiffener - without rubber base (see Figure 35)	max. 500 kg
per unit foot with height adjustment with stiffener - with rubber base (see Figure 36)	max. 300 kg

Table 6: Max. permissible load limit for unit feet

Distance of the contact surfaces in longitudinal direction of the AHU (air flow direction) when resting on the base frame:

The distance of the strips or points contact surfaces in the longitudinal direction of the AHU (air direction) should normally not be more than 1,500 mm.

Distance of the contact surfaces in longitudinal direction of the AHU (air flow direction) when resting on device feet:

If the AHU is equipped with device feet supplied by EUROCLIMA, the positions of the device feet are shown in the device drawing by EUROCLIMA. In this example, each device foot forms a contact surface on the foundation.

Distance of the contact surfaces in cross direction of the AHU (across the air flow direction) when resting on the base frame:

AHUs with an internal device width up to 2,135 mm do not require any contact surfaces in the cross direction of the device. For wider devices, an additional central contact surface is not absolutely necessary, but it is recommended especially for wide and heavy sections. Instead, a strip-shaped contact can also be placed under the base frame cross members. On request, EUROCLIMA will provide a base frame drawing showing the contact surfaces of the base frame.

Distance of the contact surfaces in cross direction of the AHU (across the air flow direction) when resting on device feet:

If the AHU is equipped with device feet supplied by EUROCLIMA, the positions of the device feet are shown in the device drawing from EUROCLIMA. In this case, each device foot forms a contact surface on the foundation. Normally, 4 device feet are fitted for all device widths per delivery section (at the section corners); further contact points are generally not required.

In special cases (with particularly wide and heavy unit sections) an additional central contact surface can additionally reduce the static and dynamic deformation. On request, EUROCLIMA will provide a foundation drawing showing the contact surfaces of the device feet.

The installation of special underlay with impact sound insulation properties and high specifications is highly recommended. It is recommended, depending on the location of the erection, to underlay the AHU with cork, Mafund plates or Sylomer strips. The use of absorbent material must be adjusted to the load to achieve optimum noise insulation and efficiency. Each contact point between AHU and foundation must be noise insulated. Additionally, the respective design criteria of the provider must be complied. For the weight specifications of the AHU see the technical data sheet.

4.2 Erection

4.2.1 Potential risks that could arise at the erection site

- For heating or cooling water, water-glycol circuits or steam lines for heating or cooling these can be connected to the AHU. There may also be internal (closed) water or water-glycol circuits. In addition, a humidifier with inlets, outlets, overflows may be installed for humidification.
- The pipes or hoses and their fittings can leak or become loose, so that inside or outside of the AHU water or other substances are evident through the resulting leakage.
- Cooling processes can cause dehumidification and the associated formation of condensation in the AHU. The AHU is therefore equipped with condensate collecting trays and outlets. Nevertheless, condensate can exit from the AHU in the event of performance issues by the device, under prohibited or extreme operating conditions. Errors on the AHU, prohibited or extreme operating conditions can also cause the formation of condensate on the outer surfaces of the AHU, which may cause dripping.
- Internal and external cleaning (also wet cleaning) can be performed on the AHU. When performing this work, leaking / dripping of the cleaning fluid is possible.
- All parts which are in contact with water inside and outside of the AHU may freeze under certain environmental conditions. Particularly, the following components have an increased risk of freezing:
 - o Condensate pans of heat recovery systems and heat exchangers inclusive pan nozzles, siphons and drains
 - o Freezing condensate directly on the heat recovery system and heat exchanger

- Freezing operation fluid of heat exchangers with/without glycol
- Humidifier section (spray humidifier and honeycomb humidifiers are not applicable for outside AHUs)
- All areas and parts of the AHU which are exposed to the weather.

4.2.2 Actions to prevent potential risks

These risks can be prevented by the following actions:

- The position/ location of the AHU does not really matter. For example, whether or not it is situated on a floor, heightened on a frame or suspended from the ceiling. The important aspect is that there is guaranteed access and appropriate space onsite for assembling and maintenance of the AHU.
- Depending on the installation, suitable protective actions must be taken to ensure that persons, buildings and equipment are not at risk from falling parts (e.g. tools, screws, etc.) and possible drainage of water or other fluids.
- The ground around the installation site should be watertight and have with a downward gradient to a sufficiently sized outlet for drainage.
- Where this condition is not met, the installation of the AHU in a sufficiently drainage system/ pan with an outlet may be an appropriate solution.
- A humidity sensor with an alarm transmitter can offer additional protective support in critical operating conditions.
- For AHUs suspended from the ceiling, it is recommended, in any case, that a sufficiently dimensioned collecting tray with outlet, positioned under the AHU is acquired.
- To avoid components freezing, the customer must ensure that the AHU is protected against adverse weather conditions and resulting temperature variations, which could lead to such problems. Additionally, the customer must take further measures to provide freeze protection. Some recommendations for that purpose are:
 - Complete drainage of the heat exchanger when it is not in use
 - Usage of water/glycol mixtures with adequate glycol concentration as fluid for the heat exchanger. (Attention: Performance loss must be considered)
 - Control-technological frost protection

The customer has to make decisions on appropriate actions, through their knowledge of the situation and conditions on site. The installation technician and the operator of the AHU have to ensure preventive actions and protection, in accordance with the instructions mentioned herein. In this context, it is recommended to have insurance against damage caused by water and other liquids.

EUROCLIMA is not liable for damages that may arise due to leakage of the AHU, of fittings, of pipes or hoses or due to condensation.

4.2.3 General indications for the erection

If floor AHUs are to be mounted on the ceiling, then the device must be fixed with the base frame on an encompassing suspension system (see **Figure 40** right). The handling of the structure-borne noise insulation is resemblant of for floor AHUs.

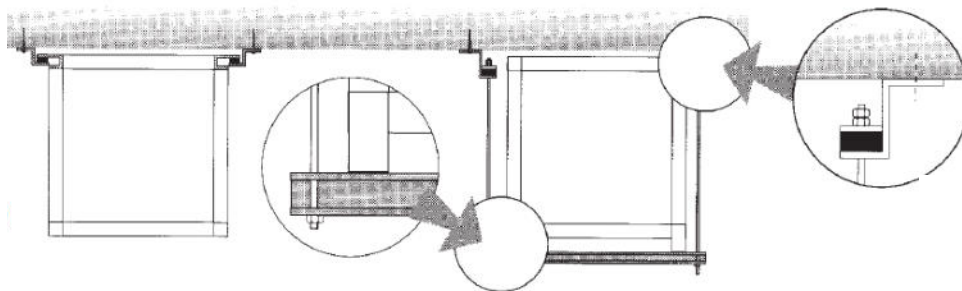


Figure 40: Suspension of ceiling AHUs

AHU which are not designed to stack, should not be stacked (one on top of the other). Spray humidifier will need feet depending on the foundations, either on one side or both sides, which are supplied if ordered or requested (refer to **Figure 41**).

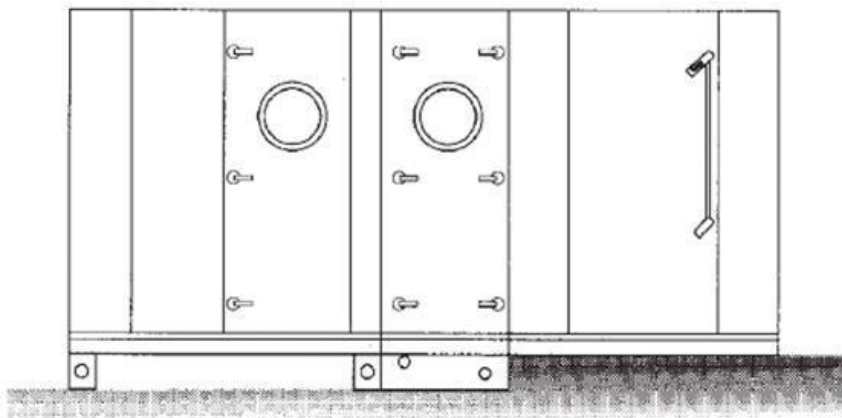


Figure 41: Spray humidifier with both sides feet

Treatment of GfK air washer and plastic parts

Thermoplastics are strong and have a similar steel impact and shock sensitive. At low temperatures an additional brittleness can develop. Therefore, treat and protect the pieces of fiberglass or plastic such as piping, nozzles and droplet eliminators with caution and care.

4.2.4 Special guidelines for flat AHUs – ceiling AHUs

Usage

- For the suspension from a ceiling.

Assembly of the individual components of the flat AHUs

- The individual components are bolted together by use of an Easy Connection system – see **Figure 58 (chapter 5.1.2)**.
- The assembly should be undertaken on the ground, since the Easy Connection on the top side of the flat AHU may no longer be accessible after positioning on the ceiling.

Suspension

- The dimensioning and construction of the suspension and fixture must be carried out on site and has to be compatible to the size and weight of the flat AHU.
- All necessary material for suspending and fixing the flat AHU on the ceiling, like longitudinal and transverse profiles for the bottom side, including threaded rods, dowels, etc. must be provided by the customer.

- The suspension can consist only of transverse profiles (transversely to the air flow), as shown in **Figure 42**, or of transverse profiles with additional longitudinal profiles (longitudinal to the air flow), see **Figure 43**.
- In order to prevent deflection of the bottom panel, the maximum distance of the supporting profiles should not exceed 1 m to each other.
- Profiles must be positioned so that downward-opening doors, positions and functioning of wells, etc. are not blocked or hindered, see **Figure 42**.
- Longitudinal profiles are intended to support the aluminum profiles on the bottom edges of the flat AHU.
- Furthermore, it is recommended that the supporting profiles should be screwed together with the aluminum profiles of the bottom edge for secure positioning e.g. by means of threaded rivets.
- To avoid transmission of structure-borne noise, a recommendation is to use sound-absorbing material between suspension and AHU. A possible solution is shown in **Figure 40**.

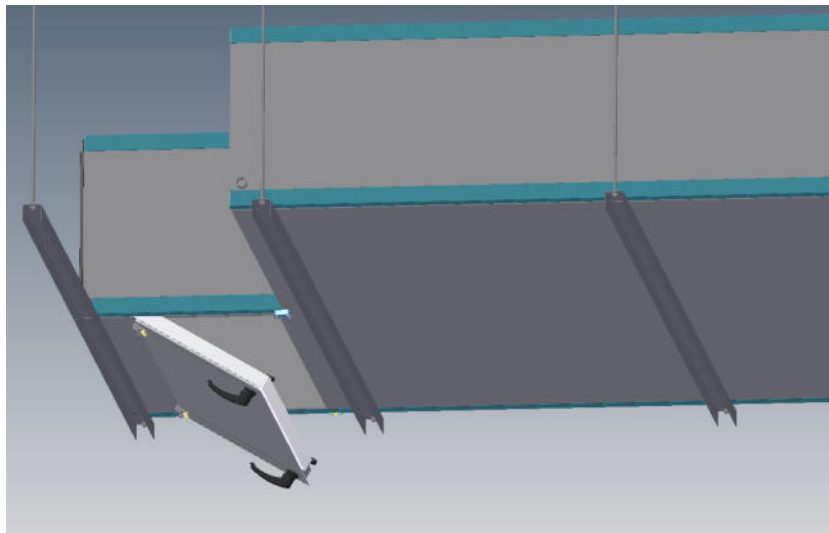


Figure 42: Suspension with transverse profiles

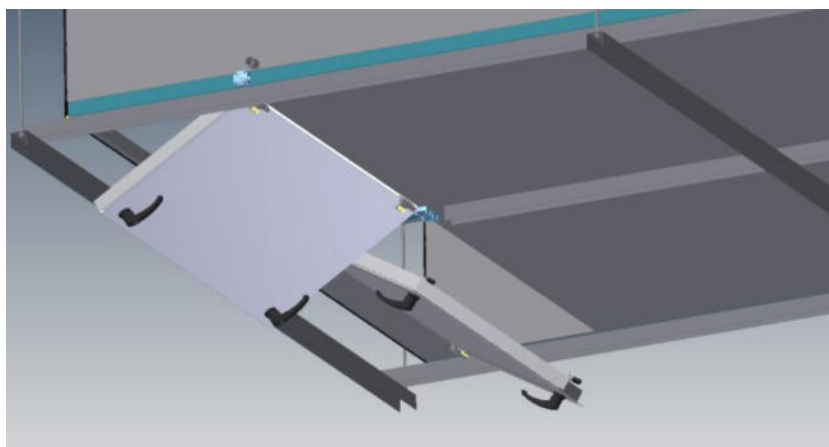


Figure 43: Suspension with longitudinal and transverse profiles

5 Assembly



NOTICE!

If climbing on the AHU is absolutely necessary during assembly, for example, for connecting the roof plates, appropriate measures must be put in place. For example, using boards, that the weight is distributed evenly, in order to avoid bending or denting of the roof panels.



Figure 44: Do not climb on the AHU!

5.1 Assembly of casing

5.1.1 Actions before the assembly of casing

If several AHU sections must be connected, then the procedure after the pre-positioning of the sections is as follows:

Remove crane lugs

If lifting lugs are mounted, remove them. To set the AHU in the exact assembling position, it can be moved by a rod (leverage). Use the rod only on the base frame profile.

Applying sealing material

The supplied self-adhesive sealing strip (**Figure 45**) must be applied at all section connections evenly before assembling, see **Figure 46**.

Following section connection points must be sealed:

- The flange areas between sections.
- Between duct and casing connection openings.
- Between connection flange and dampers, flexible connection, weather protection grid, sand trap louvre, intake hoods etc.



Figure 45: Sealing strip

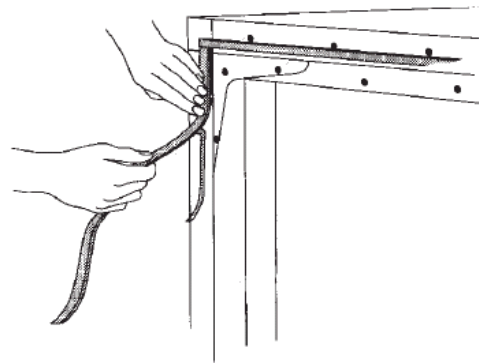


Figure 46: Applying the sealing strip

Section connection points, screw connections between inside and outside, connection openings and bushings, and all other openings, which penetrate or protrude from the casing must additionally be sealed with SIKAFLEX (For example, heat exchanger connections, mounting screws, duct connections, measuring openings, etc.), as shown on **Figure 47** and **Figure 48**.

For roof AHUs as well as at device separations directly before or after a wet area (For example, cooler, humidifier, spray humidifier), special actions must be done for sealing. For that purpose, the supplied sealing agent Sikaflex (**Figure 47**) must be used. Further information will follow in **chapter 5.1.5 (Special features for roof AHUs and device separations at wet areas)**.



Figure 47: Sealing agent (Sikaflex)

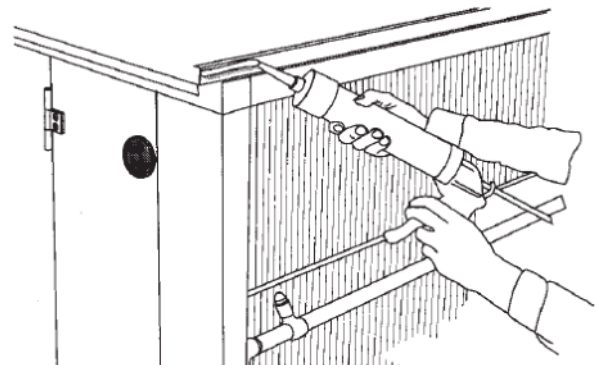


Figure 48: Applying the sealing agent

Connecting the AHU sections

The AHU sections must be aligned precisely and the front sides shall be exactly parallel to the other. If necessary, some minor adjustments can be made by placing steel plates under the section.

The AHU sections can be pulled together with belts/ slings, which attach on the base frame, as shown in **Figure 49** and **Figure 50**.



Figure 49: Pulling AHU sections together



Figure 50: Pulling AHU sections together (detail)

Remove external panels at butt joints

For aligning and connecting the delivery sections, the external panels need to be removed, unless heat exchanger fittings or similar attached components prevent this.

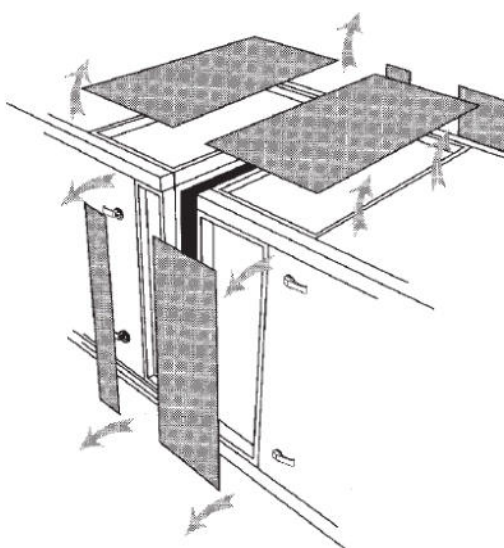


Figure 51: Removable external panels

Procedure:

- **ZHK 2000 – Housing type: “snap-in” construction** – To remove the external panel - start at the corners - use a screwdriver – refer to **Figure 52**. After removing the external panel, remove the insulation. Undertake caution to prevent any damage either to the panel or to the device!

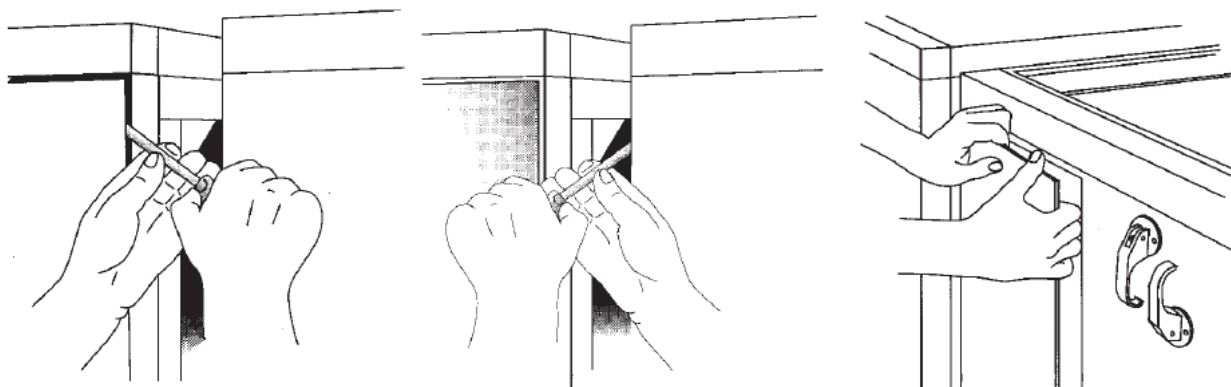


Figure 52: Removal of the external panel

- **ZHK INOVA and ZHK VISION – Housing type: screwing construction** – The external panel is located on the inner panel and is screwed to it using TORX screws (see **Figure 53**). After removing all screws, the outer panel can be removed and the insulation can then be removed. Any door frame plugs can also be removed to gain access for bolting/ screwing.



Figure 53: Fitting the external panels



Figure 54: External panel with unscrewed screws



Figure 55: Removal of the external panels

5.1.2 Standard connections and connection components

The connection via base frame must be always made at all AHUs, see **Figure 56** and **Figure 57**.



Figure 56: Hexagon bolt with locknut M8x20 / M10x30 / M12x40

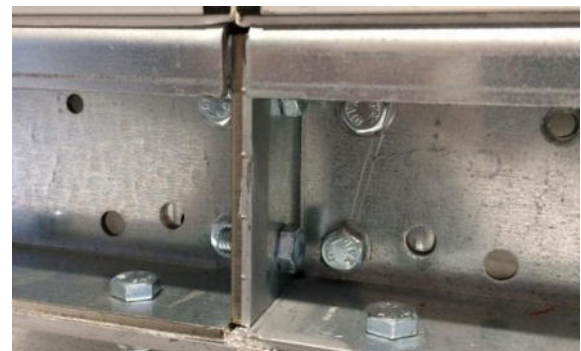


Figure 57: Bolt connection of base frames

Additionally, to the base frame, there are other possibilities for connecting AHU parts. These are dependent on the AHU series/type and are listed below, ranked by the execution sequence and configuration.

ZHK INOVA and ZHK VISION:

1. Easy Connection, see **Figure 58** up to **Figure 61**
2. Connection angle, connection frame, see **Figure 62** up to **Figure 66**
3. Connection via panels, see **Figure 65** and **Figure 67**

ZHK 2000:

1. Connection angle, connection frame, see **Figure 62** up to **Figure 66**
2. Connection via panels, see **Figure 65** and **Figure 67**



Figure 58: Easy Connection

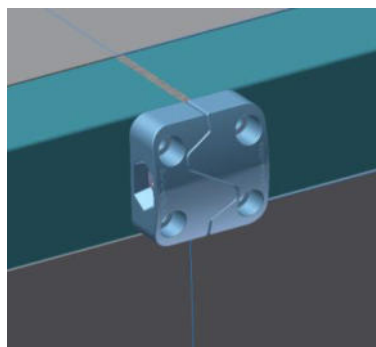


Figure 59: Connection via Easy Connection

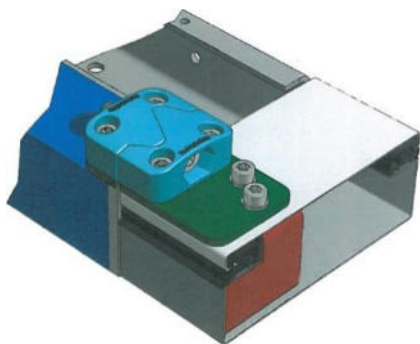


Figure 60: Easy Connection at two-storey AHUs

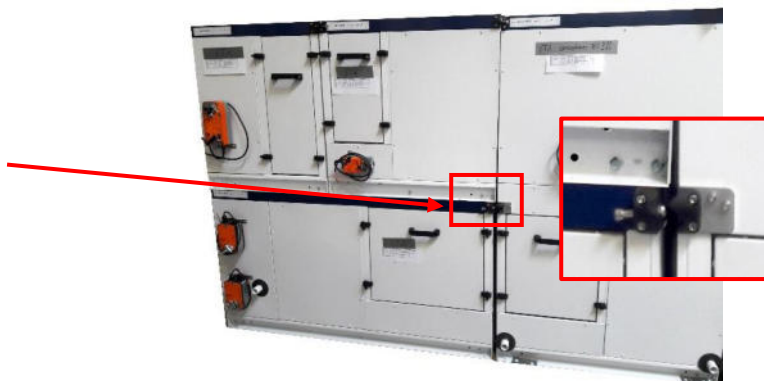


Figure 61: Mounted Easy Connection at two-storey AHUs

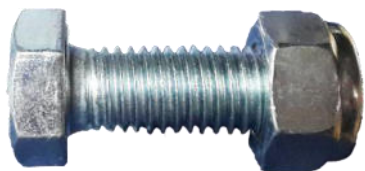


Figure 62: Hexagon bolt with locknut M8x20

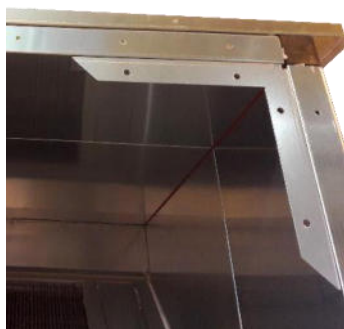


Figure 63: Connection angle



Figure 64: Connection via connection strengthening angle



Figure 65: Hexagon bolt with nut M6x16



Figure 66: Connection frame

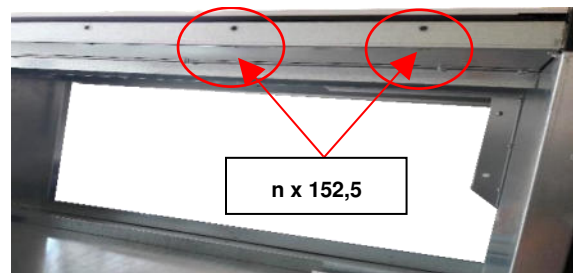


Figure 67: Hole spacing of the internal panel

5.1.3 Detailed solutions and connection components

- **Connection between door frame / door frame and door frame / internal panel**
Screw spacing: 152 mm



Figure 68: Tapping screw $\varnothing 8 \times 11$



Figure 69: Tapping screw Ejot SHEETtracs® $\varnothing 70 \times 16$

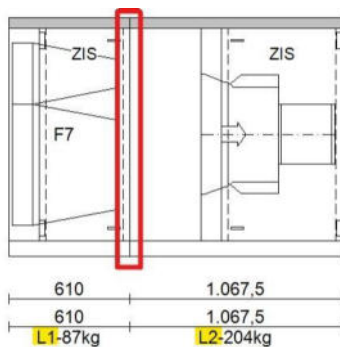


Figure 70: Joint on the AHU drawing



Figure 71: Connection between door frame / internal panel

- **Connection of 3 mm thick casing components without holes**



Figure 72: Self-tapping screw $\varnothing 6,3 \times 22$



Figure 73: Application of self-tapping screws

- **Connection of internal panels with the front side of the casing**



Figure 74: Self-tapping screw TORX 4,8 x 19



Figure 75: Joint on the AHU drawing



Figure 76: Joint at the AHU

- **Connection of internal and external panel (ZHK INOVA and ZHK VISION)**



Figure 77: Self-tapping pan head screw TORX 25 ø4 x 25

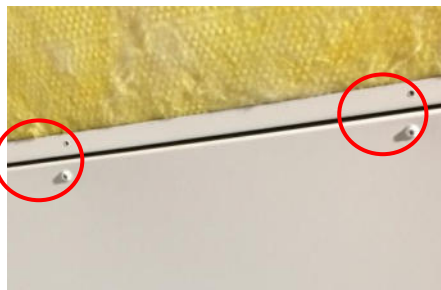


Figure 78: Screw connection of internal and external panel

- **Connection of roof plates**

Screw spacing: minimum 305 mm



Figure 79: Hexagon bolt with nut (stainless steel) M6x16



Figure 80: Connection of roof plates

- **Connection of double-deck units on top of each other**

The position and number of screws is determined by the pre-punched holes in the base frame.



Figure 81: Self-tapping screw $\varnothing 6,3 \times 22$



Figure 82: Connection of two units on top of each other

- **Connection of connection frame and partition walls**
Screw spacing: according holes in the connection frame



Figure 83: Self-tapping screw $\varnothing 6,3 \times 22$

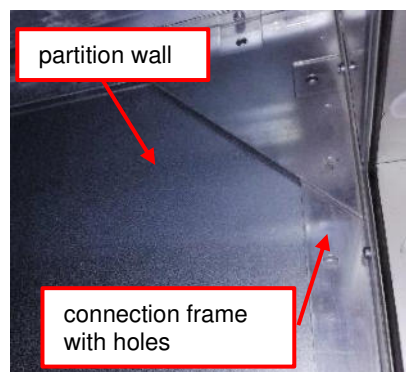


Figure 84: Connection frame and partition wall (not screwed yet)



Figure 85: Screwing of the parts

5.1.4 Establishing the screw connection of AHU parts

The exact alignment of the AHU parts and pulling together AHU sections as close as possible, as described in **chapter 5.1.1 (Actions before the assembly of casing)**, are vital for establishing easier insertions of bolts and screws through the corresponding holes.

The precisely aligned and parallel flanges are connected with the enclosed bolts. Initially, all bolts are only loosely screwed as follows:

- In the base frame profiles (**Figure 86 left**).
- If accessible, in the connection angles located in the upper corners of the AHU (**Figure 86 bottom center**).
- If accessible, in the parameter of the connection frame (**Figure 86 top center**).
- In the panels (**Figure 86 right**).
- For roof AHUs in the roof flange.

If only one side is accessible (panels and connection frame) the tapping screws $\varnothing 8 \times 11$ or Ejot $\varnothing 8 \times 16$ should be used, otherwise bolts and nuts (all supplied separately):

- Bolts M8 x 20 for connection angles and base frame
- Bolts M6 x 16 for connection frame and panels

For the tightness at least every second hole (bolt spacing 305 mm) shall be used.

After placing all the screws loosely, they shall be tightened, starting with the base frame, in two stages.



NOTICE!

It is important, to initially tighten the bolt connections at the base frame. This is to ensure an exact connection of the AHU parts.

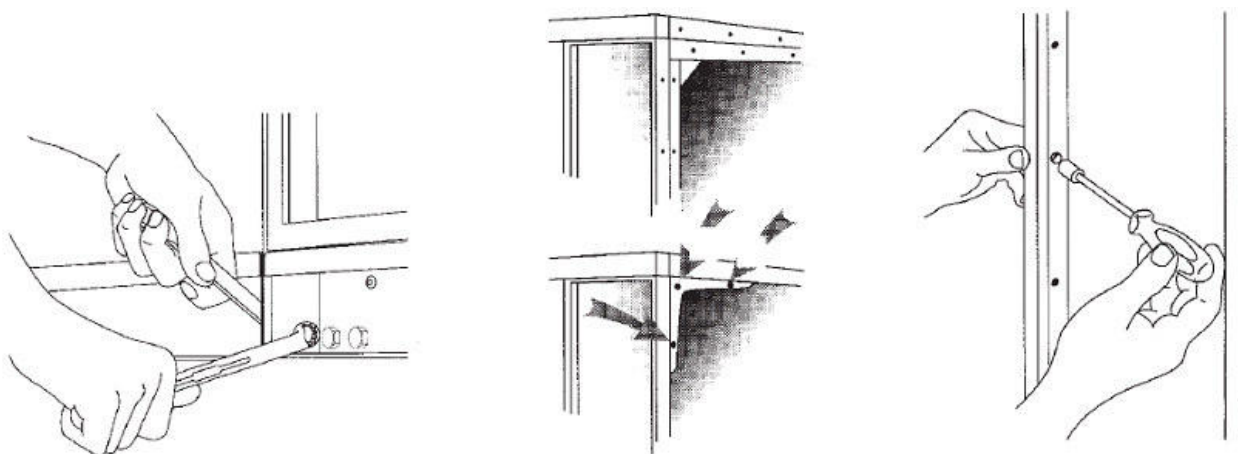


Figure 86: Bolting delivery sections together

Reinsert the insulation and remount the external panel

At AHUs of the series ZHK 2000 in outdoor execution or with outer aluminum panels, the white protective film must be removed from the sealing tape before mounting, this provides extra protection and adherence. (**Figure 87**).

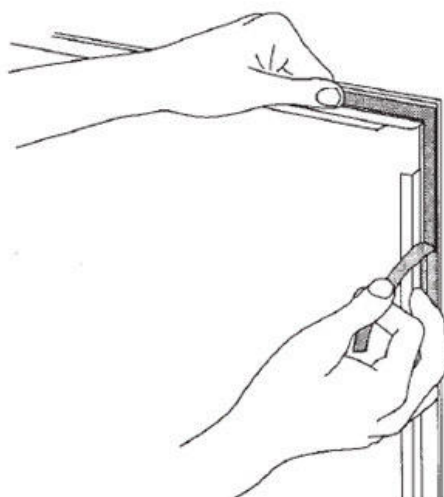


Figure 87: Removing the protective film

- **ZHK 2000 – Casing type: Snap-In-Construction**

Start at the bottom to mount the external panels. This should be done carefully to avoid any damage to the panel (**Figure 88**).

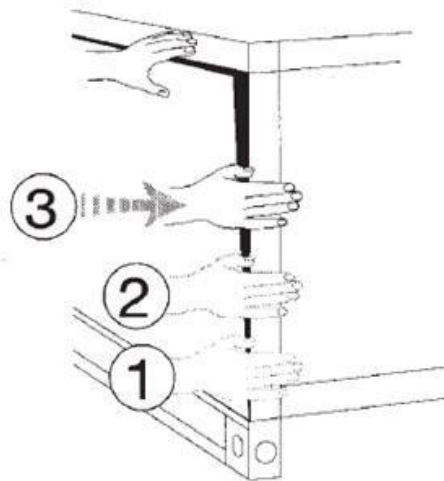


Figure 88: Pushing in the external panel

- ZHK INOVA and ZHK VISION – Casing type: Screwing-Construction

The outer panel lay on the inner panel and fixing with TORX-screws (see **Figure 89**, **Figure 90**, **Figure 91**).



Figure 89: Insertion of the outer panel



Figure 90: Outer panel not screwed



Figure 91: Screwed panel

5.1.5 Special features for roof AHUs and device separations at wet areas

For roof AHUs as well as at device separations directly before or after a wet area (e.g. cooler, humidifier, air washer), special actions for sealing the AHU must be carried out:

1. The sealing agent (Sikaflex) has to be applied instead of the sealing strip across the whole flange of the AHU, 5 mm from the inner edge (see **Figure 93** and **Figure 99**). Immediately thereafter, the relevant delivery sections have to be joined together and then bolted.
2. If the AHU separation is **accessible at the inside via a door** (see **Figure 94**), then the joints (**Figure 95**) have to be closed over the entire outline with the supplied sealing agent (Sikaflex) after bolting together the delivery sections.

Note: To prevent leaks, these actions shall also be performed when extreme operating conditions are expected or wet cleaning is planned!

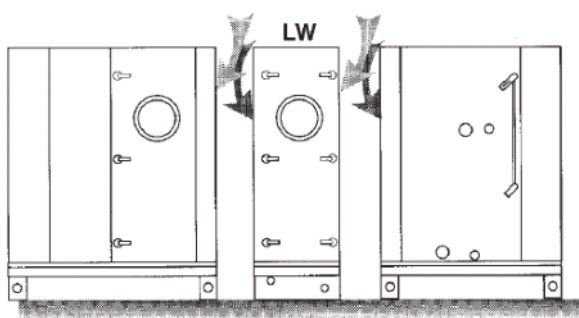


Figure 92: Sealing surfaces at wet areas

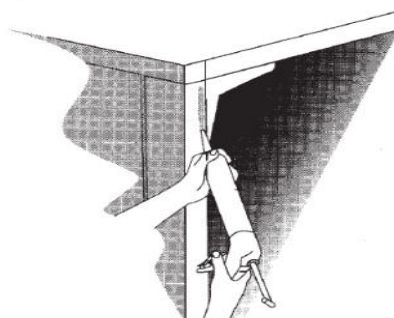


Figure 93: Sealing the frontal joints

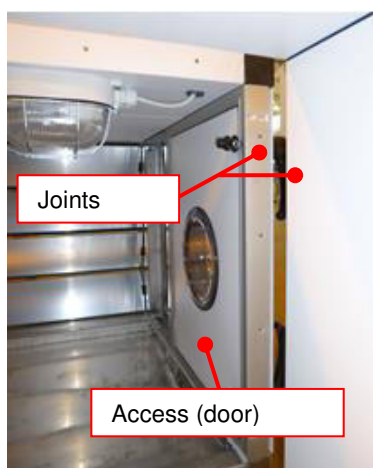


Figure 94: AHU separation accessible via door

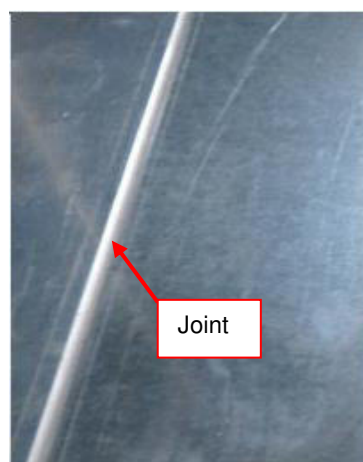


Figure 95: Sealing the section connection (joint) with the sealing agent

For roof AHUs, also the roof flange is to seal, refer to **Figure 96**.

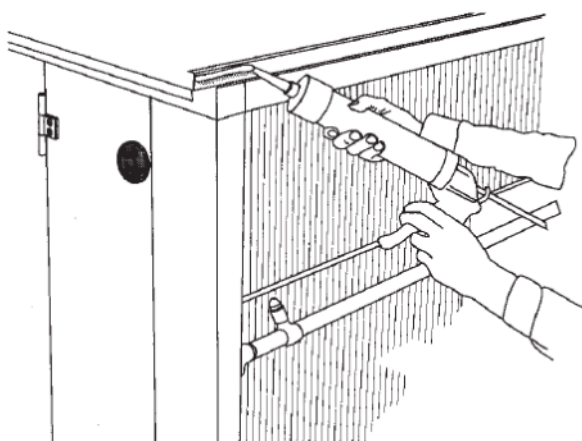


Figure 96: Sealing the roof flange

Sealing of loose delivered base frame cover

Sealings have to be provided at following positions (see **Figure 97**):

1. at the base frame cover / base frame valance above
2. at the base frame frontside
3. sealing of the base frame and to the roof profile (at two-storey AHUs)
4. sealing of open base frame holes (if present)
5. at the joints of the base frame covers

After assembling the entire sealing implementation has to be checked for durability and robustness.

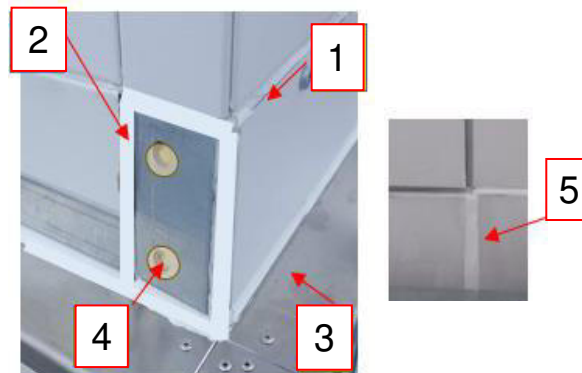


Figure 97: Sealing of the base frame cover

At AHUs in outdoor execution, an additional separation bar (included in the scope of delivery) must be mounted at the separation positions at the roof flange, see **Figure 98**.

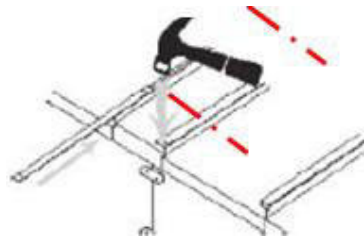


Figure 98: Mounting of the sliding bar

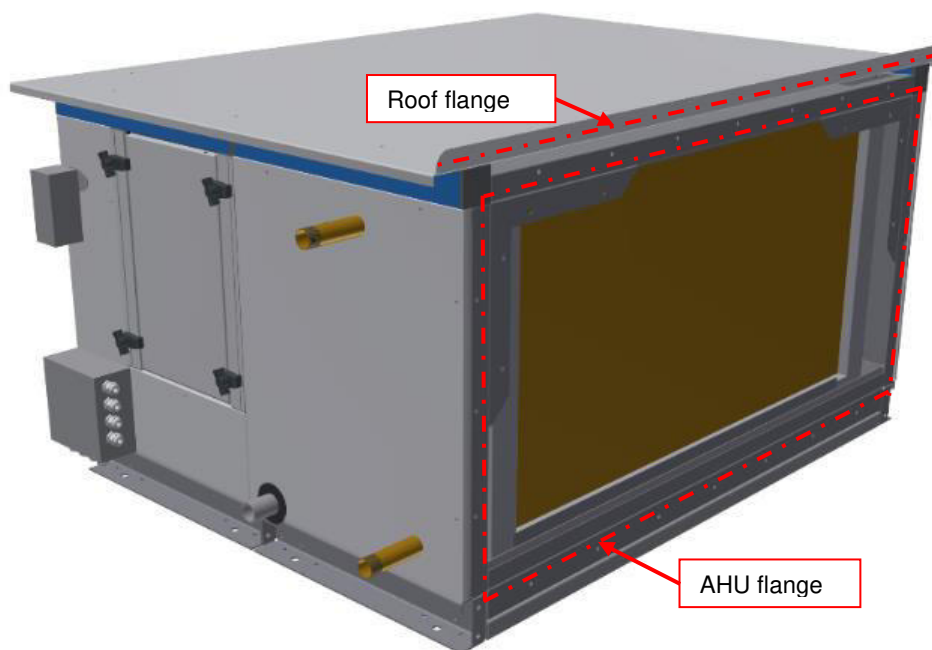


Figure 99: Applying the sealing agent on the frontal joints

Combination AHU in weather-resistant execution side by side

If parts of outdoor AHUs are set up side by side, then the metal sheet roof, which overlaps both parts of the AHU, has to be mounted on site. The scope of supply includes as follows:

- All parts of the AHU with roof inside panel inclusive insulation. The height difference of the roof inside panels on the edges, which cross to the corner profiles, and the top edge of the corner profiles is compensated by a sealing strip and / or a double-sided tape (see **Figure 100**).



Figure 100: Part of the AHU prepared for assembly of metal sheet roof

- A metal sheet roof, which overlaps the entire width with pre-punched holes. Those are to screw the metal sheet roof onto the top of the device.
- Sealant (Sikaflex) (see **Figure 102**)
- Drilling screws with a sealing washer. (see **Figure 101**)



Figure 101: Drilling screw countersunk head TORX 25 with sealing ring ø 4,8 x 30



Figure 102: Applied sealant (Sikaflex)



Figure 103: Metal sheet roof mounted

At the assembly of the metal sheet roof, proceed as follows:

- Put on the roof sheet according the AHU drawing. Leave the dripping edge 50 mm over. Adjust the sheet edge parallel to the AHU edge.
- Initially, mark the screw holes (as a guide, similar to using a template with a marker type pen) on the roof sheet at the corner profiles of the inner panel. This then enables the fitter to place the roof sheet on accurately, once the protective tape foil has been removed and any application of silicon, by guiding the roof plate to the pre-marked holes.
- Remove the roof sheet.
- Remove the protective foil from the double-sided tape. (see **Figure 100**)
- Replace the roof sheet back carefully.
- Screw the roof sheet to the casing with the drilling screws which are intended for this purpose.
- Close all joints between casing and roof with sealant. (**Figure 104**)

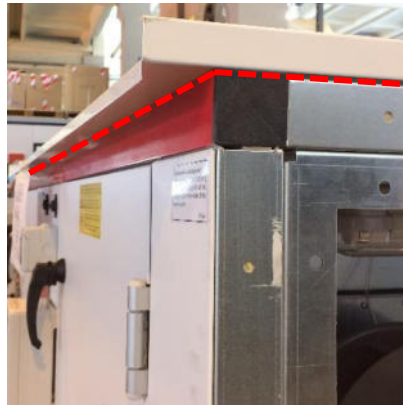


Figure 104: Closing of the joints with sealant

5.1.6 Cable gland

For the connection of engines, pumps, electric heaters, sensors, etc., EUROCLIMA loosely supplies material for cable glands (**Figure 108**), which must be installed efficiently and properly. The following procedure is recommended:

1. Drilling through AHU casing (at right angles to the surface).
2. Enlarge drillings on external panel and internal panel according to **Table 7** (by using a step drill – see **Figure 105**).

Size (of the cable gland)	External drilling diameter (for screwing)	Internal drilling diameter (for sleeve)
M 16	17	19
M 20	21	23
M 25	26	28
M 32	33	35
M 40	41	43
M 50	51	55
M 63	64	71

Table 7: Drilling diameters for cable glands



Figure 105: Step drill

3. Insert sleeve (inside – see **Figure 106**) and screwing (outside – see **Figure 107**) into the drillings and screw them together (see **Figure 108**).



Figure 106: Sleeve



Figure 107: Screwing



Figure 108: Cable gland

A drill with the diameter for the corresponding gland diameter (see **Table 7**, column 2) is sufficient for the insertion of cables into a cabinet or a single walled housing. In this case the screw is locked with the supplied locknut from the inside.

5.1.7 Transport lock

Remove the on fan-motor base frame of spring isolators mounted transport lock (signed with red point) according to **Figure 109** below.

1. Remove nuts and bolts of position 1, 2 and 3
2. Remove z-shaped metal sheet (position 4)
3. Again fasten the nut of position 1, including the potential compensation wire

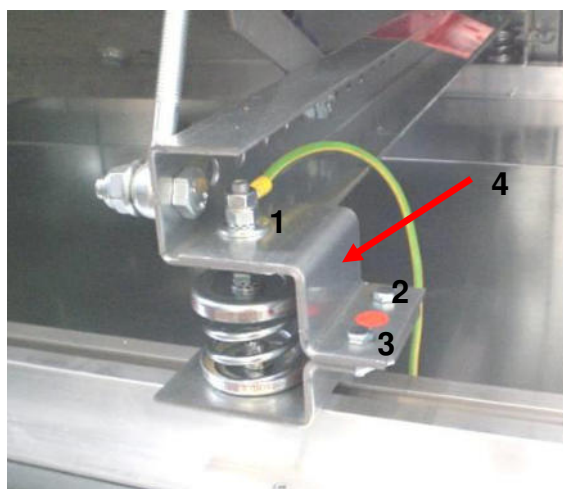


Figure 109: Transport lock

5.1.8 Securing the position of AHUs



NOTICE!

Floor AHUs must be fixed on the foundation to secure the position. Fastening material is not included in the scope of delivery of EUROCLIMA. Suitable fastening material depends on the local conditions and weather/environmental influences and must be retrofitted on site, i.e. in the customer's area of responsibility.

A direct coupling, see **Figure 110** left, should be avoided because of structure-borne sound transmission. If you use structure-borne sound insulated underlayment, the fixing by lugs is particularly suitable to avoid the displacement of the AHU in all directions (**Figure 110** right).

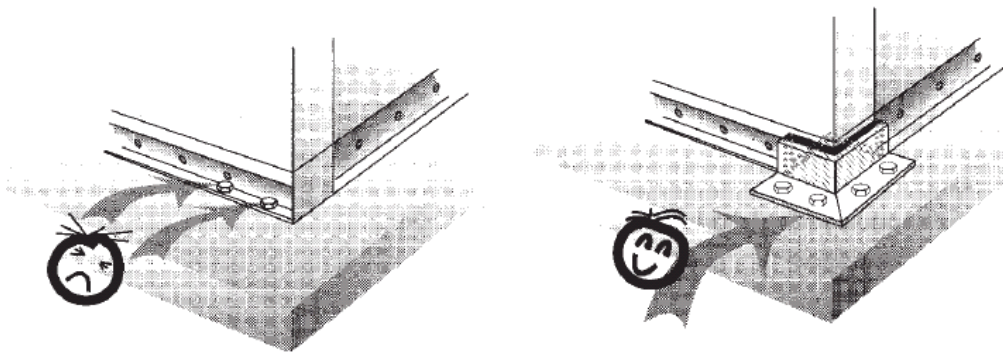


Figure 110: Securing the position on the foundation

If AHUs will be erected on roofs, a structural engineer must design the attachment of the AHU, based on the local situation and weather conditions.

5.2 Doors

Hinged doors EU.T (ZHK 2000) and ZIS (ZHK INOVA and ZHK VISION)

The EU-hinged doors in ZHK execution have the following design features:

- Space-saving design
- Operated by a handle lever.

For an open door, the handle is in horizontal position; refer to **Figure 111**.

For a closed door, the door is closed, but not locked, the handle is in vertical position, the locking slit in horizontal position; see **Figure 112**.

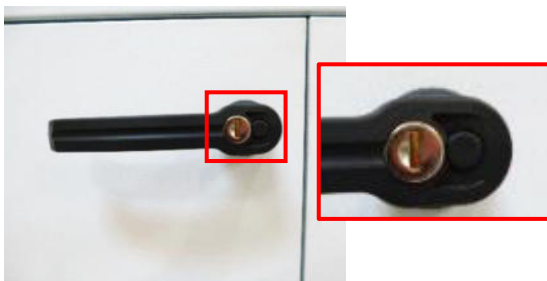


Figure 111: Door ,open'



Figure 112: Door ,closed', not ,locked'

Doors which allow access to the fan section

- are equipped with a door lock. **Figure 113** shows the lock in the position 'locked', locking slit is in vertical position.
- offer a physical barrier as a protection against the danger zone and moving parts
- stay securely in position and can be opened only by using a key
- during the operation do not permit access to the fan section and the door must be secure

The keys are provided attached to the handle, refer to **Figure 114**.

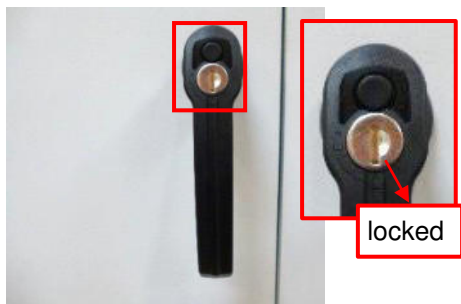


Figure 113: Door ‚closed‘ and ‚locked‘



Figure 114: Delivery of the keys

Abovementioned doors with locks are an effective safety device according to EN ISO 12499: there is no situation whereby entering during fan operation is required, refer also to **chapter 2.3 (Indications for minimizing specific hazards)**.

The locking mechanism of the hinged door is on the inside of the door panel and is shown in **Figure 115** (closed position) and **Figure 116** (open position). The rolling piston can be pressed from above (if you are in the AHU) with your thumb in the position 'open'. Thereby, for example, an accidentally trapped person is able to open the locked door from the inside of the AHU.



Figure 115: ‚Closed‘



Figure 116: ‚Open‘

Hinged doors in INOVA and VISION -execution differ just in the casing and the hinge execution from the 2000-execution (see **figure beneath**).



Figure 117: Hinged door (ZIS)



Figure 118: Hinge for INOVA and VISION-execution



Figure 119: Opened hinged door (ZIS)

Readjustment of the door panel position

Because of the handling of AHU sections, the position of the door panel can move, which means it might require readjustment. (see **Figure 120** or **Figure 123**). Due to the inclination of the door panel of the EU hinged doors, problems can arise when closing and sealing of the door panel. The door panel can be readjusted through the screws on the hinges. For this purpose, first the screws on the hinge (**Figure 121** or **Figure 124**) must be loosened. Then, the door panel can be brought in the correct position (**Figure 122** or **Figure 125**) and the screws can be tightened again.

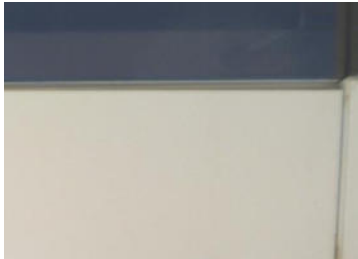


Figure 120: Inclined door panel – varying slit width



Figure 121: Adjustment of the door panel (EU.T)



Figure 122: Adjusted – constant slit width (EU.T)

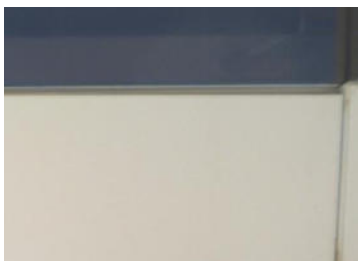


Figure 123: Inclined door panel - varying slit width

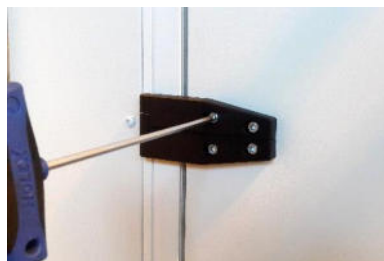


Figure 124: Adjustment of the door panel (ZIS)



Figure 125: Adjusted - constant slit width (ZIS)

If the above described readjustment of the door panel is not sufficient, then misalignment in the erection is the cause and must be appropriately corrected.

Removable door panel with locking mechanism TRA (ZHK 2000)

Beside the hinged doors, it is also possible to handle the doors as a removable door panel. A Clamping system which consists of four, six or more places on the door panel, enable the fixation of the panel in order to provide a closed air duct in the inside of the AHU. On the other side they enable a complete removal of the door panel from the AHU in order to gain access to the components inside.

The removal of the door panel from the casing can be undertaken as follows:

1. Pull forward the black plastic handles.
2. Rotate black plastic handles by 90 degrees.
3. Hold the door panel firmly with both hands and remove it.



Figure 126: Fixed door panel (TRA)

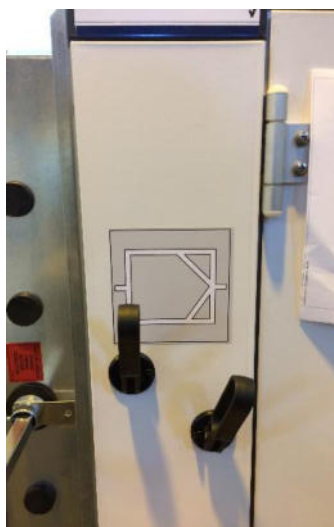


Figure 127: Opened door panel (TRA)



Figure 128: Removed door panel (TRA)

Removable door panel with screw connection TRA-E (ZHK 2000)

Beside the hinged doors, it is also possible to execute doors as a removable door panel. The door panel is held in place by screws. The screws are put through the prepared holes at the edge of the door panel and screwed to the door frame.



Figure 129: Fixed door panel (TRA-E)



Figure 130: Undoing the screw and removing the door panel (TRA-E) from the door frame



Figure 131: Door frame without door panel (TRA-E)

Removable door panel ZIB (ZHK INOVA and ZHK VISION)

Beside the hinged doors, the access to the inside of AHUs with INOVA and VISION -casing is also possible by removable panels. At this casing execution, the door panels will be fixed at the door frame by screw connections (see **figure beneath**).



Figure 132: Fixing screw with clamping piece (ZIB)



Figure 133: Fixing mechanism at door frame (ZIB)



Figure 134: Fixed door panel (ZIB)



WARNING!

Pay attention at removable door panels, because after undoing the connection they could suddenly detach and lead to injuries. Therefore, always use both hands firmly for fixing, removing and handling of door panels!



WARNING!

Attention: Pressure-sided doors represent an increased risk of injury when opening. They can firstly adhere due to the pressure-difference, and then suddenly detach and fall against the user. The user could also suddenly be forced backwards.

Therefore, particularly when opening pressure-sided doors, it must be undertaken very carefully. Open the door panel carefully and detach it slowly from the sealing. When the door panel detaches suddenly, the user must be able to carry the weight of the door. At doors with a surface of $> 0,5 \text{ m}^2$ two persons are necessary.

Pressure-sided hinged doors (EU.T. and ZIS) are equipped optionally with an additional safety device against unintentional opening according to EN 1886.

On the inside of the door panel, a catching lever is mounted (see **Figure 135** and **Figure 136**). The handle will be turned until this lever connects at the door frame. Now, the pressure can escape. Then the door panel can be opened completely.

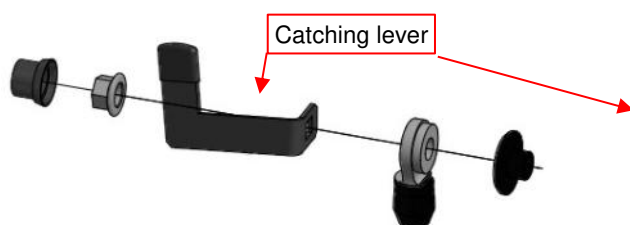


Figure 135: Safety device – catching lever

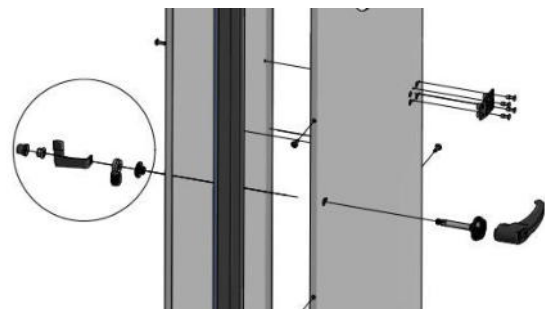


Figure 136: Assembly of safety device on door panel

5.3 Dampers

The closing position of the dampers can be identified in two different ways, see **Figure 137** and **Figure 138**.



Figure 137: Closed position, characterized by a sheet metal position indicator



Figure 138: Closed position, characterized by a marking on the gear wheel



NOTICE!

- It is not permitted to drill into the damper, otherwise it may cause damage to the gear wheels and therefore function of the damper is no longer guaranteed.
- The dampers must not be strained or overly burdened.

Torque requirement for dampers:

If the torque requirement for adjusting dampers is not available in the technical data, the documentation of the damper manufacturer must be observed to determine the torque. As a rough guide for dimensioning the actuator, 5 Nm per 1 m² of damper cross-sectional area can be assumed.

5.4 Airfilters

5.4.1 General notes

- Filters, with the exception of laterally removable pre-filters and electrostatic filters, are supplied loose and must be installed on site.
- Ensure proper insertion of the filters (the bound filter media side on the unclean air side).
- During the installation it must be understood that the filter bags cannot not be clamped or damaged. Each filter bag must freely adjust itself in the airstream.



NOTICE!

Incorrectly mounted filters can be sucked in by the fan and lead to considerable damage.

5.4.2 Panel filter and / or bag filter laterally removable

At laterally removable filters a pull-out mechanism is included in the scope of supply, see **Figure 140**.

A seal is stuck to the filter. This seal is necessary, to avoid filter-bypass-leakages. If it is not included in the scope of supply of EUROCLIMA, it must be provided by the customer.

The seal must be attached on the front side,

- between the filters,
- between filter and door,
- between filter and back side wall.



Figure 139: Pulling out the filters



Figure 140: Pull-out mechanism

5.4.3 Panel filter and / or bag filters in filter frame

Filters are supplied loose and have to be fixed by clips as follows:

1. Take the filter clips, which are included in the supply and are attached to brackets on the filter frame (**Figure 141**).
2. Four filter clips have to be inserted in the respective brackets according to **Figure 142**.
3. Finally, the filter must be fixed by the clips in the filter frame (**Figure 143**).



Figure 141: Delivery of the clips



Figure 142: Insertion of the clips



Figure 143: Fixed filter

Bag filters are installed similarly. Bags shells hang vertically.

5.4.4 Laterally removable bag filters with clamping mechanism

When inserting and fixing the removable bag filters with a clamping mechanism, proceed cautiously, so as not to damage them. The installation of laterally removable bag filters must be carried out as follows:

1. First, move all levers of the clamping rails toward the door opening (**Figure 144**).
2. Slide one filter after the other in the filter frame (**Figure 145**).
3. Press the last filter of the row against the rear panel. Then press with the lever the filter cells against the sealing (**Figure 146**).



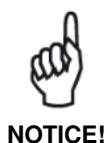
Figure 144: Loosen the clamps



Figure 145: Slide in the filters



Figure 146: Clamping the filters



Attention: For soft bags, the lower parts of the bags of the filter cells need to be lifted up in order to prevent damage by the clamping system. Again proceed slowly and carefully with installation (see **Figure 147**)



Figure 147: Lifting the filter bags



Attention: If different widths of filters are planned for one filter frame with clamping mechanism, then the order of the insertion has to be according to the filter frame raster (see **figure beneath**). Otherwise it leads to an air bypass.



Figure 148: Filter frame for different filter sizes



Figure 149: Consider the order according the filter frame raster



Figure 150: Filter section with inserted filters



NOTICE!

Attention: Filters must be pushed completely to the back, so that all filters fit closely to the filter frame and an air bypass is avoided. Important: Examine if the first filter fits closely to the sealing. (**Figure 152**)

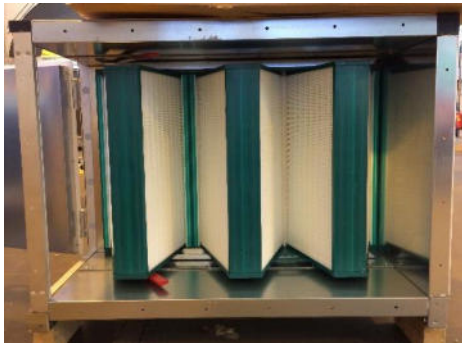


Figure 151: Pushing and clamping of the filters to the rear wall



Figure 152: Check, if filter lie on the sealing

5.4.5 HEPA filters

If a sealant is not included in the filter manufacturer delivery, a suitable sealing is delivered (loose) by EUROCLIMA. This sealing is then to fix on the filter cell, or alternatively on the filter frame.

The following two installation frames are available for HEPA filters:

Standard HEPA filter frame

The filter mounting frame is mounted in the AHU housing. This fulfils the pre-filter function for terminal HEPA filters.

During installation, the bracket must first be hooked in and then the filter cell inserted, see **Figure 153** and **Figure 154**.



Figure 153: Attaching the brackets



Figure 154: Inserting the filter cell

Depending on the filter type, one of the two systems described below is used for fixing the filter frames:

1. Filter types with frames made of wood-based materials shall be fixed with tensioning corners as shown in **Figure 155** and **Figure 156**.



Figure 155: Inserting the clamps

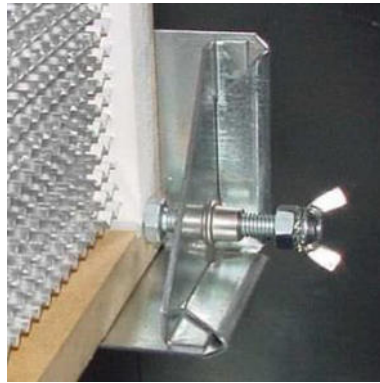


Figure 156: Clamping the filter cell

2. Filter types with metal frames shall be fixed with tensioning corners and additional pressure plates as shown in **Figure 157**.



Figure 157: Filter tensioner with pressure plate

HEPA frame “Filter Safe”:

This is a welded filter frame. It is flanged in between the AHU casing, whereby leakages between frame and casing can be avoided. The filter fulfills the requirements according EN ISO 14644.

5.4.6 Activated carbon filter

Activated carbon filter cartridges (**Figure 158**) are delivered loosely and must be inserted into the dedicated base plate (**Figure 159**) using the integrated bayonet fastenings.



Figure 158: Activated carbon filter cartridge

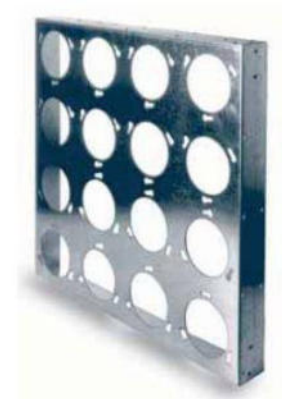


Figure 159: Base plate for activated carbon filters

5.4.7 Electrostatic filter

The following contaminants cannot be filtered by electrostatic filters:

- water vapour, even in low concentrations
- large amounts of coarse dust
- chips, iron filings and residues in general
- gases



NOTICE!

When using electrostatic filters, it is essential to avoid the following substances and environments:

- metal dust, whether or not in the form of particulate matter
- smoke produced by the combustion of organic or non-organic materials (wood, coal, naphtha, diesel, gasoline, etc.)
- explosive environments

Electrostatic filters have a multipole connection system. Therefore, the filter units only need to be inserted inside the existing filter frame of the AHU (see **Figure 160** and **Figure 161**), connected by means of plug connections (see **Figure 162**) and electrically connected, see **chapter 7.6 (Connection electrostatic filters)**.



Figure 160: Mounting electrostatic filter



Figure 161: Electrostatic filters in the filter frame



Figure 162: Plug connection electrostatic filters

Detailed instructions for mounting and dismounting for maintenance/cleaning of the electrostatic filters can be found in the manufacturer's operating instructions. These are available online via the QR code on the first page of these instruction manual.

5.5 Dampers with external gear wheels



WARNING!

At these dampers, the slats are moved via an external gear wheel connection. The installation of a suitable cover, which protects against injury and prevents the blocking of the gear wheel connection by small parts, has to be done on site and is the full responsibility of the customer (if not chosen as an option and supplied by EUROCLIMA).



Figure 163: Damper with external gear wheels

5.6 Hygienic AHUs

- In addition to the actions mentioned here, the instructions according to **chapter 9.13 (Hygienic AHUs)** have to be followed and implemented.
- After assembly, all grooves and joints at the connection positions must be sealed with the supplied sealing agent.
- In case of the replacement of components sealing must be restored.
- Access to components is ensured by door positions within easy reach of the desired component, therefore, components are accessible or side removable for cleaning and maintenance.
- Carry out the installation of ducts, tubes and electrical installation in a way that ensures easy unhindered access and does not prohibit that function of the doors.

5.7 Component assembly in the duct system

5.7.1 Duct smoke detector

- The smoke detector must be installed in the duct on site in accordance with the manufacturer's operating instructions. **Figure 164** shows an example of mounting the smoke detector in the duct system.

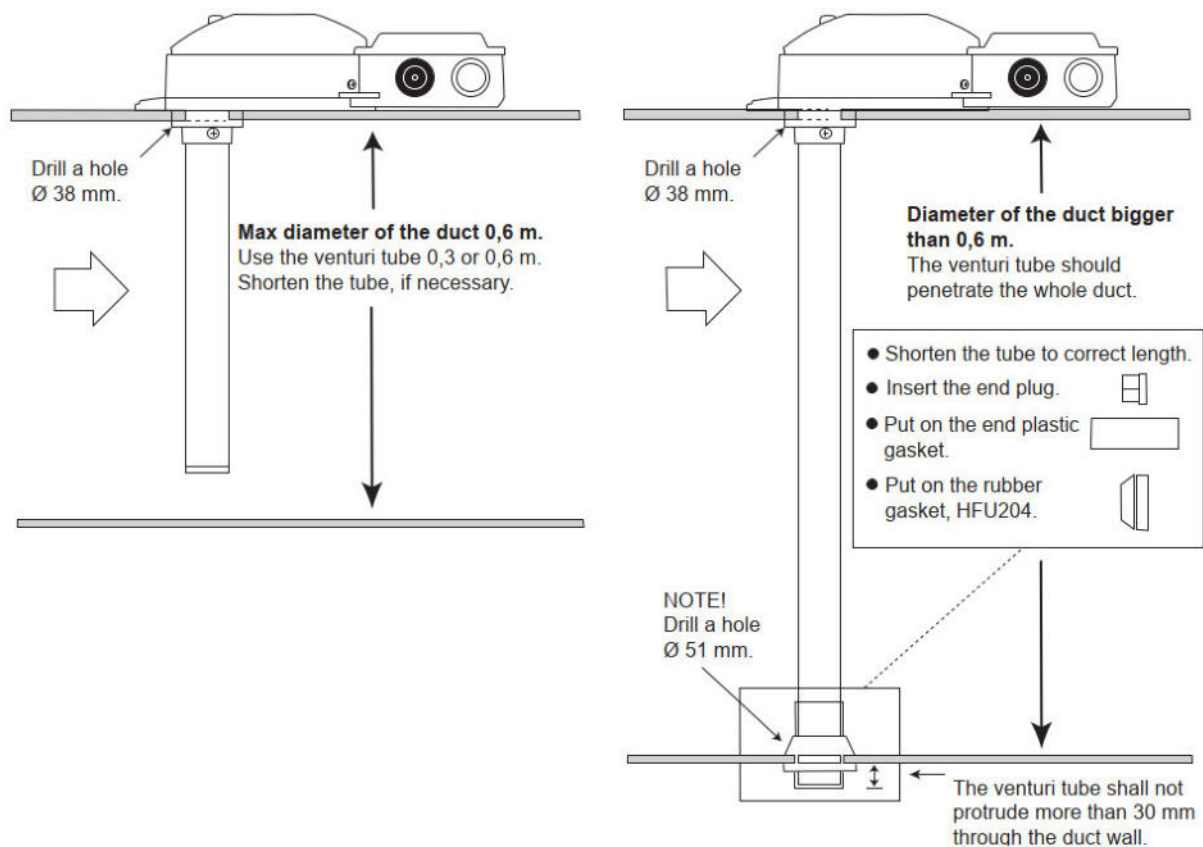


Figure 164: Exemplary mounting duct smoke detector in the duct

- After completing the installation, a function test must be performed.



NOTICE!

If there is a risk of condensation (e.g. when installing outdoors, etc.) the smoke detector should be insulated from the ambient air, for example with a weather-proof housing.

5.7.2 Gas sensor



WARNING!

The gas sensor may only be installed by qualified personnel. When using a gas sensor, the manufacturer's instructions must be followed completely and carefully.



WARNING!

The installation surfaces may not be subjected to constant vibrations in order to avoid damage to the connections and electronic devices.

Accessibility to the sensor must be guaranteed. If accessibility in the AHU is not guaranteed, the evaluation unit is mounted on the outside of the AHU and the sensor is supplied loose. If the sensor is supplied loose, it must then be installed on site in the supply air duct by means of an inspection door, as specified in the manufacturer's operating instructions.

Figure 165 and **Figure 166** show an example of the mounting of the gas sensor in the duct.

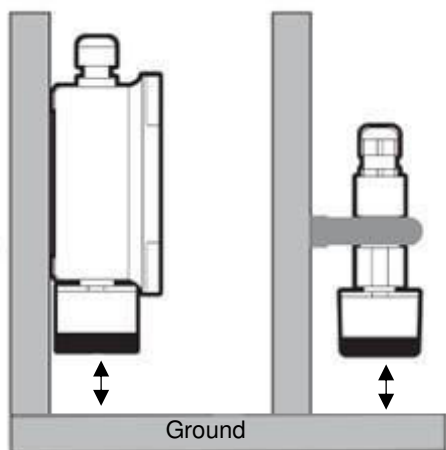


Figure 165: Exemplary mounting gas detector in the lower area



Figure 166: Mounted gas detector

6 Installation

6.1 Heat exchanger connection

6.1.1 General notes

Before connecting the heat exchanger, the piping system must be rinsed thoroughly.



NOTICE!

An absolutely stress-free connection has to be ensured and the transmission of vibrations and longitudinal expansion between the device and the piping system must be safely prevented.



NOTICE!

In order to avoid corrosion due to water, the requirements regarding water quality, professional installation, commissioning and maintenance of VDI 2035 sheet 2 have to be complied.

Connection pipes with thread:

To prevent damage of the heat exchanger connection, it is necessary to hold against with a pipe wrench during the tightening process (**Figure 167**).

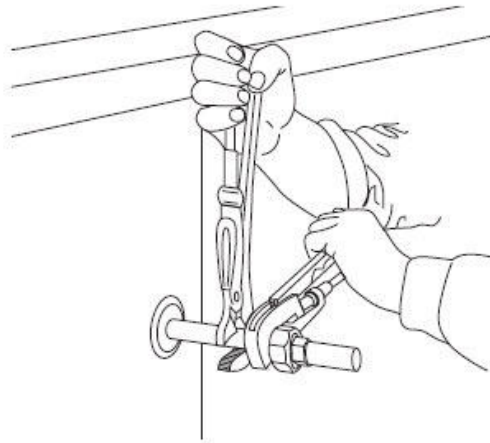


Figure 167: Holding against with a pipe wrench

Recommended sealing material for threaded sleeves:

- Steam heat exchanger, use special sealant
- Water / glycol heat exchangers, use Teflon tape.

In these cases, hemp cannot be used as sealing material!

Connection pipes without thread:

If the connection pipes are executed without threads, then a mechanical, force-fitting connection (STRAUB coupling) is recommended (**Figure 170**). This coupling could be included optionally in the scope of delivery from EUROCLIMA, if not, then it must be provided on site. In order to avoid damage of the copper pipe of the heat exchanger due to mechanical force, a ring needs to be inserted to reinforce the copper pipe (**Figure 168** and **Figure 169**).



Figure 168: Copper pipe with reinforcing ring



Figure 169: Copper pipe with inserted reinforcing ring



Figure 170: STRAUB coupling



Figure 171: Mounted STRAUB coupling

Other types of connections, for example, welding or soldering are not recommended by EUROCLIMA, because of risk of fire to neighboring materials. If one of those types of connections are chosen, the assembler is fully responsible for this task and associated hazards.

The piping for the heat exchanger should not hinder any maintenance required.

The connection of the heat exchanger is to execute as stipulated on the label on the AHU (connection diagrams in **Figure 172**).

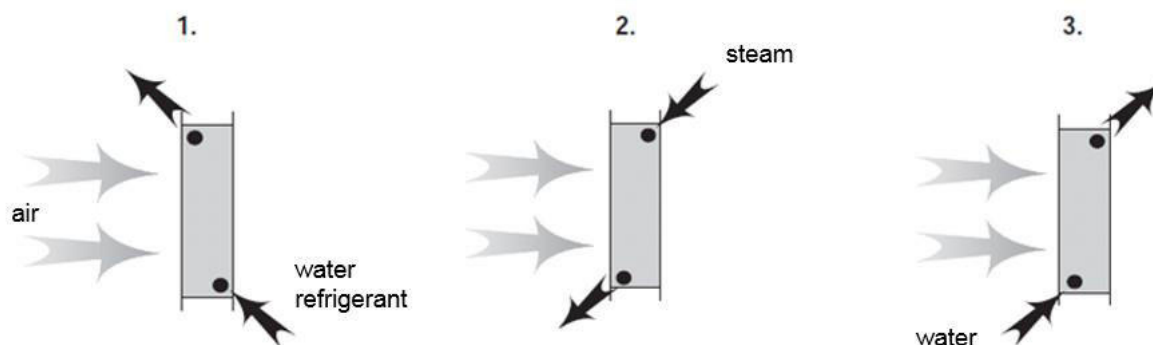


Figure 172: Heat exchanger connection

The heat exchanger operates according to the cross-counter-flow principle. Only a preheat exchanger can be supplied for parallel flow operation on request by the customer.

1. All standard heating and cooling heat exchangers - counter flow
2. Steam heat exchangers: steam inlet top, condensate bottom - counter flow
3. A Preheat exchanger is needed if there is a freezing risk and can be requested.

Hydraulic connection schemes of a heating or a cooling coil should be carried out as shown in the scheme **Figure 173** with a three way valve used as a mixing valve. Compared with a flow control using a straight-through valve, this connection avoids unequal temperature profiles, in that way air heating or cooling is quite uniform along the coil surface.

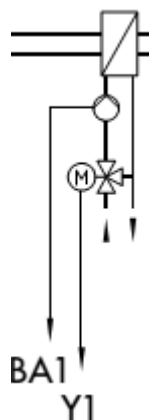


Figure 173: Hydraulic connection scheme

In order to vent and drain the heat exchanger connection, valves are mounted (on request). To ensure that the correct operation is undertaken, it is important that the vent is on the highest point of the whole water cycle and the drain at the lowest. Otherwise, the valves need to be mounted on another suitable point on the circuit.



Figure 174: Drain valve



Figure 175: Vent valve

6.1.2 Special instructions for heat exchangers operated with steam

The heater is heated to above 70 °C, next to the heater are plastic parts which have been installed. To prevent damage of the plastic parts, it is the responsibility of the client to undertake the following instructions:

- Supply and installation of thermostat
- thermostat trigger temperature: 70 °C
- thermostat probe position: approx. 100 mm downstream of airflow through steam heat exchanger / approx. 100 mm below the top panel
- A thermostat must be integrated into the AHU control system so that the steam supply valve closes in the event of the temperature exceeding the trigger stated above.
- Function: interruption of steam supply at over-temperature. For example, because of a lack airflow.

6.1.3 Special instructions for pool water condensers



WARNING!

Depending on the refrigerant type, there is a very high pressure in the refrigeration circuit. A leak in the refrigeration circuit can cause a pressure increase on the water side. For this reason, a safety valve must be installed on the water side.

Refrigeration circuits of ETA-POOL-AHUs may contain a condenser for warming the pool water as an option. The connection of the condenser to the pool water or to the water pipes for general use must be done according to the blue arrows shown in **Figure 176**:

- Bottom inlet
- Top outlet



Figure 176: Condenser for warming pool water



NOTICE!

Application of plastic water tubes are not allowed because refrigerant and in addition the plate heat exchanger, might reach temperatures of 110 °C or higher!

- Never add the chlorination chemical in front of the water inlet of the plate heat exchanger. The chlorination should be added as far away as possible from the plate heat exchanger (see **Figure 177**).
- The water inlet should be closer to the surface and the outlet nearer to the bottom. This improves the mixing of the heated water and mainly prevents the entrance of chlorine particles or concentrated solution into the plate heat exchanger (see **Figure 177**).



NOTICE!

Warning: Unfortunately, in practice, the chlorination access is often located in front of the condenser for warming pool water inlet. This improves the chlorination, but it could potentially damage the plate heat exchanger.

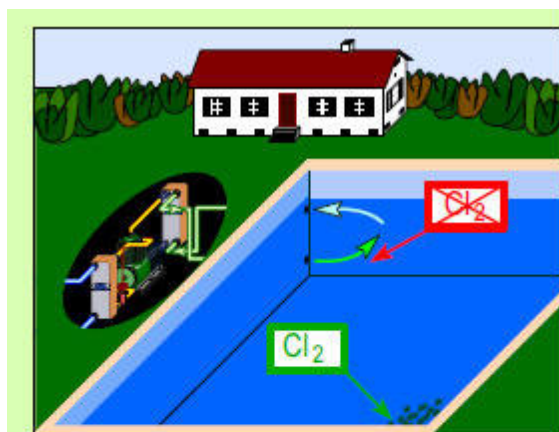


Figure 177: Notes concerning plate heat exchangers

- pH-value: should be kept as high as possible; but at least 7,5
- Cl₂: continuous < 0,5 ppm near the plate heat exchanger inlet
maximum < 2 ppm
- Cl⁻ < 150 ppm, if the water is heated to 50 – 60 °C
< 100 ppm, if the water is heated to 70 – 80 °C

6.2 Humidifier, indirect adiabatic cooling

Humidification systems function in the supply air flow as an air humidifier, as well as in the exhaust air flow as an indirect adiabatic cooling. In the following, reference will always be made to humidifiers in the supply air flow, but the information is valid for both applications, unless explicitly stated otherwise.

6.2.1 Water quality

At the water supply of a humidifier, for instance spray humidifier, pay attention to the water quality. Depending on the water hardness and the operational importance of the device, an appropriate water treatment process must be chosen in order to ensure the desired water quality. Pay particular attention to the carbonate hardness in fresh water. The water treatment system is not supplied by EUROCLIMA and must be provided by the customer on site. In order to reach sufficient operational safety limits, the circulation water quality should be within following range:

Quality			Air conditioning system for		
			Standard climate requirements	Data-processing areas	Sterile and clean rooms
Appearance			Clear, colorless and without sediment		
pH-value			7 – 8,5		
Total salt content	GSG	g/m³	< 800	< 250	< 100
El. conductivity (at reference temperature 20 °C)		mS/m	< 100	< 30	< 12
		µS/cm	< 1000	< 300	< 120
Calcium	Ca ⁺⁺	mol/m³	> 0,5		-
		g/m³	> 20		-
Carbonate hardness	KH	°dH	< 4		-
Carbonate hardness with hardness stabilization	KH	°dH	< 20		-
Chloride	Cl ⁻	mol/m³	< 5	-	-
		g/m³	< 180	-	-
Sulphate	SO ₄ ⁻⁻	mol/m³	< 3	-	-
		g/m³	< 290	-	-
KMnO ₄ -consumption		g/m³	< 50	< 20	< 10
Germ count		KBE/ml	< 1000	< 100	< 10
Legionella bacteria		KBE/ml	< 1		

Table 8: Water quality of supply of humidifier following VDI 3803

The necessity of a stationary sterilization facility depends mainly on the operational conditions and must be checked for each single case.

6.2.2 Protection of the drinking water against pollution

During installation, it must be ensured by appropriate measures that the installer complies with EN1717. This European Standard contains general requirements to safety installations, which are purposed to protect the drinking water against pollution. For instance, installation of safety equipment to prevent against drinking water and against contamination due to malfunction or a backfill. Before commissioning, such appropriate measures must be executed by the operator on site to ensure conformity to EN 1717.

6.2.3 Special indications for different humidification systems

6.2.3.1 Spray humidifier – Installation of the pump circuit

General indications

A spray humidifier could be used for humidification as well for air cleaning, in the function of an air washer. Hereinafter, the term 'spray humidifier' is used, but the description is also valid if the system is used as an air washer.

Spray humidifier pump circuit is delivered in parts, see **Figure 178**:

1. Pump on anti-vibration socket plate
2. Suction side tube (from water tank nozzle till flexible connector)
3. Pressure side tube (from flexible connector till water tank nozzle)
4. Flexible connecting tubes
5. Threaded strut

The connection between the parts must be made by flexible tubes and clamps, which ensure the vibration decoupling of the pump arrangement.

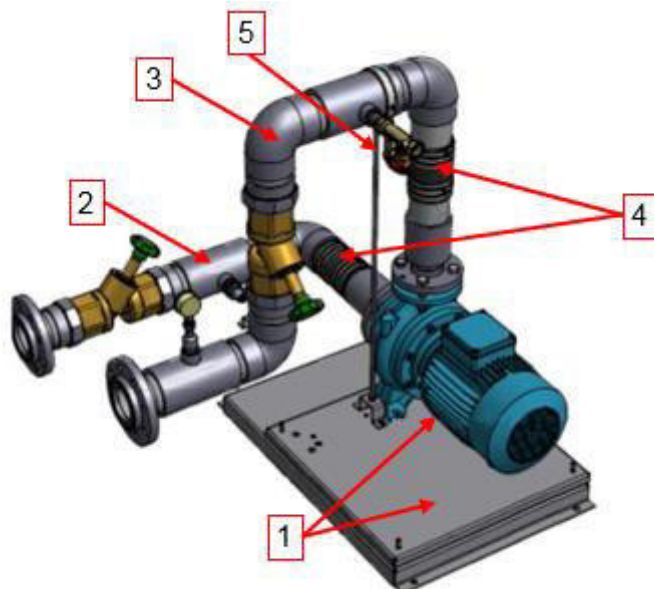


Figure 178: Parts of spray humidifier pump circuit

The assembly of the parts must be completed on site by the customer and has to follow the present description. To avoid the flexible compensator becoming loose, due to situations listed below, the installer must follow exactly, the instructions of the installation process.

The flexible compensator can become loose, if

- delivered number of clamps are not fixed during installation
- installation of different clamps (not the original ones)
- corresponding clamps fixed with too high or too low torque
- flexible tube is not long enough, see **Figure 179**.
- in the event that the costumer applied lubricant at the flexible tube during installation.



WARNING!

In this situation, the relating tube connection may loosen and cause a water leakage and subsequent damages!



NOTICE!

To ensure a proper operation and to minimize the risk of water leakage, EUROCLIMA highly recommends installing and checking the clamp connections according to the instructions below.

Installation instructions

The assessment of the parts for the flexible connecting tubes and clamps follows **Table 9**.

The table shows the size and the number of clamps depending on the tube diameter. For example, 2+2 means two clamps on each end of the flexible connector.

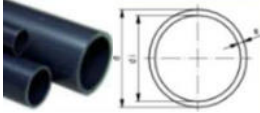


Rigid PVC tubing diameter pressure side / suction side	Flexible (black) rubber tube	Clamp for flexible tube connection	
		Type Normaclamp TORRO 12 W1	
			
outer diameter (mm)	outer diameter (mm)	size	Number for one flexible tube
25	approx. 33	25 – 40	2+2
32	approx. 42	30 – 45	2+2
40	approx. 47	40 – 60	2+2
50	approx. 61	50 – 70	3+3
63	approx. 76	60 – 80	3+3
75	approx. 87	70 – 90	3+3
90	approx. 106	90 – 110	3+3
110	approx. 120	110 – 130	3+3
125	approx. 136	130 – 150	3+3

Table 9: Specifications - size and number of clamps for flexible connecting tubes

The following actions must be carried out separately for the pressure side connection and the suction side connection. Please note, that the tubing on pump suction side and pressure side usually have different diameters.

1. Flexible tube length:

- The flexible tube length L is delivered in standard with L = 180 mm. For some installations shorter tubes may be installed. In this case cut the flexible tube to match the drawing in **Figure 179**.
- Ensure, that the free distance between the two ends of the rigid (grey) tubes is not less than 20 mm and not more than 60 mm according the drawing.

- Ensure that the (black) flexible tube covers the (grey) rigid tube ends at each side for a length of 60 mm according to the drawing.
- Mark the correct position of the flexible tube on the rigid tube (60 mm length) before installing the flexible tube.

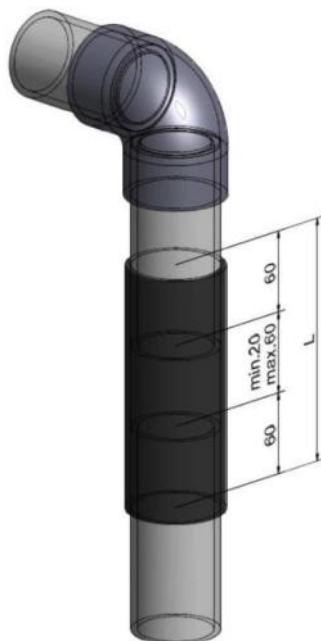


Figure 179: Correct positioning of the flexible connecting tube (black); dimensions in mm

2. Install the flexible tube and clamps

- Clean the plastic tubes and flexible connector tube carefully with a dry, clean cloth
- Check that the correct clamps are being used: The clamps are imprinted with “NORMA” and the size range must be as indicated in **Table 9**.



Do not apply any lubricant between the black flexible tube and the rigid (grey) tube. This could degrade the flexible rubber tube and reduce the safety and integrity of the connection.

NOTICE!

Do not use any benzene based cleansing products, this could damage the rubber material.

3. Positioning of the flexible tube and clamps

- Check if the flexible tube is positioned correctly overlapping 60 mm on each end the grey rigid tube, according to **Figure 179**.
- Firstly, install loosely the indicated type and number of clamps on each side of the connection.
- Check if the clamps are positioned on each side completely within the 60 mm overlapping length.

4. Fixing of the clamps

- Tighten the clamps using a torque wrench. Fix the screw with a torque of 5/ 6,5 Nm.



Figure 180: Mounted clamps

5. Installation of threaded strut

The threaded strut is mounted on the pressured side and holds the pressure side tube in position, in order to relieve the pressure side flexible tube connection from axial forces. The strut needs to be fixed near to the vertical tube coming from the pump pressure side as shown in **Figure 181**.

For installing the threaded strut, the following parts are needed (included in the scope of supply by EUROCLIMA), **Figure 181**:

1. Clamp for threaded strut
2. Threaded strut (M10)
3. Base support for strut

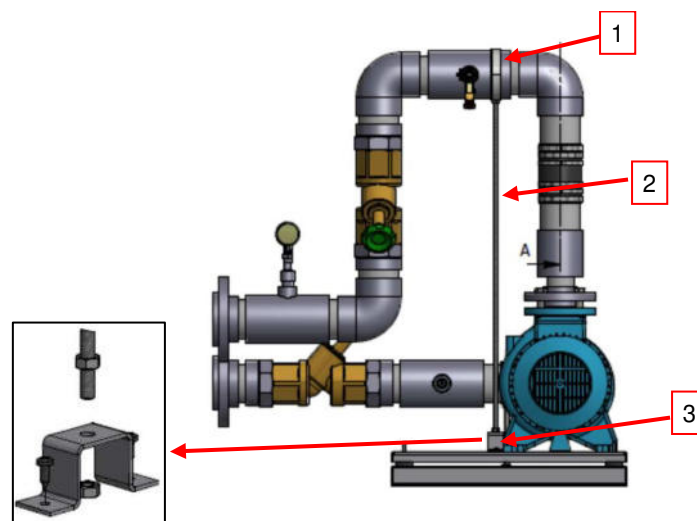


Figure 181: Position and parts for installing the strut

To install the threaded strut, proceed as follows:

- Fix the clamp for the strut at the upper horizontal tube near to the vertical pump coming from the pump.
- The base support shall be installed vertically under the upper clamp. (For spray humidifier equipped with UV water treatment, a small discrepancy may be possible.)
- Cut the threaded rod to the required length and fix the rod accordingly. (For spray humidifier equipped with UV water treatment, the rod may be bent to pass the UV circuit tubes).
- Tighten the lower nut and the counter nut in order to fix down slightly the tube assembly.

In the event of problems or needing support with your product, do not hesitate to contact EUROCLIMA for any further clarification or support.

6.2.3.2 Evaporative humidifier

Fresh water operation

A solenoid valve must be provided by the customer on site for the fresh water supply line. If the AHU is equipped with an EUROCLIMA control, the necessary power supply is stipulated on the wiring diagram.

Circulation water operation

A solenoid valve must be provided by the customer on site for the fresh water supply line and for emptying. If the AHU is equipped with an EUROCLIMA control, the necessary power supply for the valves is stipulated on the wiring diagram.

- AHUs equipped from EUROCLIMA with control

If EUROCLIMA control system is included in the scope of supply and the evaporative humidifier is in a circulation water operation, all components listed in **Figure 182** must be selected. In this case all those components are controlled by the EUROCLIMA control system, mounted in the piping system and where possible connected electronically, or supplied loose and prepared for electrical connection.

- AHUs which are not equipped from EUROCLIMA with control

Required components listed in **Figure 182** (except position 6 "Blowdown by tacosetter" which is always included in the scope of supply from EUROCLIMA) can be selected or must be provided on site, which is therefore the responsibility of the customer. All electrical components must be integrated into the customers control system.

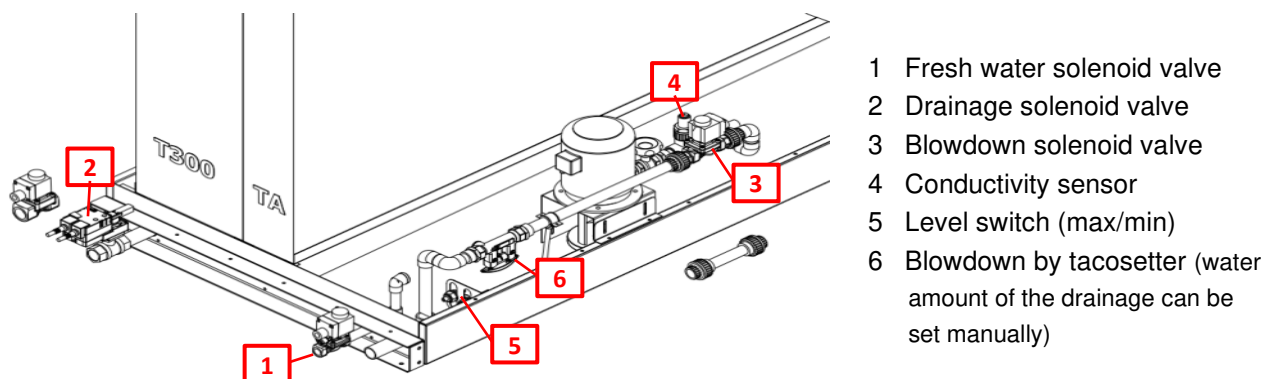


Figure 182: Components of an evaporative humidifier system with circulation water operation

6.2.3.3 High pressure spray humidifier

The manufacturer of the high pressure spray humidifier must be contacted for support on the installation process.

6.2.3.4 Steam humidifier

The instructions of the manufacturer of the steam humidifier must be followed for the installation process. For example, for the correct installation of the steam hose or for the connection of the condensate drainage.

6.3 Drain for condensate and excess water

Each drain must be equipped with a siphon. Siphons are available as accessories from EUROCLIMA.

6.3.1 Standard siphons

A space-saving design of the necessary siphon height can be completed by EUROCLIMA on request. Contact your sales representative for further detailed information.



The following conditions are essential for correct operation:

- At each drain, a siphon must be connected.
- Several drains should not be connected to one siphon.
- The water from the siphon must run in a funnel.
- Before starting, fill the siphon with water.
- In the case of outdoor AHUs, an antifreeze mechanism has to be installed and provided on site.

The heights H1, H2 and H3 can be determined from the maximum negative pressure (p) and maximum pressure (p) in the section of the siphon or be determined by the information on the technical data sheet as follows:

Total pressure	p_{ges}	= 1196 Pa
Dynamic pressure	p_{dyn}	= 83 Pa
Total static pressure	$p_{stat} = p_{ges} - p_{dyn}$	= 1113 Pa

$$1 \text{ mmWS} = 9,81 \text{ Pa}$$

$$H1 > 1113/9,81 = 114 \text{ mm} + 15 \text{ mm (Safety)} = \text{about } 130 \text{ mm}$$

$$H2 = 65 \text{ mm}$$

Siphon on suction side (in direction of airflow before the fan), see Figure 183.

$$H1 \text{ (mm)} > p \text{ (mm WS)}$$

$$H2 \text{ (mm)} > p/2 \text{ (mm WS)}$$

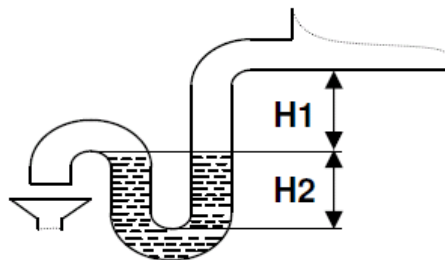


Figure 183: Siphon on suction side

Siphon on pressure side (in direction of airflow after the fan), see Figure 184.

$$H3 \text{ (mm)} > p \text{ (mm WS)}$$

$$H4 \text{ (mm)} \geq 0$$

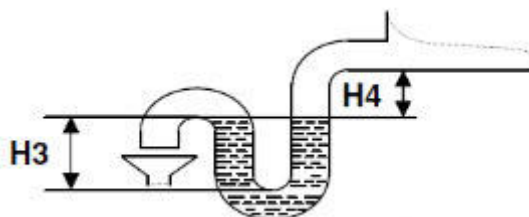


Figure 184: Siphon on pressure side

6.3.2 Ball Siphons

If Ball Siphons with the design shown below are supplied by EUROCLIMA, then the following instructions should be followed during installation:

Depending on the suction side or pressure side mounting position, the siphon body has to be installed so that the direction of the arrow (see **Figure 185**) corresponds to the flow direction.

- Pa = suction side
- + Pa = pressure side

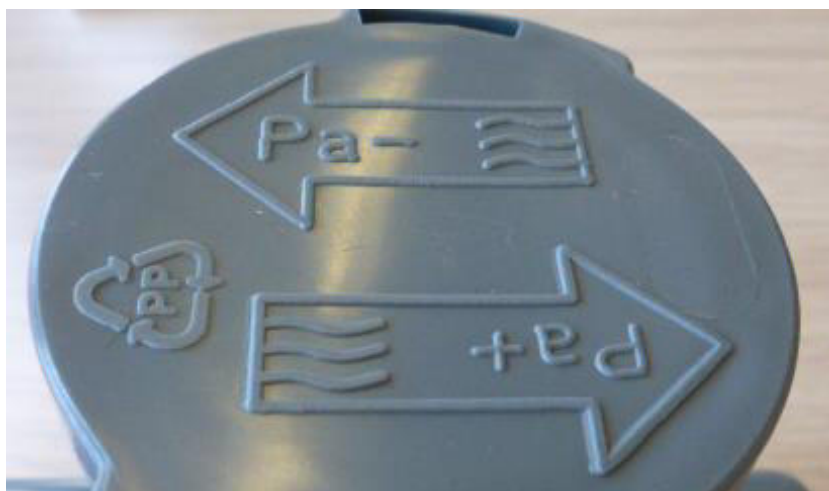


Figure 185: Observe the mounting position - flow direction according to the arrow

Siphon on suction side (in direction of airflow before the fan)

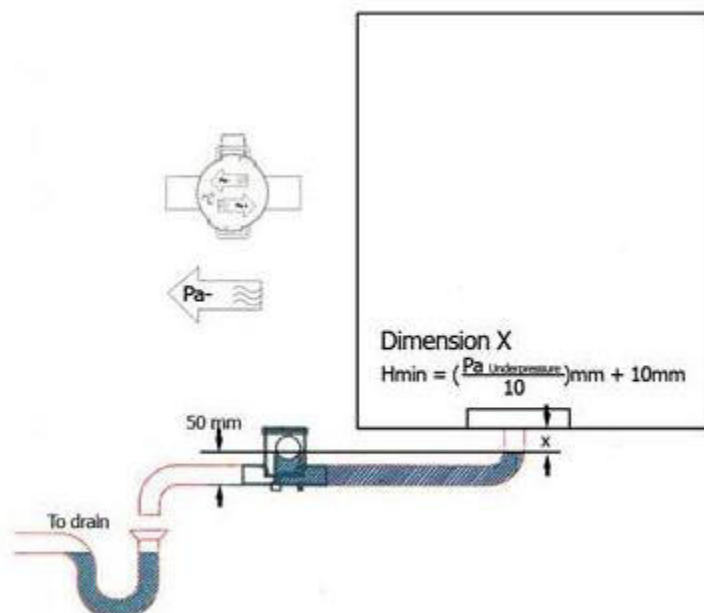


Figure 186: Suction side execution

Siphon on pressure side (in direction of airflow after the fan)

The black plug must be removed for the pressure side installation (see **Figure 188**).

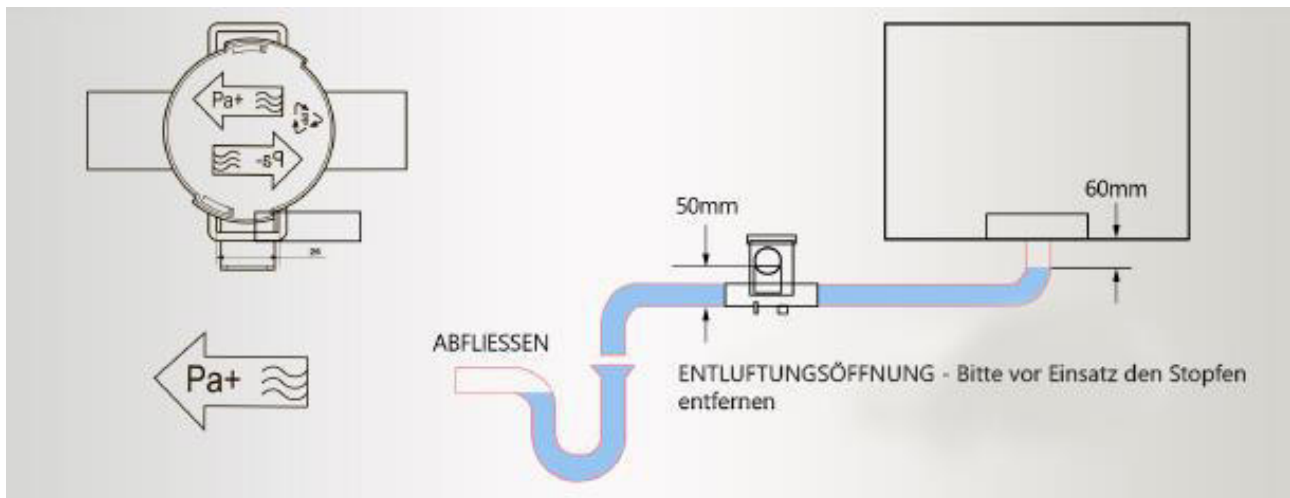


Figure 187: Pressure side execution



Figure 188: Pressure side installation: remove the black closing plug

6.4 Duct connection – airside connection to AHU

Depending on the customer's requirements, EUROCLIMA devices are equipped with various accessories and options for attaching air duct elements like dampers, flexible connections, frames, panel flanges, etc.

If no such accessories are supplied, then the airside mounting of components of the duct system is made directly to the housing of the AHU. Depending on the device opening, this can be done directly on the panel flange or directly on the external panel of the device.

When connecting, make sure that the requirements listed below are followed:

6.4.1 Requirements

- Ensure proper performance of the AHU by avoiding excessive pressure drops in the duct. To minimize the noise, the basic principles of the duct construction and acoustic design must be followed.

- A suitable seal (not included in the scope of supply) has to be installed between the device housing and the component of the duct system.
- The aero-technical connections must be executed free of tension and torsion. For example no forces / loads are allowed to be transmitted to the device housing by means of attached accessories such as ducts etc. The components on the system side must be fastened and supported separately.
- Even if no flexible connection is included in the scope of delivery of the device, an elastic connection must always be installed to prevent structure-borne sound transmission between the device and the duct system. It is recommended to use an interposed elastic connection of at least 140 mm in width, which needs to be installed unstrained between the duct and the AHU.
- This elastic connection must have sufficient flexibility and must be installed in a professional manner in order to avoid transmission of vibrations to the duct system.
- For proper performance of the AHUs, following of the basic rules of the duct construction is necessary. By appropriate planning, dimensioning and execution of the duct system, increased pressure losses and flow noise in the duct can be avoided.

Mounting components of the duct system directly on the external panel of the AHU

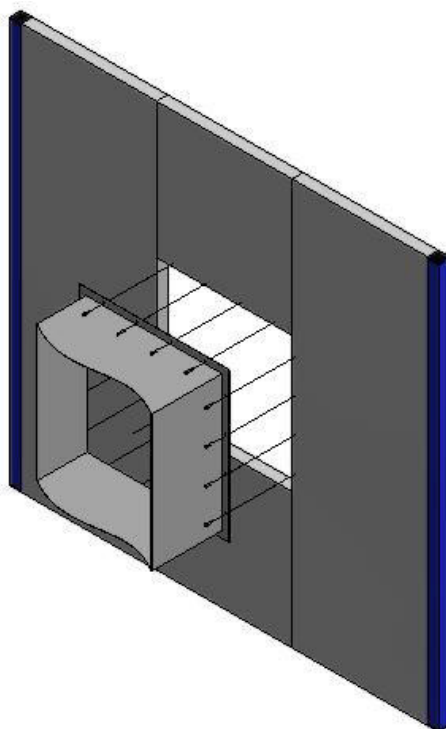


Figure 189: Airside duct connection directly on the external panel of the AHU

The procedure is as follows:

- The dimensions (internal dimensions) of the device opening can be taken from the device drawing or measured directly at the AHU.
- The components of the duct system, which are to be fastened to the respective device opening, must have the same internal dimensions as the device opening!
- A flange contact surface for supporting the components of the duct system is provided around the clear opening - the recommended flange width is 30 mm.
- The components of the duct system can be fastened on this flange surface with self-tapping screws (not supplied).

- Attention: Holes for fastening elements must be installed at a distance of max. 15 mm from the clear device opening. If the distance is greater, then it is not possible to effectively and securely fasten it (see **Figure 190**)!

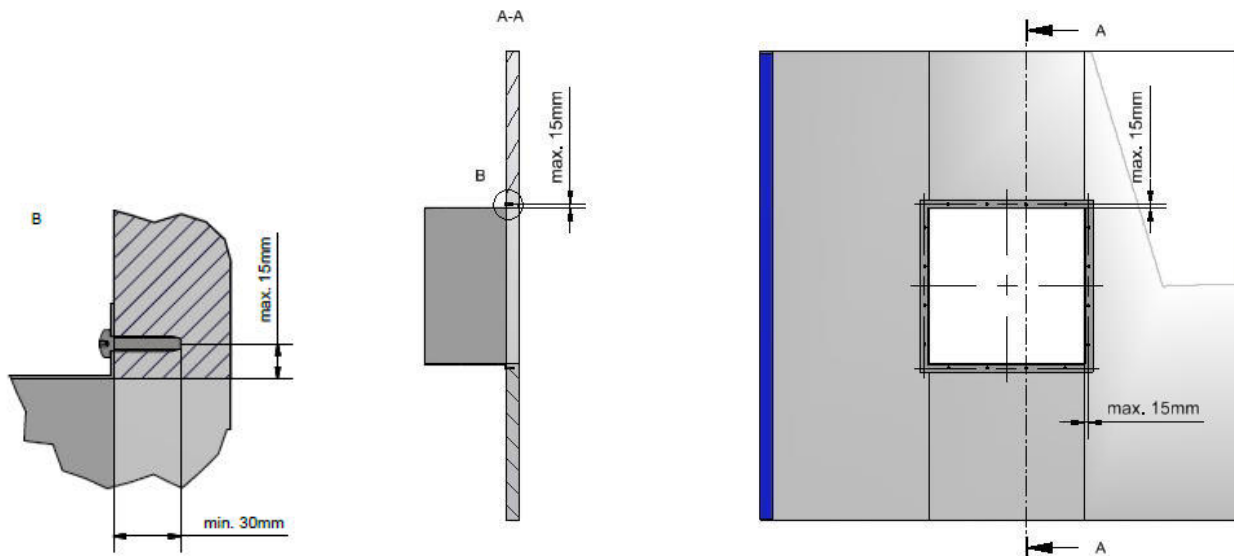


Figure 190: Mounting of duct components on the external panel of the AHU

Number of screws

The duct components are screwed as follows,

- each at a distance of 120 mm from the corner
- additional number of screws see **Table 10** and **Figure 191**.

Length or width		Additional number of screws
< 915		0
>= 915	<= 1220	2
>= 1372,5	<= 1830	3
>= 1982,5	<= 2592,5	4
> 2745	<= 3202,5	5
>= 3355	<= 3660	6
> 3812,5	<= 3965	7

Table 10: Information on the screw distances

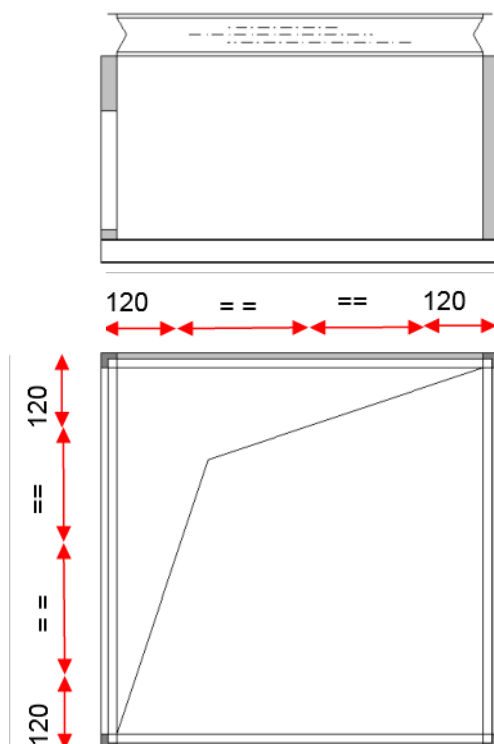


Figure 191: Information on the screw distance

6.4.2 Insulation of fresh air damper

Before connecting the duct section, the flange of the fresh air damper must be fully insulated. This action is imperative to prevent the formation of condensation by heat transfer.

If fresh air dampers are not integrated in the AHU casing, then the damper frame must be insulated.

6.5 Pumps

- In case of subsequent pump installation, it has to be noted that the intake socket is below the water surface.
- The pump base has to be set so low, that the suction tub declines towards the pump.
- For noise insulation, the foundation shall be executed as the AHU itself (refer to **chapter 4.1 (Foundation)**).
- **Fresh water supply:** The maximum allowable pressure is 300 kPa (3.0 bar).

6.6 Freeze protection measures

It is the customer's responsibility to provide sufficient freeze protection. Some possibilities for that purpose are listed below:

At cooling coils:

- Complete drainage of the heat exchanger
- Usage of water/glycol fluid mixtures with adequate glycol concentration. Performance loss must be considered.

At heating coils:

- Control-technological frost protection: Installation of a thermostat on the air outlet side to trigger alarm or temperature variation alert. (Setting trigger temperature 5 °C). In the event of an alarm, the mixture valve opens (100%), the heating circuit pump gets a signal and the fan is switched off automatically.

At run-around-systems:

- Usage of water/glycol fluid mixtures with adequate glycol concentration. Performance loss must be considered.

7 Electrical connection

- The electrical connection must be executed in compliance with international regulations such as the Low Voltage Directive 2014/35/EU and the requirements of electromagnetic compatibility Directive 2014/30/EU, of national legislation and the requirements of the local electricity provider.
- All electrical connections must be inspected annually and deficiencies (for example, loose cable strands, loose screw and clamp connection, etc.) must be eliminated and repaired immediately.
- For systems, which operate in hazardous areas, there are special provisions for component / equipment design and used materials. For details refer to **chapter 11 (AHUs)**.

7.1 Connecting to an external protective conductor system

The AHU must be connected to an external protective conductor system. The AHU shall be either:

- connected at the base frames or
- alternatively, at the Potential Compensation, that is mounted on the flexible connection by EUROCLIMA.

Furthermore, each electrical component must be connected to the protective conductor system.

The connection to the external protective earth system has to be executed according to EN 60204-1, pt. 5.2. The minimum cross-sectional-surface of the earth at frequency converter has to be 10 mm², otherwise 4 mm² at AHUs with control. Depending on the cross-sectional-surface of the outer conductor, the requirements regarding minimum cross-sectional-surfaces of the protective earth system according to EN 60204-1, pt. 5.2, table 1 have to be considered additionally.

After assembling and installation the consistency of the protective conductor system has to be checked and documented according to EN 60201-1, pt. 18.2.

During commissioning, the loop impedance of the entire, completed system must be checked. A maximum permissible limit value of 1 Ω applies here, which ensures that the electrical protective devices are triggered in good time.

Lightning protection for roof AHUs



WARNING!

A lightning protection, especially for roof AHUs, must be professionally installed on site according to national laws and guidance. Otherwise, a fire can be caused, for example, by a lightning strike.

7.2 AC motors

The three-phase motors fulfill the following criteria:

- Protection class: IP 55

- Thermal class: F
- Type: B3

In thermal class F, the motor can deliver the rated capacity up to

- a coolant temperature (air temperature in the fan section) of 40 °C.
- at an altitude up to 1000 m.

At values that exceed from the above, the load is to reduce.

Single-speed motors

Single-speed motors are suitable for direct and star-delta starting. If the wiring to the AHU outside was completed and installed by EUROCLIMA, standard wiring is for direct-start. Wiring for star-delta start is possible on request.

All single-speed motors are suitable for frequency converters.



NOTICE!

Admissible operating range of the motor:

- To ensure an adequate motor cooling the minimum frequency during the frequency converter operation must be not less than 15 Hz.
- The maximum admissible motor speed depends on the maximum admissible fan speed. The maximum admissible fan speed is specified on the order-related technical data sheets. For safety reasons, the maximum admissible fan speed must not be exceeded!
- In order to prevent high vibration loads and damage, critical speeds or operating frequencies must be avoided, see **chapter 8.3.3 (Vibration verification)**.

EUROCLIMA, therefore, recommends that the operating conditions are continually monitored and assessed.

Two or three speed motors

These motors are always designed for direct-start in each stage.



NOTICE!

These motors are not suitable for a frequency converter! A frequency converter destroys the motor winding!

For ZHK AHUs the following on site equipment is required:

1) Motor without a frequency converter: motor protection switch

A motor protection switch must always be used when the motor is not running with a frequency converter.

The motor protection switch must be equipped with a thermal switch to protect the motor winding and with an electro-magnetic switch (short-circuit protection). The function of the motor protection switch is to protect the motor against destruction by switching off all connections in the event of:

- Not start
- Overload
- Decrease of mains voltage
- Failure of a conductor in the three phases power supply

2) Motor with frequency converter: circuit breaker is sufficient

If the motor is operated at the frequency converter, a short circuit protection by a circuit breaker is adequate.



DANGER!

Attention: Danger due to leakage current!

Leakage current exceeds 3.5 mA. It is the task of the operator or the certificated electrician to provide a suitable earth (see **7.1 Connecting to an external protective conductor system**) of the AHU. An incompetently fitted earth of the frequency converter could lead to death or to serious injuries.

In addition to 1) or 2) full motor protection with PTC (thermistor)

As standard a PTC thermistor (specified in the technical data sheet as PTC) is used for:

- Motors for belt-driven fans capacity ≥ 11 kW
- As an option for smaller capacities available
- For all plug fan motors



NOTICE!

To prevent motor damage, the PTC must be connected to a PTC relay. The PTC relay does not replace the motor protection switch or circuit breaker and is needed in addition. The connection to a PTC relay is a prerequisite for the guaranteed warranty of the product in case of winding damage.

The full motor protection consists of temperature sensors and a PTC relay (on site). On frequency converters, this function is integrated.

How it works: For single-speed three-phase AC motors, 3 temperature sensors are installed in series on the exhaust air side of the motor in the winding head. At 135 °C, a sharp increase of resistance occurs, which switches the PTC relay off. For an example of the connection diagram refer to **Figure 192**.

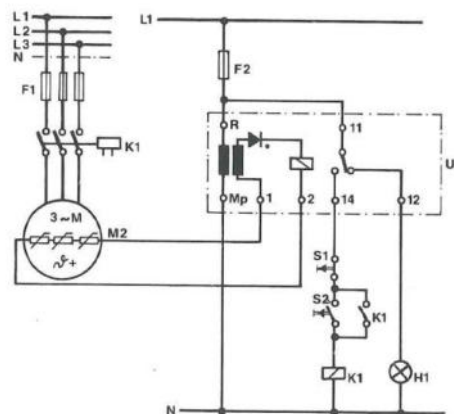


Figure 192: Wiring diagram for thermistors

The full motor protection switches off the motor in case of:

- Overload of the motor
- Poor cooling
- Bearing damage
- Block of the rotor
- Winding problems



NOTICE!

Voltages must not exceed 5 V at the temperature sensor. This leads to its destruction!

Alternative to PTC: Motors with integrated bimetal sensor (thermal contact, Clixon) - optional

Bimetal detectors are used for thermal monitoring of motor windings and consist of two successive rolled metals, with unequal thermal expansion coefficients. When they are heated, they expand unevenly and can switch a contact. They have the advantage that they can be placed directly on the switch and so no special relay (as for PTC) is needed.

Block diagram for connection: refer to **Figure 193**.

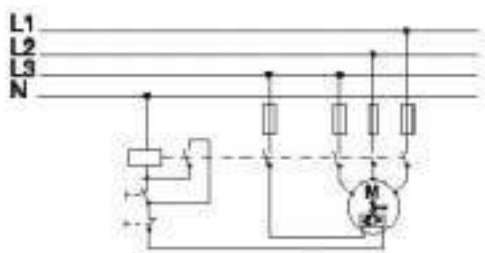


Figure 193: Wiring diagram for thermal contacts

ETA - AHU

These AHUs are as standard equipped, with a circuit protection switch and frequency converters, if not equipped with EC motors. When the motor is equipped with a PTC, it is connected to frequency converter to monitor the temperature.

Motor connection

The three-phase motor must be connected, depending on the used supply voltage and according to the information on the rating plate (see **Figure 194**) and in the terminal box (see **Figure 195**) of the motor.

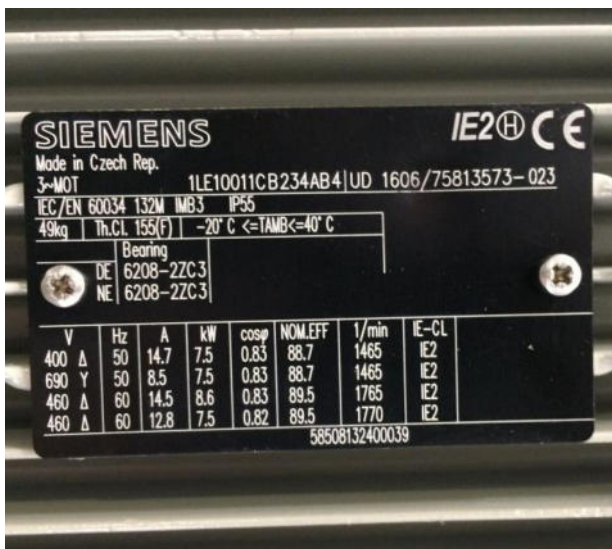


Figure 194: Motor rating plate



Figure 195: Motor terminal box

Cable type for motor connection

The motor can be powered directly or via a frequency converter. A shielded cable must be used for the motor cable and the shield must be grounded on both ends (frequency converter / main switch & motor).

Correct direction of motor rotation is a result of direction of fan impeller rotation which is marked by an arrow: for EC fan refer to **Figure 198**, for plug fan refer to **Figure 196**, for fan with housing refer to **Figure 197**.

Before connecting the motor, check the rotating field of mains connection with a suitable device. Afterwards, connect the phases accordingly to the motor terminal or main switch (if supplied and wired by EUROCLIMA).



Figure 196: Rotation marking of plug fans



Figure 197: Rotation marking of housing fans



Figure 198: Rotation marking of EC fans

Fastening torque for electrical connections on the control panel refer to **Table 11**:


	Thread Ø		M4	M5	M6
	Nm	min.	0,8	1,8	2,7
		max.	1,2	2,5	4

Table 11: Torques for the motor terminal board



NOTICE!

Before connecting to the local power network, check that the local power supply is compatible with the motor requirements from the nameplate. In general the fan motors are designed for continuous operation. Abnormal operating conditions, particularly multiple start-ups at short intervals should be avoided, it could lead to thermal overloading of the motor.

7.3 EC motors

EC motors are variable through an integrated frequency converter. For operation, the supply voltage, a digital enable signal and an analog control signal are required for the speed control.

**NOTICE!**

- The maximum admissible motor speed depends on the maximum admissible fan speed. The maximum admissible fan speed is specified on the order-related technical data sheets. For safety reasons, the maximum admissible fan speed must not be exceeded!
- In order to prevent high vibration loads and damage, critical speeds or operating frequencies must be avoided, see **chapter 8.3.3 (Vibration verification)**.

EUROCLIMA, therefore, recommends that operating conditions are continually monitored and assessed.

When using residual current circuit breakers (RCDs), the supply line must be protected by means of an all-current sensitive (type B or B+) residual current circuit breaker.

Cable type for motor connection

A shielded cable must be used for the motor cable (supply voltage) and the analog input signal, and the shield must be grounded on both ends (main switch & motor).

7.4 Main switch (emergency stop switch)

According to the standards IEC / EN 60204 and VDE 0113, all hazardous facilities have to be equipped with a main switch, which separates the plant from all active conductors of the main supply. This means that every single AHU must be equipped with such a main switch.

The main functions and requirements (in compliance with standards DIN VDE 0660 and IEC 947-3) when using the RED-YELLOW main switch as follows:

1. Is used as a repair, maintenance or safety switch, because the actuation of the switch does not reset the control commands from control system.
2. Has a clearly marked OFF (0) and ON (I) position.
3. The OFF position is lockable, to secure against unauthorized or unintentional restart.
4. For outdoor installation the main switch must be at least IP65.
5. Interrupts the power supply to the AHU (lighting can be excluded, refer to **chapter 7.10 (Lighting)**).
6. Separates the electrical equipment from the main supply.
7. Is easily accessible
8. Mounted within sight of the AHU.
9. The allocation to the AHU can be clearly seen.
10. **Emergency stop function:** The main switch (red switch with yellow background) **must be connected to the control system with appropriate components** in order to ensure the emergency stop function works effectively. Reset means that a manual start command, separate from main switch, must be activated.



Figure 199: Main switch

ZHK-AHU with EUROCLIMA-control

- Control box is equipped with main switch in execution RED-YELLOW as specified above
- It is the responsibility of the client to ensure that the above specified requirements, according to DIN VDE 0660 and IEC 947-3, are complied with and main switch fulfills the following:
 - a) items 7 to 9
 - b) item 10, implementation of emergency stop function in control system

ZHK-AHU without EUROCLIMA-control

- The specified main switch must be provided by the client
- If EUROCLIMA is not asked to provide components/ mechanisms, the supply and installation of a main switch for the fan motor must be undertaken by the client and/ or contractor. Fan motor main switch only cuts the motor off.
- Furthermore, it is the responsibility of the client to ensure that all items 1 to 10 of the above specified **requirements according to DIN VDE 0660 and IEC 947-3 on a main switch in RED-YELLOW execution** are fulfilled and instruction adhered.

7.5 Variable, frequency-controlled drives (VFD, frequency converters)

If the frequency converter is supplied by an alternative company/ source other than EUROCLIMA, it is important to note the following points to ensure proper operation:

- Suitability for fans with variable torque.
- The frequency converters supplied by EUROCLIMA are usually equipped with interference filters. The interference filter must be compatible with the on-site power supply system.
- The current output of the frequency converter must be compatible with the nominal motor capacity.
- The frequency converter must be adapted for the installation type (IP rating, type of ventilation, temperature, electromagnetic environment etc.)
- If the frequency converter is be mounted in the fan section, the frequency converter must be equipped with a separate display unit.



WARNING!

In this case, the display needs to be kept on the outside of the AHU. Operating in the fan section is not permitted for safety reasons!

When using residual current devices (RCD), the supply cable has to be equipped with a RCD, which is approved for frequency converter (Type B or U, 300 mA).

Plug fans

When using this type of fan (fan with direct-coupled motor-wheel), a frequency converter is necessary to reach the operating point.

7.6 Connection electrostatic filters

- If the electrostatic filters are supplied loose, the correct power connection must be carried out on site according to the manufacturer's operating instructions. This can be accessed online using the QR code on the first page of these instruction manual.
- A safety microswitch must be installed on all doors in the electrostatic filters section, which interrupts the current voltage applied to the filters when the door is opened.
- The power connections must be set up so that the electrostatic filters can only be powered and switched on when the fan is operating properly.
- The electrostatic filter must be supplied with a voltage of 230 volts 50/60 Hz via the power connection plug provided for this purpose. **Figure 200** shows an example of the connection between the filters.

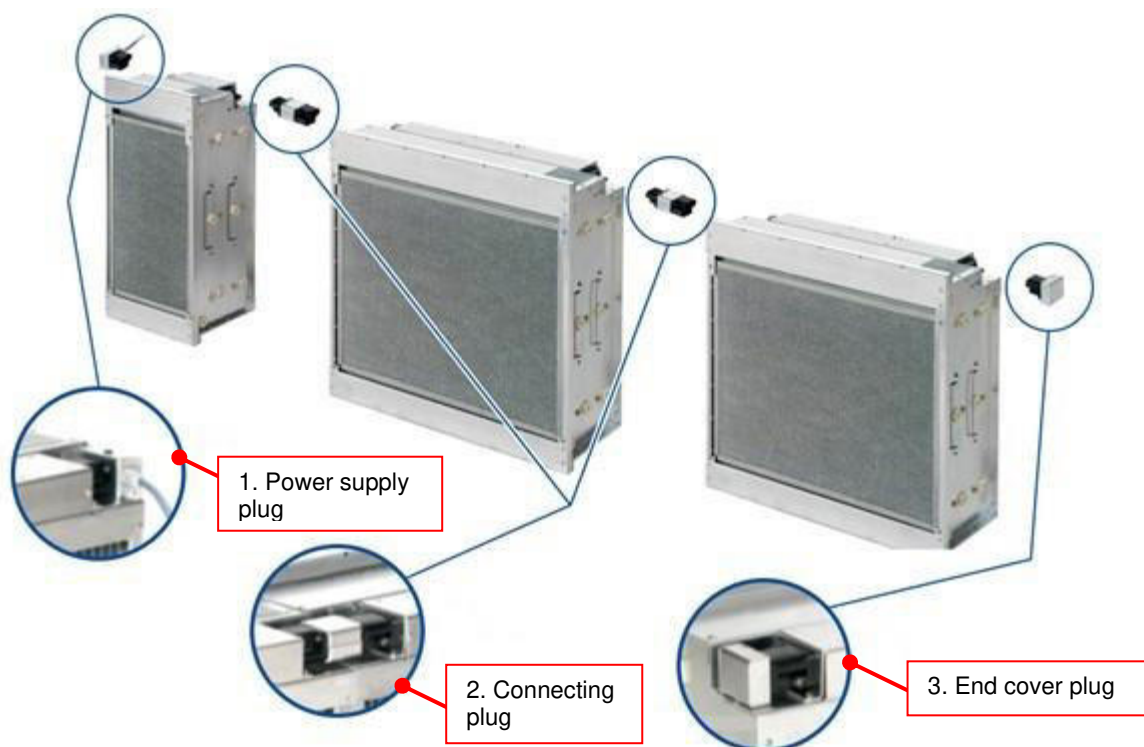


Figure 200: Connection example electrostatic filter

7.7 Electric heaters

An electric heater is designed to heat the airflow, which is recorded on the technical data sheet, from the specified air inlet temperature to the air outlet temperature. EUROCLIMA provides electric heaters with one or more stages according to customer requirements.

The control of the electric heater provided by the customer can be considered in several ways:

- On-Off at single-stage electric heater (this type of control decreases the lifetime of the electric heater under circumstances significantly)
- On-Off at multistage electric heater
- Continuous (e.g. with suitable thyristor control)



WARNING!

Fire risk!

With the electric heater in operation, the heating elements increase to a temperature of several hundred °C.

In the event of malfunction, for example, a heater in operation without adequate airflow, inadmissible temperatures could occur. Furthermore, plastic parts, for example, filters, gaskets and droplet eliminators etc., which are close to an electric heater could become damaged or even catch fire. This could lead to the spread of fire and significant damages to the wider building.

In order to avoid the above stated risks, EUROCLIMA provides, as standard, electric heaters with two independent safety thermostats.

7.7.1 AHUs equipped by EUROCLIMA with control

Units, which are supplied by EUROCLIMA with control, are limiting the supply air temperature to a default value of 35 °C.

This execution and function, as specified below, is supplied by EUROCLIMA.

Control-side limitation of the air temperature beyond the electric heater

The control of the electric heater always regulates the temperature of the air passing through the heater so that it never exceeds the permitted air temperature in the AHU (40 °C, if not differently specified in the technical data). This item must be specially and closely monitored, when the AHU is only operated with a partial air flow. For example, in times of reduced use of the building.



WARNING!

As the heat output of an electric heater is generated very quickly and at full capacity at ON-OFF operation, there is a significant risk of overheating of the AHU, which contributes to the damage of several components. This risk occurs especially at low air flows.

For this purpose, the air handling unit is equipped with a supply air sensor, which directly measures and monitors the air temperature generated by the electric heater. The control engineering is used to ensure that the heating power of the electric heater is controlled so that the temperature remains within the permitted air temperature levels in the AHU.

Avoid overheating of AHU components by residual heat of the electric heater

In order to avoid excessive heating of components by residual heat of the electric heater, this control ensures that fan motor keeps on running for at least 5 min after cutting off of the electric heater! By using an enabling contact (see **Figure 204**) the control engineering also ensures that the electric heater can only start its operation when the fan is running.



WARNING!

If in case of main power failure (for example lightning strike) this automatic running cannot be ensured. The AHU could become damaged by the residual heat of the electric heater.

Therefore, in order to avoid damages, an uninterrupted power supply is recommended. If the AHU is not operated by an uninterrupted power supply after every main power failure, an AHU inspection is required as indicated in **chapter 9 (Maintenance)**.

Safety concept

Electric heater power supply is equipped with two contactors in serial connection!

The two safety thermostats protect the AHU in two independent ways:

Firstly: By hardware via contactors in the power supply.

Secondly: By software via controlling. In the event of failure, contactors can immediately cut off the electric heater from the power supply.

- The two safety thermostats are connected in serial connection.
- The two safety thermostats are equipped with manual reset.
- After triggering (the reason for stopping) must be detected and eliminated before the reset of the thermostat!

Thermostat 1 (Figure 201 and Figure 202)

- Position of thermostat body: attached on the electric heater at the connection side, is accessible by removing the electric heater access panel.
- Triggering temperature: pre-set-value must not be changed.
- Sensor position: between heating bars.
- Function: alarm-triggered-stop in case of temperature levels exceeding set limits because of low airflow issues.



Figure 201: Thermostat with cover cap on the reset button

Cover cap on reset button
Reset button



Figure 202: Thermostat with uncovered reset button

Thermostat 2 (Figure 203)

- Position of the thermostat casing: attached on the outside panel of AHU casing
- Triggering temperature: set to 70 °C – value must not be changed
- Sensor position: downstream of the electric heater in upper area of airflow
- Function: alarm-triggered-shutdown in the event of temperatures exceeding set limits because of lack of airflow



Figure 203: Thermostat 2

Connection box could reach high temperatures. For suitable connection, use heat-resistant cables (admissible operation temperature min. 110 °C), for example silicone, Teflon or glass fiber insulated cables.

Connection scheme for electric heater according to EUROCLIMA:

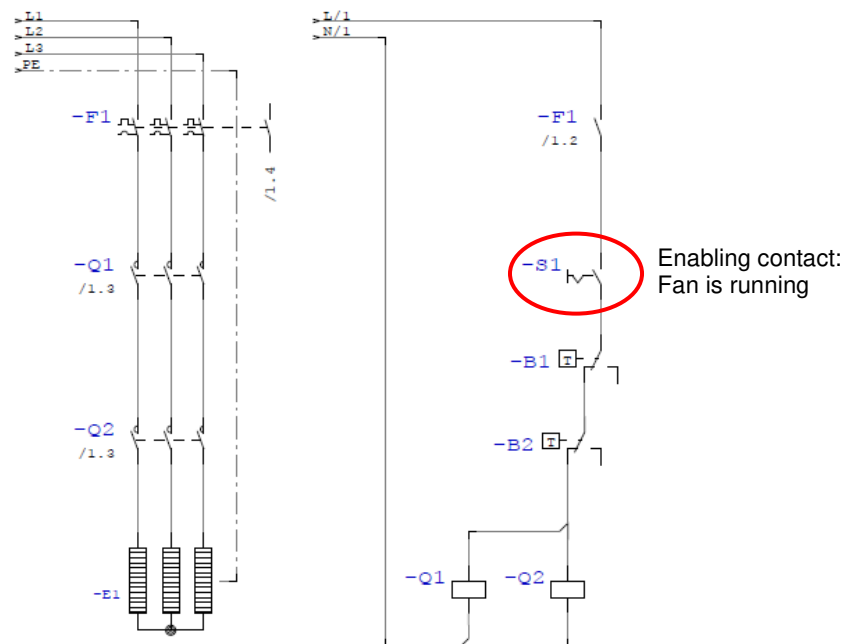


Figure 204: Connection scheme for electric heater

In the event of dehumidification at the wheel downstream of electric heater, it is ensured that control rotates the wheel while electric heater is on (additional enabling contact).

7.7.2 AHUs which are not equipped from EUROCLIMA with control

Supply by EUROCLIMA contains:

- Two independent safety thermostats
- assembly of the safety thermostats



WARNING!

The **safety related and correct implementation of this control** must be carried out **on site**. It is the full responsibility of the client to undertake this task.

The minimum safety requirements described in **chapter 7.7.1 (AHUs equipped by EUROCLIMA with control)** have to be ensured and is the full responsibility of the customer to do so.

7.8 Differential pressure restriction for plate heat exchangers

7.8.1 General indications



NOTICE!

Plate heat exchangers are only partly pressure resistant.

Through incorrect installation, commissioning or operation by the user of the system, the pressure between supply and exhaust air in the plate heat exchanger could rise inadmissibly and destroy it.

The damages are costly.

The maximum allowed pressure difference of the plate heat exchanger is given in the plate heat exchanger section – supply air in the technical data, see **Figure 205**. In the part of the technical data of the exhaust air this value is not given, see **Figure 206**.

PT	Plate exchanger - diagonal				2.287,5 [mm]	18,74 [m2]	993,00 [kg]	180 [Pa]
Type	FI AL 14 N 1825 U 1 AE SM BHBP155				Max. allowed pressure difference			2.000 [Pa]
With bypass	155,0 [mm]				Density [kg/m³]			1,20
<u>Winter condition</u>					<u>Cooling condition</u>			
Exhaust [m³/h]	11.627	air-side humid p.d. [174	Exhaust [m³/h]	air-side humid p.d. [P		
Entering [°C]	22,00	Humidity [%]		50,0	Entering [°C]	Humidity [%]		
Leaving [°C]	2,30	Humidity [%]		100,0	Leaving [°C]	Humidity [%]		
Supply [m³/h]	11.627	air-side humid p.d. [167	Supply [m³/h]	air-side humid p.d. [P		
Entering [°C]	-12,00	Humidity [%]		90,0	Entering [°C]	Humidity [%]		
Leaving [°C]	17,30	Humidity [%]		10,0	Leaving [°C]	Humidity [%]		

Figure 205: Plate exchanger section in technical data – supply air – maximum admissible differential pressure

PT	Plate exchanger - diagonal				2.287,5 [mm]	18,74 [m²]	993,00 [kg]	190 [Pa]
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Figure 206: Plate exchanger section in technical data – exhaust air

Possible causes for inadmissible pressure increase:

The following factors can cause an increase in pressure and destroy the plate heat exchanger:

- Dampers are closed or will be closed or are delayed in opening.
- Filters were not changed if they reached their final pressure drop.
- The external pressure drop is higher than calculated.
- Dampers in the duct system, unintended barriers, closed outlet grille or unfinished duct systems can lead to additional external pressures.
- Only one fan is working (supply- or exhaust air), which can increase the pressure in some cases.

7.8.2 Prevention measures

General measures:



NOTICE!

It must be ensured on site that all of the above-mentioned causes that can lead to an increase in pressure in the duct system are avoided during commissioning and operation!

Unless otherwise stated, the assumed pressure situation in the ducts (suction and pressure side) for the technical design is based on the specification of EN13053. The real pressure situation in the ducts must be checked before commissioning. If there are any deviations, EUROCLIMA must be contacted.

In principle there are different technical measures, which contribute to the prevention of inadmissible pressure in the plate exchanger. One of these measures is described in **chapter 7.8.3**.

7.8.3 Pressure monitoring with differential pressure switch

Additionally, to the general measures, pressure monitoring could protect the plate exchanger against damage caused by a steady pressure increase, **but not if the pressure increases abruptly.**

One possibility for pressure monitoring is a differential pressure switch. The usage is described as follows:

- Depending on the fan arrangement, one or two differential pressure switches must be provided, see **Figure 207** to **Figure 210**.
- The differential pressure switches monitor the differential pressures, which the plate heat exchanger is exposed to.
- If the measured pressure exceeds the admissible, adjusted value, the differential pressure switch shuts off the concerned fan motors. For this purpose, the switches must be installed (airside and electrically) as follows.

Airside connection of the pressure switch depending on the fan arrangement

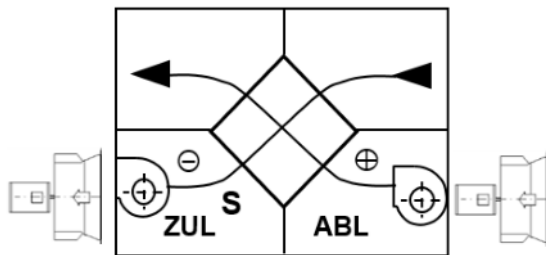


Figure 207: Supply air sucking, exhaust air pressing;
1 pressure switch (S), 2 measuring points (+/-)

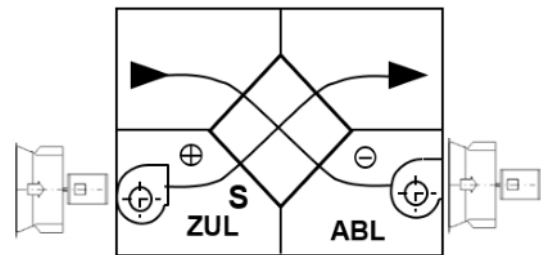


Figure 208: Supply air pressing, exhaust air sucking;
1 pressure switch (S), 2 measuring points (+/-)

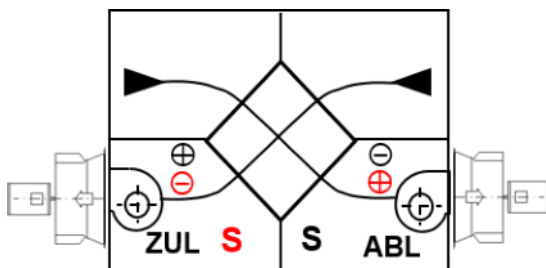


Figure 209: Supply air sucking, exhaust air sucking ;2
pressure switch (S), 4 measuring points (+/-)

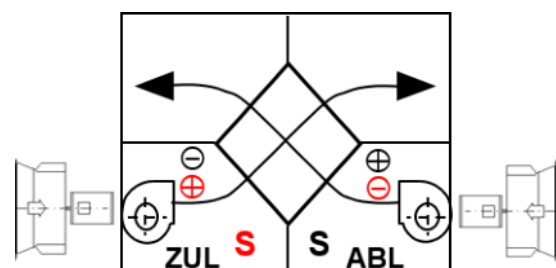


Figure 210: Supply air pressing, exhaust air pressing;
2 pressure switch (S), 4 measuring points (+/-)

Electrical connection

The electrical connection of the fans must be undertaken on site, which is the full responsibility of the customer to implement. This is extremely important because in the event of exceeding the maximum allowable differential pressure, the fan motors will immediately be disconnected from the power supply until they can be restarted safely by the relevant professional. . For an example for connection diagram, refer to **Figure 211** below.

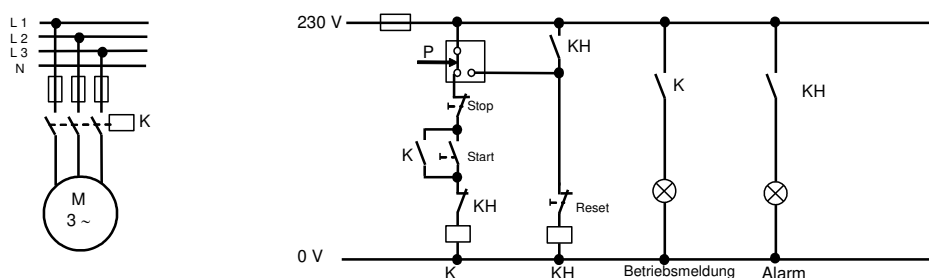


Figure 211: Electrical connection scheme

When the differential pressure switch has been activated, the cause of the excessive pressure must be found, repaired and eliminated before restarting.

Value to be set:

The setting of the differential pressure switch must be undertaken on site, based on the actual pressure situation observed on site. The actual differential pressures must be measured at the commissioning stage with the target volume flows. Measuring points, depending on the fan arrangement, can be found in **Figure 207** to **Figure 210**. From the beginning, until reaching the target volume flow, the maximum admissible differential pressure (according to the technical data) must not be exceeded. Based on these measured values reserves, for example, for filter pressure losses or other additional pressure losses, must be added. This calculated pressure measurement must be adjusted at the differential pressure switch as trigger value.



NOTICE!

It is vital that this calculated value does not exceed the maximum admissible differential pressure according to the technical data, see Figure 205.

If the maximum admissible differential pressure is not given in the technical data, EUROCLIMA must be contacted.

If EUROCLIMA supplies the differential pressure switch, then they are factory mounted. The setting, as described above, must be executed by the customer on site at the commissioning stage. The correct connection of the measuring hoses, according to **Figure 207** to **Figure 210**, must be ensured before commissioning.

Important: If you have any questions or doubts regarding the correct installation, connection and adjustment of differential pressure switches or other measures to protect against impermissible pressures, please contact EUROCLIMA.

7.9 Frost protection for plate heat exchanger

At low temperatures and high air speeds, the condensate in the plate heat exchanger can freeze and ice over.

For devices supplied by EUROCLIMA with control, this is prevented by pressure monitoring of the plate heat exchanger and the temporary adjustment of the supply air volume flow. For devices supplied by EUROCLIMA without control, appropriate measures are required to protect the plate heat exchanger on site. For example, a temporary reduction of the supply air flow.

7.10 Lighting

Depending on the number of delivered (optional) lamps, the assignment of the switches and junction boxes can be found below:

1 Lamp	1 switch
> 1 <= 4 Lamp	1 switch, 1 junction box
> 4 <= 8 Lamp	1 switch, 2 junction box
> 8 <= 12 Lamp	1 switch, 3 junction box

The lamps are mounted and supplied with one side connected and one side with loose cables, sufficient in length to be routed to the nearest junction box or the next switch.

The AHU will be delivered in parts, and for this reason the lights have to be connected on site and the client is responsible for the completion of this work.

If the AHU require lights to be fitted on site, make sure that sections with condensate (cooling sections), humidifier sections and wet sections are equipped with lights with appropriate protection of at least IP55. Switches or junction boxes mounted on the outside of rooftop AHUs must also have at least protection class IP55.

For AHUs with integrated control and lighting, an additional power supply for the lighting must be provided and separated from the power supply for the control cabinet. This ensures that the light also can be switched on during repair work, despite the main switch being switched off (prerequisite for access to the AHU).

7.11 UV section

This section contains UV-C-lamps to destroy germs on surfaces as well as in the air in the direct radiation area. If no other configuration is agreed, these lamps should be mounted as evenly as possible and distributed on the ceiling, the rear sidewall and on the bottom. The number of lamps to be installed will be determined by consultation with your EUROCLIMA office.

EUROCLIMA is not able to determine the amount of germs killed through the use of UV-C-lamps.

The lamps will be mounted, cabled, led and fixed to the junction box (inclusive switch) outside of the AHU by EUROCLIMA.



- The safety instructions in **chapter 2.3 (Indications for minimizing specific hazards)** and the user manual of the lamp manufacturer (delivered with the present instruction manual) have to be followed and considered.
- Due to the high voltage of the lamp, maintain it safely and do not work with it whilst it is active and live. **Danger to life due to electrical shock!**
- **DANGER:** UV-risk class 3. These lamps emit strong UV radiation, which could lead to serious injuries of skin and eyes. Avoid eye and skin contact with un-screened products. Use them only in a safe and secure environment, which protects the user against radiation.



- It is highly unlikely that a lamp break would immediately impact on your health, but repair with caution and safely. If a lamp breaks, air the room for 30 minutes and remove the broken pieces, preferably with cut resistant gloves. Put the waste into a sealed plastic bag and take them to the local recycling station. Do not use a vacuum cleaner.

8 Commissioning

8.1 Preliminary steps

- Clean thoroughly the AHU and all components of dust, shavings and any other debris.
- Remove all loose parts like tools, screws, unneeded parts etc. and any documentation from the AHU. Such parts can be sucked in by the fan and lead to its destruction.
- check all bolt connections and electrical connections and retighten if necessary
- Ensure that the duct pressure corresponds to the pressure for the nominal air flow and the pressure specified in the technical data sheet.
- Ensure that all planned filters are mounted. Non mounted filters can overload the fan motor.
- All cables must be checked for damage to the insulation and replaced if necessary.

- Function test of the repair switch (emergency stop switch):
 - o Press the switch
 - o Check that there is no voltage or power
 - o After pressing the switch again, the system should not restart and should remain without power and at a standstill. A manual start command is also required for this process (see **chapter 7.4 (Main switch (emergency stop switch))**).

Here are some important points to consider, which could cause problems after transport or inappropriate AHU handling.

- Rotate the impeller of the fan by hand, to check whether it rotates freely.
- Check that the screws of variable pulleys are tightened – refer to **Figure 212**, tightening torque depends on the type of bush, according to **Table 12**.


	Socket	1108	1210	1215	1610	1615	2012	2517
	Nm	5,7	20	20	20	20	32	50

Table 12: Tightening torque for variable pulleys

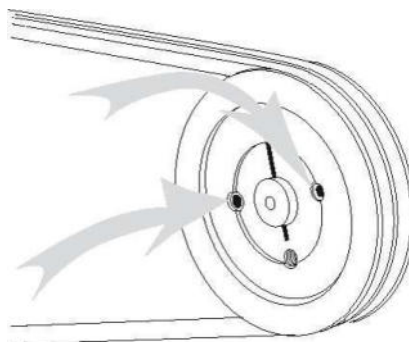


Figure 212: Fixing screws

- Check the tension of the belt and the alignment of the pulleys, refer to **chapter 9.3.5 (Re-tensioning of belts)**.
- Check the motor connection and the matching of the supply voltage at the rated voltage - a fluctuation of supply voltage between + -5% is permitted.

8.1.1 Variable frequency controlled drives (frequency converter) - parameters

The frequency converter must be configured, if this is not undertaken by EUROCLIMA. Therefore, the relevant persons must refer to technical data sheet: parameterization using the following **Table 13** and respectively the provided operating instructions of the frequency converter manufacturer and data from EUROCLIMA technical data sheet.



WARNING!

- Observe and follow safety instructions of **chapter 2.3 (Indications for minimizing specific hazards)** and safety instructions of the frequency converter manufacturer (supplied by EUROCLIMA).
- Observe safety instructions of the fan manufacturer (supplied from EUROCLIMA) regarding fan minimum starting up time. Otherwise a fatigue fracture of the impeller could occur.

Parameters for Danfoss frequency converter FC102

Nr.	Description	Value	Note
0-...	Display		
0-01	Language	[1] German	[0] English, [5] Italian
0-02	Switching between Hz/rpm	[1] Hz	Display in Hz or rpm
0-20	Display line 1.1	[1601] Setpoint [unit]	
0-21	Display line 1.2	[1610] Power [kW]	
0-22	Display line 1.3	[1614] Current [A]	
1-...	Motor/load		
1-00	Control type	[0] Speed control	
1-03	Torque behavior of load	[3] Auto energy optimization VT	
1-20	Motor nominal power	... kW	According to motor nameplate
1-22	Motor nominal voltage	... V	According to motor nameplate
1-23	Motor nominal frequency	... Hz	According to motor nameplate
1-24	Motor nominal current	... A	According to motor nameplate
1-25	Motor nominal speed	... rpm	According to motor nameplate
1-90	Thermal motor protection	[2] Switch off of thermistor	Connect PTC/Clixon
1-93	Thermistor connection	[2] Analog input 54	Connect thermistor to 50/54
3-...	Setpoints/ramps		
3-02	Minimum setpoint	15 Hz	
3-03	Maximum setpoint	... Hz	According to AHU data sheet Max[Hz]=max speed [rpm]/nominal speed [rpm]*50[Hz]
3-15	Variable setpoint 1	[1] Analog input 53	
3-16	Variable setpoint 2	[0] Disabled	
3-17	Variable setpoint 3	[0] Disabled	
3-41	Speed increase after start 1	30 s	
3-42	Speed decrease after stop 1	30 s	
4-...	Limits/Warnings		
4-10	Motor rotation direction	[0] Only clockwise	
4-12	Minimum frequency	15 Hz	
4-14	Maximum frequency	... Hz	According to AHU data sheet Max[Hz]=max speed [rpm]/nominal speed [rpm]*50[Hz]
4-16	Torque limit	110 %	
4-18	Current limit	110 %	
4-50	Warning low current	0 A	
4-51	Warning high current	... A	Nom. current according to motor plate
5-...	Digital inputs/outputs		
5-10	Clamp digital input 18	[8] Start	Start command clamp 12/18
5-11	Clamp digital input 19	[0] Without function	
5-12	Clamp digital input 27	[2] Motor coast (inv)	Bridge 12/27 necessary for operation
5-13	Clamp digital input 29	[0] Without function	
5-14	Clamp digital input 32	[0] Without function	
5-15	Clamp digital input 33	[0] Without function	
5-40	Relays 1 [0]	[5] Motor rotates	
	Relays 2 [1]	[2] Ready	
6-...	Analog inputs/outputs		
6-01	Dropout of signal function	[0] Off	
6-10	Clamp 53 minimum voltage	0.00 V	
6-11	Clamp 53 maximum voltage	10.00 V	
6-14	Clamp 53 minimum frequency	15 Hz	
6-15	Clamp 53 maximum frequency	... Hz	According to AHU data sheet Max[Hz]=max speed [rpm]/nominal speed [rpm]*50[Hz]
6-17	Clamp 53 signal error	[0] Disabled	
	Connections control cables:		
	PTC/Clixon	Clamp 50 and 54	50=+10V, 54=analog input 2
	Start	Clamp 12 and 18	12=+24V, 18=digital input
	Release	Clamp 12 and 27	12=+24V, 27=digital input

Table 13: Parameters for Danfoss frequency converter FC102

8.1.2 Airflow measurement by differential pressure measurement at the fan

If the fan is provided with pressure test points for airflow measurement and black test points are provided on the outside of the fan unit (accessories are indicated on the technical data sheet), then a differential pressure signal can be taken.

The delivered airflow rate can be calculated or displayed from the measured differential pressure. A so-called K-value and an associated formula are used for calculation or for input into display or control devices.

Usually, two different formulas and thus two different K-values are in use:

Formula A	Formula B
In this formula, the respective air density at the fan is taken into account. The air density must be determined as a function of air temperature, air humidity, sea level and atmospheric pressure.	In this formula, a variable air density is not taken into account. Instead, a "fixed" air density of 1.20 kg/m³ is assumed.
With the following formulas, the airflow rate can be determined from the pressure signal:	
<div>- Airflow rate calculation</div> <div>$\dot{V} = K_A \cdot \sqrt{\frac{2 \cdot \Delta p_w}{\rho_v}}$</div> <div><div>$\dot{V}$</div><div>Nominal airflow rate</div><div>m³/h</div></div> <div><div>K_A</div><div>K_A –factor for formula A</div><div>m²*s/h</div></div> <div><div>Δp_w</div><div>Measured diff. pressure</div><div>Pa</div></div> <div><div>ρ_v</div><div>Air density at the fan</div><div>kg/m³</div></div>	<div>- Airflow rate calculation</div> <div>$\dot{V} = k_B \cdot \sqrt{\Delta p_w}$</div> <div><div>$\dot{V}$</div><div>Nominal airflow rate</div><div>m³/h</div></div> <div><div>k_B</div><div>k_B –factor for formula B</div><div>m³/(h*Pa^{0.5})</div></div> <div><div>Δp_w</div><div>Measured diff. pressure</div><div>Pa</div></div>
If several fans in a fan section are operated in parallel with the same speed, then the total airflow rate is accordingly a multiple of the calculated individual airflow rate.	
With the following formulas, the setpoint Δp_w can be determined for a certain airflow rate (e.g. for dimensioning a pressure sensor, for constant airflow rate control):	
<div>- Target differential pressure calculation</div> <div>$\Delta p_{w.set} = \frac{\dot{V}^2 \cdot \rho_v}{K_A^2 \cdot 2}$</div> <div><div>$\Delta p_{w.set}$</div><div>Target differential pressure</div><div>Pa</div></div> <div><div>\dot{V}</div><div>Target airflow rate</div><div>m³/h</div></div> <div><div>K_A</div><div>K_A –factor for formula A (s.a.)</div><div>m²*s/h</div></div> <div><div>ρ_v</div><div>Air density at the fan (Nominal value)</div><div>kg/m³</div></div>	<div>- Target differential pressure calculation</div> <div>$\Delta p_{w.set} = \frac{\dot{V}^2}{k_B^2}$</div> <div><div>$\Delta p_{w.set}$</div><div>Target differential pressure</div><div>Pa</div></div> <div><div>\dot{V}</div><div>Target airflow rate</div><div>m³/h</div></div> <div><div>k_B</div><div>k_B –factor for formula B (s.a.)</div><div>m³/(h*Pa^{0.5})</div></div>

Table 14: Formulas for airflow rate measurement

For entry into a display or control unit, please check whether or not this is programmed according to formula A or formula B and enter the corresponding value K_A or k_B .

The corresponding K-factors of the fan are shown on the fan-motor data sheet or on the technical data sheet for the AHU. The data on the data sheet always refers to one fan.



NOTICE!

The K-values of the fans specified in the technical data sheet apply only to free-suction fans without any components. If components (e.g.: intake protection grille, fan dampers, etc.) are installed on the fan, the K-value of the fans must be re-measured by the customer onsite when the AHU is commissioned.

The air density at the measuring point is to set up manually, depending on sea level, temperature and humidity. In most cases, 1.2 kg/m³ is a suitable value.

Note: If the EUROCLIMA delivery includes a device for airflow measurement, then it is the responsibility of the client to make sure that this is configured on site before commissioning the device.

Airflow rate indicator type PREMAREG 7161

This airflow indicator is used by EUROCLIMA and is supplied with the AHU, if included in the scope of delivery. The setting of the parameters must be made by the customer before commissioning. This means, it is the client's responsibility to complete this task in accordance with the enclosed instructions of the component manufacturer.

The display is programmed according to formula B. Correspondingly, the value kB specified on the data sheet in the fan section or the technical data sheet for the AHU must be used.

If more than one fan is installed in the supply or exhaust air, then the following instructions must be observed:

Fan execution	Displays in pcs.	Measuring points	Total air flow rate
2 fans 50 % + 50 %	1 display	Only the fan nearest to the operating side	Displayed value * 2
2 fans 100 % + 100 %	2 displays	Both fans separately	Displayed value (powered fan)
>2 fans/fan walls	1 display	Only the fan nearest to the operating side	Displayed value * number of powered fans)

Table 15: Notes for airflow rate indicators, which are included in the scope of delivery

Processing the pressure signal in other devices

Devices from other manufacturers may require a conversion of the K-value. Therefore, always ask for the formula, which the device needs and uses.

8.1.3 Heat exchanger

The heat exchangers, fittings and valves shall be tested for tightness and integrity.

Attention!

Refrigerant

If direct expansion heat exchangers or air cooled heat exchangers are installed, the system must be filled with refrigerant after the complete assembly. In this case, a refrigeration engineer must execute the installation and piping.

Water heat exchangers

Normal heating, cooling coils filled with water and additives for freeze and corrosion protection:

- Open vent valve.
- Water valve is initially only to open slightly, so that the coil will be slowly filled with water. To avoid heat stress.
- When the heat exchanger is filled, close the vent valve.
- Open the water valve fully and then start the fan?
- Subsequently, the entire piping system must be vented properly.

Steam heat exchanger filling

- Open vent and drain valve on the condensate drain.
- Open the steam valve only slightly at the beginning, until steam is coming out of the drain and vent valve (on the condensate drain outlet).
- Close drain and vent valve and open steam valve fully.
- Check regularly the vent valve during operation.

Attention!

During a temporary shutdown of the system because of frost and corrosion, it is important to avoid condensate remaining in the pipes.

8.1.4 Electric heater

Observe specifications of **chapter 7.7 (Electric heaters)** -safety thermostats.



NOTICE!

Caution is required with electric heaters that are located near to a honeycomb humidifier: The material of the honeycombs is only resistant to a temperature of maximum 60 °C. Start the heater only with running fan for heat removal!

8.1.5 Air filters

8.1.5.1 General indications

- Before the commissioning stage, all filters should be checked for tightness, as otherwise they could be sucked in and therefore lead to damage.
- Differential pressure measuring devices (U-tube manometer and inclined manometer) are optional and must be filled with the supplied test liquid (bottle) of density 1 kg/l.
- If a differential pressure switch is mounted (option) or is it installed on site, then it is to be set to the final pressure drop. Information regarding the final pressure drop can be found at the technical data sheet.
- In addition, the output of a warning alert when the final pressure loss is reached must be ensured during the commissioning. The resulting maintenance actions are described in **chapter 9.4 (Air filters)**.

8.1.5.2 Electrostatic air filters

Specifications of **chapter 7.6 (Connection electrostatic filters)** must be observed.

- The electrostatic filters may only be supplied with power when the fan is in operation.

8.1.6 Humidifier / Air washer

8.1.6.1 General indications



NOTICE!

Drain pans must be cleaned thoroughly. Pollution from installation dust residue can cause failure of the pump. In the event of this, the warranty becomes null and void.

Attention! Never operate the pump running dryly. Running against a closed discharge valve is permitted. However, operating against a closed shut-off valve should be avoided, otherwise there is danger of overheating.

- Check the pump rotation direction (arrow on the pump). Measure the current consumption and compare the values with the data on the nameplate.
- The water pressure for the water supply should be 3.0 bar. Maximum allowable pressure is 6.0 bar.
- Check the tightness of the flange connection of the humidifier to the adjoining components. If necessary, reseal.

8.1.6.2 Spray humidifier

- Fill pan and U-trap with fresh water and adjust float valve so that valve closes with a water level 2-3 cm below the overflow. Ensure in any case, bubble-free suction.
- Open the valves on the pump pressure side and suction side (where applicable) completely.
- Check the tightness of all tube connections. Retighten the clamps using a torque wrench. Fix the screw with a torque of 5/ 6. 5 Nm.
- Start the pump and re-check all tube connections for tightness. Repeat this process after 10 hours of operation.
- When the pump is running at nominal RPM, check the manometer on the pressure side. The water pressure at the manometer should be 2.5/ 3.0 bar – if necessary close the pressure side valve accordingly.
- Check that the pump strainer, washer nozzles and tubes are fitted properly.
- Check the humidifier strainer and clean it if necessary.

8.1.6.3 Evaporative humidifier

General indications:

- Check the proper installation of the PVC fins and droplet eliminator. The arrow must point in direction of airflow (**Figure 213**).
- Fins made from cellulose material can initially have an odor, which is normal and will soon disappear.

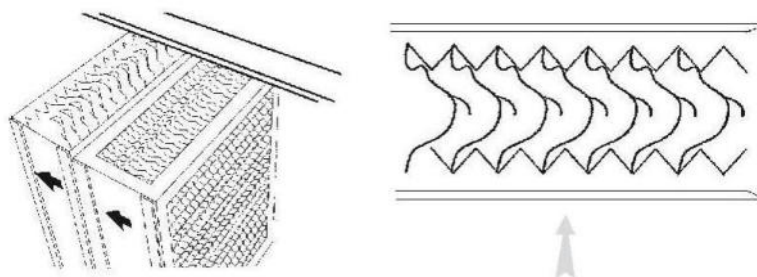


Figure 213: Installation of honey comb and droplet separator packages

Circulation water operation

- The blowdown quantity is to be setup manually at the tacosetter. Recommended setting (thumb): Bleed off rate = evaporation rate

- Ensure that the pump impeller is completely covered by water. The water level must be regulated by the maximum and minimum level switch.
- Furthermore, it must be ensured by the control, that the designated conductivity, see **Table 8**, will not be exceeded. If the limit is reached, the blowdown valve must be opened.

8.1.6.4 High-pressure spray humidifier

If no commissioning of the high-pressure spray humidifier is agreed with EUROCLIMA, the manufacturer of the high-pressure spray must be contacted directly.

8.1.6.5 Steam Humidifier

The instructions of the manufacturer of the steam humidifier must be observed for the commissioning.

8.2 Refrigeration circuit

8.2.1 General notes

- Refrigeration equipment is subject to the EG Pressure Equipment Directive 2014/68/EU and requires special handling and special care.
- Start the refrigeration circuit only if it was properly installed, evacuated and filled. Never start a compressor under vacuum.
- It is essential that the flow of refrigerant blends as R407C is carefully considered when adjusting superheat controls.
- Air inlet and thus the entry of humidity into the refrigeration circuit must be avoided rigorously, since the refrigerant oil is highly hygroscopic. The water, which is absorbed by the oil, cannot be removed sufficiently.

8.2.2 Manually starting the compressor via EUROCLIMA control system

The compressor can be started via the display of the EUROCLIMA control system as follows:

1. Start page → All Settings → Password handling → Enter the password
Note: Manually starting the compressor can only be performed at service level (Password level 4; key symbol: 2 keys). The 4-digit password for the service level is 6975.
2. Start page → All Settings → Inputs/Outputs → Digital outputs → Compressor 1 (/ Compressor 2 / Compressor 3) → Manual intervention → On

8.2.3 Refrigerant



DANGER!

Refrigerant vapors, which escape from leaking cylinders or refrigeration plants, will mix undetected with air and therefore creates a significant risk of suffocation due to a severe lack of essential oxygen. Humans are not able to detect oxygen deficiency with their senses. As refrigerant vapor is heavier than air, it concentrates at ground level and in lower-lying areas of the building. To avoid the occurrence of higher concentrations, workplaces must always be ventilated well.



WARNING!

Halogenated refrigerants can also have narcotic effect. In the event of high refrigerant concentration (e.g. tube leakage) in the technical room, the room must be evacuated immediately. Enter only after adequate room ventilation occurs and it is deemed safe to do so.



WARNING!

If the room must be entered during high refrigerant concentrations, then a breathing apparatus that is independent from the ambient air must be used. Furthermore, such a breathing apparatus can only be used by specially trained personnel, medics or other relevant professionals.

Figure 214 shows the basically distinction between refrigerants of class A1, A2L, A2 and A3:

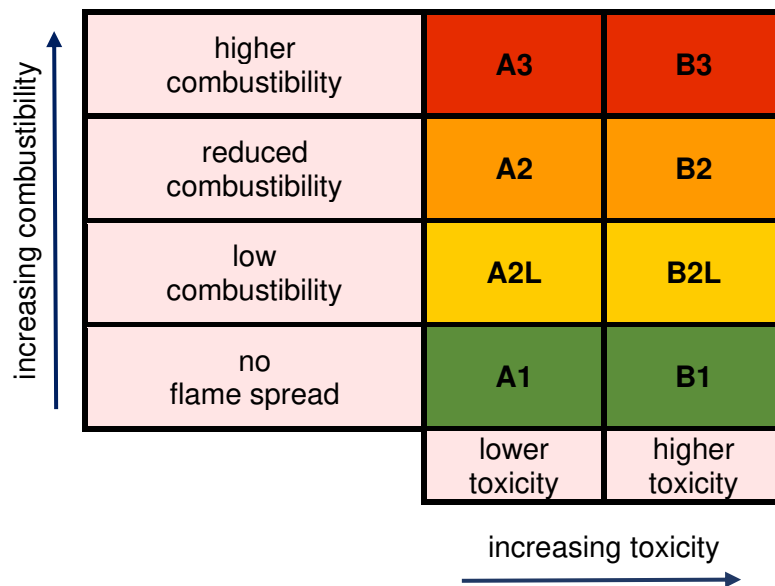


Figure 214: Refrigerant classes

Refrigerants used by EUROCLIMA are halogenated hydrocarbons of the classes A1 (preferably R410A, R407C and R134a) and A2L (preferably R32).

Refrigerants of the class A1:

Refrigerants of the class A1 are also known as safety refrigerants in contrast to flammable refrigerants such as Propane or toxic refrigerants such as Ammonia. They are actually non-flammable under normal operating conditions and do not create explosive mixtures with air, but are odorless. Only higher concentrations in the air can be noted by the olfactory sense.

Refrigerants of the class A2L:

Considering the project specific data EUROCLIMA determines in a limit value calculation (see **Figure 215**) the limit quantity of refrigerant R32 to keep the following values according to the safety data sheet:

- **LFL** (Lower flammability limit): flammable from this concentration
- **LFL25%** (25% of the Lower flammability limit): 25% as safety factor
- **DNEL** (Derived non effect level): below this value, no effects on humans are to be expected

Order		Drawing	
Position		Date	
Project		Customer	

Calculation of maximum used refrigerant in buildings Difluormethan (R32) - HFC refrigerant

R32	LFL (acc. security data sheet)	0,3060	[kg/m³]	Limits	LFL	137,7	[kg]
	LFL 25% (acc. security data sheet)	0,0765	[kg/m³]		LFL 25%	34,425	[kg]
	DNEL (acc. security data sheet)	0,007035	[kg/m³]		DNEL	3,16575	[kg]
					Real room size	450	[m³]
	Refrigerant quantity (DX circuit)	3,05	[kg]		Min. required room size	434	[m³]
Room values	Room length (acc. customer info)	12,50	[m]	Info			
	Room width (acc. customer info)	12,00	[m]				
	Room height (acc. customer info)	3,00	[m]				
	Selection OK	YES					

Figure 215: Calculation of maximum used refrigerant R32



WARNING!

In general, in every AHU from EUROCLIMA that is supplied with a refrigerant of the class A2L a corresponding gas sensor is installed in the supply air volume flow in the immediate vicinity of the refrigeration circuit. The trigger unit is mounted clearly visible on the AHU - the signaling by means of different colors makes it possible to see even from a distance whether there is a gas leak or not.

If a corresponding gas sensor is not present in the AHU, it must be retrofitted by the customer before the first commissioning of the AHU to monitor the limit values.



WARNING!

Only specially trained employees or refrigeration technicians certified in accordance with the implementing regulation (EU) 2015/2067 are allowed to handle with A2L refrigerants.

8.2.4 Compressor lubricant

- Compressor oil, a synthetic ester oil, is highly hygroscopic, so that the bound moisture in the oil cannot be completely removed by the evacuation of refrigeration circuit.
- Air entering into the system must be completely avoided.
- For R407C and R134a scroll compressors use Emkarate RL 32 3MAF oil.

8.2.5 Gas sensor

The specifications in **chapter 5.7.2 (Gas sensor)** must be observed.

After switching on the sensor, wait until the warm-up time has passed - this status is indicated by the flashing green LED. After the warm-up process is complete, the green LED lights up continuously; the sensor is active to detect any gas leaks. The yellow LED is activated when the set minimum warning threshold is exceeded; the red LED indicates that the warning threshold has been exceeded.

8.3 Test run

8.3.1 General notes

After having completed the preparatory work the AHU can be started for the test run.

- For testing the device, measuring the motor data and the volumetric flow rate, the device must be fully connected to the operational duct system.
- The AHU doors must be closed, to eliminate errors in pressure drop measurement results.



Before starting the fan, open the dampers! The Fan might not work against closed dampers.

NOTICE!

In addition, the actual power consumption of all phases shall be measured and compared with the nameplate. If the actual power consumption is too high, there could be a faulty connection. Therefore, the system must be shut down immediately.

Measure the volume flow and the pressure difference. Often the measured airflow does not match with the design data of the device.

Possible causes for low airflow:

- The external pressure drop is higher than indicated on the technical data sheet.
- Possible closed fire or VAV dampers in the duct

8.3.2 Adjusting variable pulleys

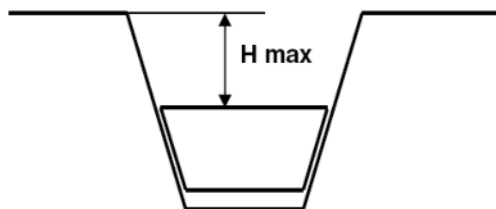


Figure 216: Smallest working diameter

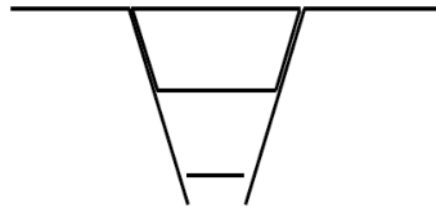


Figure 217: Biggest working diameter

Belt type	Pulley type	Min. working diameter (mm)	H max. (mm)	Max. working diameter (mm)
SPZ	RST 84	62	9	80
	RST 95	73	9	91
	RST 100	78	9	96
	RST 108	90	7	104

SPA	RST 108	76	13	102
	RST 120	88	13	114
	RST 129	97	13	123
	RST 139	109	12	133
	RST 146	116	12	140
	RST 156	126	12	150
	RST 164	134	12	158
	RST 177	149	11	171
	RST 187	159	11	181
SPB	RST 156	117	19	149
	RST 164	125	19	157
	RST 178	139	19	171
	RST 187	148	19	180
	RST 200	161	19	193
	RST 250	211	19	243

Table 16: Data of pulley types

Changing the working diameter of a variable pulley:

1. Decrease the belt tension.
2. Open the disk circumference distributed screws (position see **Figure 219**)
3. Twist the outer ring (the outer rings for pulleys with 2 slots) to the desired diameter, observe the limits as per **Figure 216** and **Figure 217**.
4. Fix the Allen screws.
5. Tighten the belts (refer to **chapter 9.3.5 (Re-tensioning of belts)**).

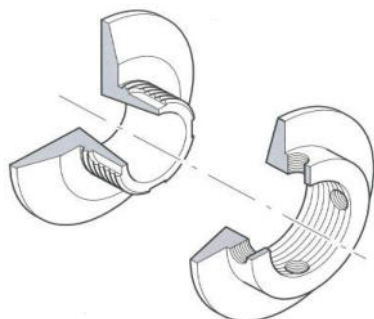


Figure 218: Schematic structures of a variable pulley



Figure 219: Position of the Allen screws on variable pulleys

After a change of the transmission ratio, the current consumption of the motor must be controlled in each case. If the consumption is too high, the effective diameter has to be adjusted again. The nominal current shown on the nameplate must not be exceeded.

Determination of frequency converter caused problems:

It can be determined whether or not problems are caused by the frequency converter by connecting the fan motor directly to mains power supply. Most commercially available frequency converters have a feature to address these problems.

If the airflow is incorrect and support is required on this matter, please contact EUROCLIMA.

8.3.3 Vibration verification

Check on the quiet running of the fan. There should be no unusual rocking or vibration. Check for unusual bearing noises. To prevent damage, operation above the permissible vibration values is forbidden. The maximum permissible vibration speed according to the specifications of the fan-motor-unit manufacturer must be strictly observed and followed.

On commissioning of the AHU, vibration measurement and / or resonance frequency search in the entire speed control range must be carried out and recorded in the acceptance report.

Resonance at fans

The operation of fans at the resonant frequency (and multiples of it) must be avoided, in order to prevent high vibration loads. The resonant frequency must be determined at the AHU on site. **Figure 220** shows a typical vibration curve.

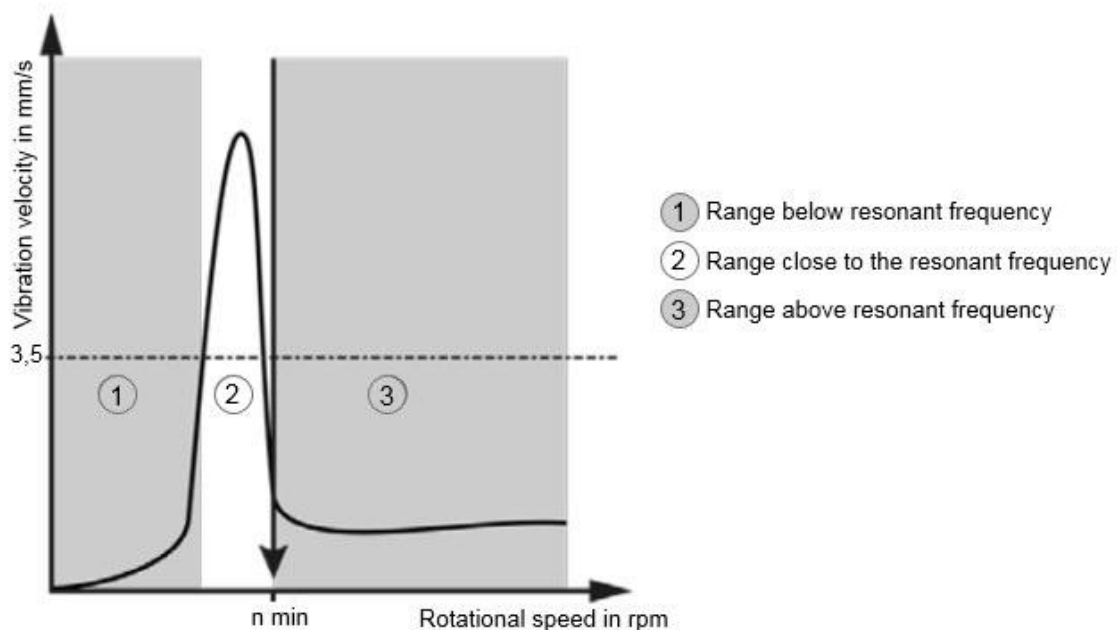


Figure 220: Typical vibration curve

The following generally applies:

- Avoid dropping below the minimum speed
- Pass through the point of resonance quickly on start-up
- No operation in speed ranges of increased vibrations (resonance)

During partial load operations, it could be that the operating point may coincide with the resonant range. In such situations, this operation must be prevented on site through small adjustments to the control. If a frequency converter is used for running the fan, then the resonant range can be suppressed directly there.

At AHUs with EUROCLIMA control, the resonant range can be suppressed. For that purpose, the appropriate setting of the software must be done at the commissioning process.

9 Maintenance



EUROCLIMA AHUs are built mostly maintenance free and are easy to maintain when required. The maintenance intervals (see **Table 21**) are indicative for normal operating conditions. Widely differing applications may require different intervals, ask EUROCLIMA for details. The execution of the described checks and maintenance, see **chapter 9.16 (Maintenance plan)** needs are necessary to ensure a permanent safety operation and functionality of the AHU.

9.1 General information



WARNING!

Before servicing any electrical parts such as fan motors, damper motors, electric heaters etc. use the emergency-stop control devices, to separate the parts completely from the power supply. Instructions in **chapter 2 (Safety instructions)** have to be observed!

- The entire AHU and all components must be checked regularly for pollution, corrosion, damage and fastening and be cleaned, and if necessary appropriate measures must be taken.
- In order to avoid corrosion, in the case of components made of stainless steel like drain pans or bases, ensure that any located fragments of carbon steel are removed and stainless steel parts are cleaned from swarf of carbon steel.
- The AHU housing must be checked inside and outside for pollution, deposits, damage, corrosion and fastening and be cleaned, and if necessary repaired.
- Check door seals for tightness and integrity, and if necessary, replaced.
- Depending on the material used and the environmental conditions, it can lead to a superficial corrosion on components. For example, motor, fan shafts, pulleys, bushings, sheet metal cutting edges etc. The resulting corrosion layer protects the underlying material from further corroding and does not represent a deficiency of the component or the device. The removal of surface corrosion and treatment of the corresponding sites are generally not required. Depending on the material used, a superficial oxidation can be removed as part of regular maintenance and the appropriate site treated with suitable protective measures.
- Please note that EUROCLIMA is not responsible for damage caused by improper handling of solvents and cleaning agents, and our company would not be liable for resulting mechanical damage. Solvents and cleaning agents should not contain alcohol for use on coated surfaces.
- EUROCLIMA recommends, depending on the specified AHU execution, performing checks, maintenance and repair work in compliance to specifications according to VDI 6022 sheet 1, requirements regarding operation and maintenance.
- To order spare parts please contact your EUROCLIMA sales partner.

9.2 Electrical connection, control cabinet

- All electrical connections must be inspected annually and deficiencies (e.g. loose cable strands, loose screw and clamp connection etc.) must be identified, repaired and eliminated immediately.
- The function test of the main switch (see **chapter 8.1 (Preliminary steps)**) must be carried out regularly (see **Table 21**).
- The following maintenance work is recommended for the control cabinet of AHUs with integrated control:
 - o annual change of the filter
 - o annually check the function of the fan for the control cabinet ventilation (if present)
 - o annually check the function of the heater (installed in outdoor AHUs)

- annually check of screw connections and electrical connections and if necessary re-tighten and secure.
- cleaning of possible dust deposits

9.3 Fan / motor group

The function test of the repair (main) switch (see **chapter 8.1 (Preliminary steps)**) must be carried out regularly (see **Table 21**).

9.3.1 Vibrations



WARNING!

Permanent operation of the fan-motor-unit at inadmissible high vibrations or at resonant frequency (and multiples of it) can lead to severe damage of the AHU and can subsequently lead to damage to property and/ or injury to personnel.

During operation of the AHU, an excessive vibration level can occur due to an unfavorable air flow, accumulation of dirt and dust, lack of and / or incorrect cleaning and maintenance. Furthermore, vibrations can be transmitted from and to external system components.

The fan-motor-unit must be monitored regularly for mechanical vibrations according to the fan-motor-unit manufacturer's specifications, and the results must be recorded. The maximum vibration speed according to the fan-motor-unit manufacturer's specifications must be strictly observed and followed. If the admissible vibration values are exceeded, the cause must be identified immediately and urgent, appropriate measures put in place to rectify the situation.

9.3.2 Fan

- Check for dirt, debris, damage and corrosion, clean if necessary.
- Coat surface damage of the housing and impeller with zinc dust paint.
- Flexible connections are to be checked for damage through visual inspection.
- Check vibration isolators for proper mounting through damage (visual inspection).
- Check the protection grid (Fan in and/or outlet) if available for correct installation / damaged (visual inspection).
- Check the drain (if available) for functionality.
- Test the wheel by rotating it by hand and listen for abnormal noises.
- Rotate the wheel by hand and check for strange bearing noise.
- Renew both bearings if there are irregular or rough noises.
- The theoretical lifetime, depending on the operating conditions, is at least 20,000 hours.
- The fan bearings are lubricated for life. Except the pillow block bearings of larger fans, with demanding operating conditions because these should be lubricated annually in accordance with **Table 17**. This should be done with lithium soap grease. See **Table 18** for recommended grease types. After three separate lubrications the bearings must be removed, cleaned and greased again.
- After dismantling and reinstalling an impeller, the fan must be checked for mechanical vibrations. It may be necessary to rebalance this for efficient use.

Ambient conditions	Temperature range °C	Lubrication interval
Clean	$T < 50$	6 - 12 month
	$50 < T < 70$	2 - 4 month
	$70 < T < 100$	2 - 6 weeks
	$100 < T$	1 week
Dusty	$T < 70$	1 - 4 weeks
	$70 < T < 100$	1 - 2 weeks
	$100 < T$	1 - 7 days
Extreme humidity		1 week

Table 17: Lubrication intervals for fan bearings

Figure 221: Fan bearing with grease nipple
 (example Comefri NTHZ)

Supplier	Type	Basis	Temp. range
FINA	Marson HTL 3	Lithium	30 °C / +120 °C
SHELL	Alvania Fett 3	Lithium	-20 °C / + 130 °C
ESSO	Beacon 3	Lithium	-20 °C / + 130 °C
MOBIL	Mobilux EP3	Lithium	-30 °C / + 130 °C

Table 18: Recommended grease types

Plug fan

- The fan is directly flanged to the motor and due to the absence of the belt drive, it is a service friendly component.
- To reach the operating point, a frequency converter is required.
- Danger: Deposits on the wheel can cause damage (risk of fatigue fracture) and the impeller can be damaged!
- Visual inspection: Check the wheel for any particular weld cracking.

9.3.3 Motor

- Check the motor for cleanliness and clean if necessary.
- Measure current consumption, which must not exceed the rated current stipulated on the nameplate.

Motor bearings

- In case of irregular or unusual sounds, the corresponding bearing must be replaced.

- Small and medium sized motors are equipped with a closed bearing, which can run for several years without the need of lubrication.
- Bearings of larger motors, depending on the motor manufacturer and motor size, are equipped with nipples for lubrication. For exact details and information regarding grease type and quantity for lubrication, please refer to the operating instructions of the motor manufacturer. After three separate re-lubrications, the bearings must be dismounted, cleaned and greased again. For lubrication intervals under normal operating conditions and 24 h/day load refer to **Table 19**.

Size	2-pole 3000 1/min	4-pole 1500 1/min	6-pole 1000 1/min	8-pole 750 1/min
bis 180	12	12	12	12
bis 250	6	12	12	12
280	3	12	12	12

Table 19: Lubrication intervals for motor bearings (in month)

- For different, unfavorable operating conditions, the intervals are to be reduced according to the motor manufacturer's instructions.
- Recommended grease types for the re-lubrication of motor bearings can be taken from **Table 18 chapter 9.3.2 (Fan)**.

9.3.4 V-belt drive

The V-belt drive is a reliable, low-maintenance component, provided that it is not subjected to unfavorable working conditions as shown in **Figure 222** up to **Figure 225**, which could reduce durability and result in reduced efficiency. The unfavorable conditions include high temperatures and inadequate filtered air and thus formation of deposits.

- Check the V-belt drive for dirt, damage, wear, tension and alignment (visible inspection). Belts with damages like cracks or frayed edges must be replaced.
- Pulleys must be checked for fitting, wear and damage.

Reasons for increased belt wear or defect

- Belt contact the groove bottom / unequal set of belt / tension is too high or too low – **Figure 222**

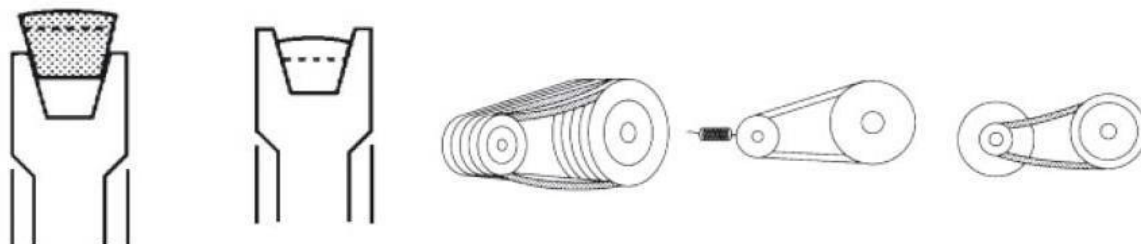


Figure 222: Unfavorable operating conditions (1)

- Slippage / pulley too small / overloading / damaged disc / eccentricity, wobble – **Figure 223**

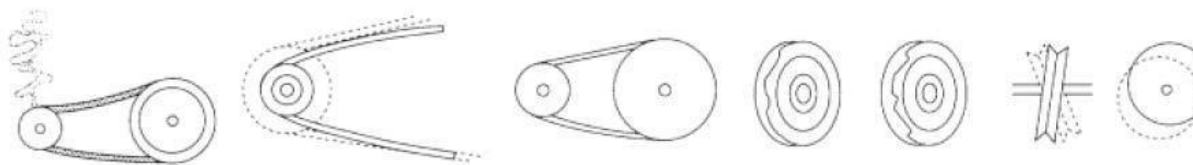


Figure 223: Unfavorable operating conditions (2)

- Disc worn / grooved not uniform / dust, dirt / moisture, humidity – **Figure 224**

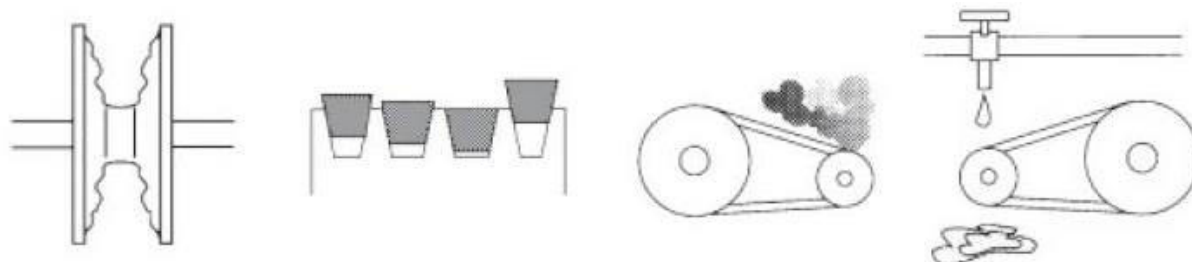


Figure 224: Unfavorable operating conditions (3)

- Alignment / offset wheels / non-parallel plates / discs rotated to each other – **Figure 225.**

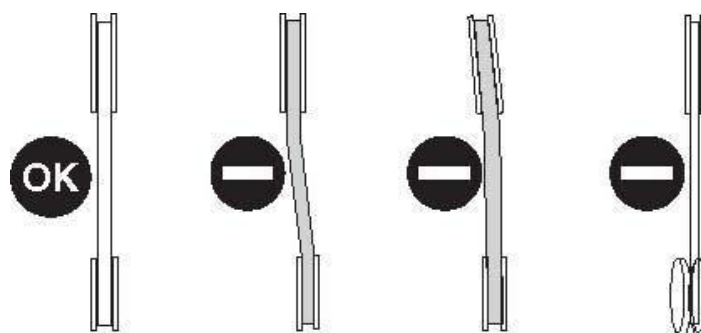


Figure 225: Unfavorable operating conditions (4)

9.3.5 Re-tensioning of belts

Moving the motor away from the fan adjusts the tensioning of the belt.

Depending on the size of the motor is this:

- On a rocker swivel
- On rails moveably mounted.

Loosening the lock nut and then turning the adjustment screws make the necessary adjustment. It is important to maintain the alignment of the discs accordingly – **Figure 226** and **Table 20**. This should be checked after each tensioning with a straight edge.

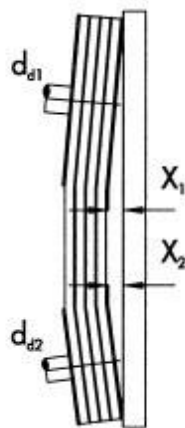


Figure 226: Adjustment of pulleys

Pulley diameter d_{d1}, d_{d2} in mm	Max. distance x_1, x_2 in mm
< 112	0,5
< 224	1
< 450	2
< 630	3

Table 20: Maximum deviation at adjustment of pulleys

For quick results during the pulley alignment for factory mounted pulleys, we recommend setting the same protruding thread size of the threaded rods on the left and right side shown in **Figure 227**.

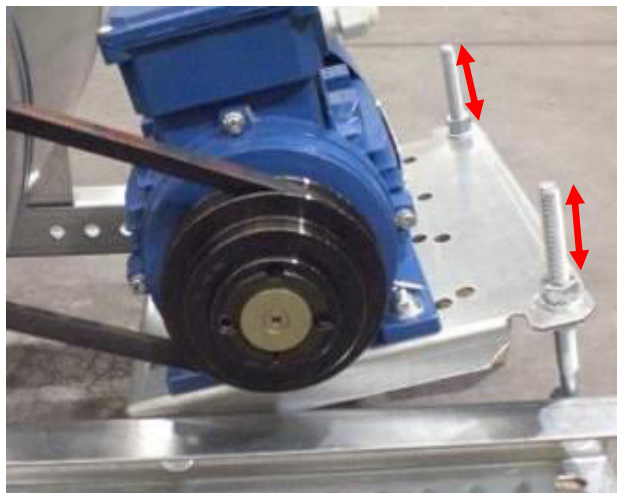


Figure 227: Adjustment of pulleys via threaded rods

In case of various pulley widths, the gap must be equal on both sides. The belt drive is to be re-tensioned, after the first 10 operating hours.

Belt tension

The correct tension of the belt is obtained through adjustment in compliance with the tensioning data, which is calculated separately for each drive. The necessary information to guide the worker in the tensioning of new and used belts can be found on the tensioning data sheet, which see sample in **Figure 228**.

BELT TRANSMISSION AND TENSIONING DATA				Supply air	
fan type:	Nicotra/Gebhardt / RDA E6-0500			motor type	ELVEM 6XM 132S-4
revolutions:	1.724	1/min		revolutions:	1.450 1/min
fan shaft power:	3,82	kW		motor shaft power	5,50 kW
fan pulley:	1 SPB 160			motor pulley:	1 SPB 190
pulley work diameter:	160,0			pulley work diameter:	190,0
fan bush	1610-40			motor bush	2012-38
belt section				1 x SPB - 2.000,0	
axle distance	A	[mm]		725,0	
				NEW BELTS	USED BELTS
static tension per belt strand	FS	[N]		295,0	226,9
deflection force	FE	[N]		75,0	75,0
deflection under deflection force	TE	[mm]		27,0	20,8
frequency of tended belt	f	[Hz]		28,0 [+10%]	24,0 [+10%]
AMPERAGE					
-- measure motor amperage during commissioning					
-- for max. motor current see motor type plate					
BELT TENSIONING					
-- check belt tension after the first 10 hours of operation					
-- respect the above mentioned tensioning date					
-- use measuring instrument for check					
-- check periodically the belt tension					
-- maintain unit according to service handbook					
ATTENTION: OVERTENSIONED BELTS CAN CAUSE EXPENSIVE SUBSEQUENT DAMAGES					
MODIFICATION OF BELT TRANSMISSION ONLY WITH WRITTEN CONFORMATION BY EUROCLIMA					
IMPORTANT FREQUENCY CONTROLLER PARAMETERS					
nom. freq. [Hz]	50,1	max freq. [Hz]	77,0	max. current [A]	10,9

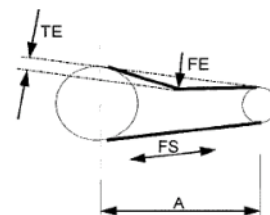


Figure 228: Belt transmission and tensioning data sheet

The following two methods to determine tensioning are described:

Force-way measurement

The information

- Test force FE
- Indentation depth TE
- Statistical belt tension (belt tension), FS

The belts are to be tensioned so that the deflection TE arises when the belt is loaded with the test load in point FE (such as with a spring balance). Alternatively, you can check the static belt tension FS directly with special belt tension measuring instruments.

Frequency Measurement

Special measuring instruments that are based on frequency measurements are available on the market. Tension the belt in such a way that during the measurement you measure the same frequency as recorded on the fan data sheet.

9.3.6 Replacing of belts

- Loosen the belt tension to ensure that the old belt can be removed.
- Clean components before putting on the new belt pulleys and check for damage and wear.
- Never push the new belt with a tool onto the pulley in order to avoid damage, which can shorten the lifetime of the belt.
- On multi-groove pulleys, all belts must be replaced simultaneously.
- Ensure that the belt number coincides with the number of pulley grooves.
- When tensioning the belt on multi-groove drives, ensure that all belts have their loose side on the same side otherwise they can become damaged (see **Figure 229**).



Figure 229: Multi-groove pulleys – attaching the belts

- Tension the belts, give the drive a few turns with no load and re-measure the belt tension.
- Check axle and wheel alignment, see **chapter 9.3.5 (Re-tensioning of belts)**.
- Repeat these steps until alignment and belt tension are correct.

9.4 Air filters

- All filters should be checked for tightness and fit, because otherwise they could be sucked in and could lead to damage and/ or poor functioning and quality.

EUROCLIMA recommends, in accordance with the REHVA (*Federation of European Heating, Ventilation and Air Conditioning Associations*), to wear safety gloves and FFP3 respirator when changing air filters, and to dispose of the dirty filters in a sealed bag



NOTICE!

To ensure the performance and the energy-efficient operation of the AHU, the air filters must be replaced regularly. Use only filter types and filter sizes, which are suitable and intended for assembly and purpose. To gain this information, view the technical data (**Figure 230**).

TF	Bag Filter	610,0 [mm]	2,41 [m2]	94,00 [kg]	101 [Pa]
Manufacture	Camfil	Filter surface [m2] 8,20			
Type	Basic-Flo-M5 tmax.=70°C	Cells pcs x size [mm] 2 x 592,0 x 592,0			
Init.-Dim.-Final [Pa]	48-99-150				
Airflow [m³/h]	6.000				
Bag length [mm]	520,0	Stainless steel frames AISI 316L (front removable) clean air sid			

Figure 230: Extract (filter section) of technical data

If AHUs are equipped with EUROCLIMA control, then a corresponding warning message is displayed on the HMI (see **Figure 231**) when the differential pressure limitation is reached.

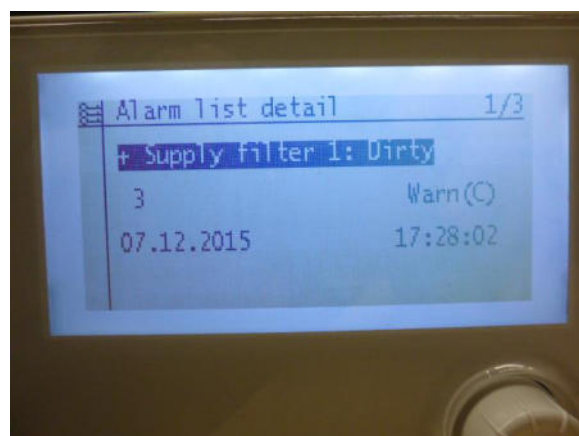


Figure 231: Warning message filter

If such a warning message is displayed, then appropriate actions have to be taken immediately (e.g. change of air filters).

9.4.1 Panel filters

- The contamination level of the filter can be controlled by the differential pressure drop (check every 14 days to 1 month). When reaching the pressure difference indicated in the technical data sheet, cleaning or replacement is required immediately.

9.4.2 Bag filters

- The contamination level of the filter can be controlled by the differential pressure drop (check every 14 days to 1 month). When reaching the pressure difference indicated in the technical data sheet, cleaning or replacement is required.

9.4.3 HEPA filters

- Contamination level of the filter can be controlled by the differential pressure drop (check every 14 days to 1 month), therefore replace the filter when necessary.
- Check filter sealing and fastening. The filter clamps must be tightened evenly. Tighten the clamps clockwise in two stages.

9.4.4 Activated carbon filters

If saturation is reached (expiration of the designated operation hours), the activated carbon cartridges must be changed. Proceed as followed:

1. Release cartridge from base plate (bayonet fastening).
2. Insert and fix a new filter cartridge.
3. Check tightness of the filter.

9.4.5 Electrostatic filters

- Maintenance of the electrostatic filters must be performed as described in the manufacturer's operating instructions. These are available online via the QR code on the first page of these instruction manual.

9.5 Heat exchangers

- For prolonged standstill periods, we recommend the complete emptying of the heat exchanger.
- At each refill, the heat exchanger must be vented properly.

The manual of the component manufacturer must be read and adhered to for cleaning works.

9.5.1 Medium water / steam

Special maintenance for heat exchangers is not required, only timely cleaning is recommended. Approximately every three months, depending on the hours of operation and filter maintenance. The heat exchanger fins should be checked for dust contamination, debris and cleaned if necessary. The piping is to be checked for leaks and integrity.

Cleaning

Cleaning is to be carried out on the mounted state with a strong vacuum cleaner from the dust air-side. For strongly adhering dust, the heat exchanger can be dismantled and cleaned with water. Galvanized steel coils can be cleaned with a steam cleaner or by washing the fins with a strong water jet. A soft brush might help, but be extra careful not to damage the fins.



NOTICE!

The fins of copper-aluminum heat exchangers are particularly sensitive, therefore, use, with extra care, water with low-pressure for cleaning. Damaging the fins by mechanical force leads to premature deterioration of the heat exchanger.

Corrosion spots must be cleaned and protected with zinc dust paint.

Antifreeze protection

Check antifreeze activity before each winter season. Also check the frost protection thermostat to make sure that the setting is accurate and correct.

Drain pan

The Drain pan and drain should be checked for debris and cleaned, if necessary – **Figure 232**.

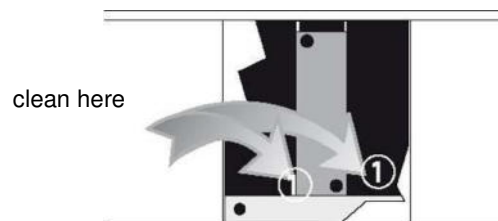


Figure 232: Cleaning of air coolers

Droplet eliminator

Check the droplet eliminator about once per year for contamination. Remove fins and clean it if necessary. Please make sure that the fins are installed properly and are not bent or have popped out of the frame.



NOTICE!

Pollutants can cause poor performance of the AHU as well as damage to the device, air functioning and components.

Steam Coil

Check automatic vapor-supply-stop and automatic-fan-run for a few minutes, after the AHU is shut down.

9.5.2 Medium refrigerant

For the medium refrigerant (direct evaporator or condenser coil) the same actions apply as described in **chapter 9.5.1 (Medium water / steam)**. For additional actions to be taken see **chapter 9.12 (Refrigeration circuit)**.

9.5.3 Electric Heater

- When working on the electric heater, refer to the instructions in **chapter 2 (Safety instructions)**.
- Check electric heaters for dirt and corrosion, clean heating elements if necessary.
- Check built-in safety devices and electrical parts for proper functioning.
- Check the device part for thermal damage after each power failure and take appropriate measures if necessary.

9.6 Humidifiers

9.6.1 General indications

The instructions of **chapter 8.1.6.1** are to be applied analogously.

The following instructions are generally stated and apply, as far as the respective component is available, in the present humidification system.

- The maintenance of the pump must be carried out according to the pump manufacturer's instructions.
- Regular cleaning of all components, largely determines the effective levels of hygiene of the entire system.
- When unused for long periods, the water must be released (for hygiene reasons) and the drain must be cleaned properly. The pump must be drained as well.
- Fill the siphon with clean water.
- Depending on water pollution, water hardness and water treatment, impurities and lime deposits must be removed from the washer: Severe calcification of components such as nozzles and droplet eliminators indicate significantly insufficient water treatment. Calcification of nozzles and droplet eliminators can be removed by treatment with dilute formic acid. After treatment, rinse well with clean water. Calcifications at droplet eliminators and straighteners made of PPTV may be removed through slight bending of the fins after drying and dismantling of respective components.
- Replace corroded or damaged droplet eliminator fins.
- Check sieves and strainers for dirt deposits and clean if necessary.
- Check outlet, overflow, U-trap and water tank for debris and clean if necessary.
- Check solenoid valves for functionality and clean if necessary.
- Check control and safety devices for functionality.
- Check door seals for tightness and integrity and replace if necessary.

9.6.2 Spray humidifier

The instructions of **chapter 9.6.1** are to be applied analogously.

- Check water supply for proper function and check the water level, if necessary, adjust the float valve so that the valve closes at a water level of 10 – 15 mm below the overflow.
- Remove and clean the nozzles.
- Damaged nozzles are to be replaced. Never clean the nozzle holes with hard objects. Clean the nozzle holder without nozzles with high-pressure water. Make sure that the drain valve is open while undertaking this process.
- Check pump piping for leaks and integrity.
- Check the hose clamps fit properly.
- Check the flexible tube connections in the air washer circuit for fissures and for damages every three months. When there are visible damages, cracks in the surface, signs of aging or deterioration, the flexible tubes must be replaced immediately.

- Replace flexible connector tube on pressure side and suction side every 5 years.

9.6.3 Evaporative humidifiers

The instructions of **chapter 9.6.1** are to be applied analogously.

- According to the intervals specified in the maintenance plan, see **Table 21**, any readjustments of the blowdown device must be carried out. The float valve has to close securely at a water level of 15 – 20 mm below the overflow to ensure bubble free suction.
- Heavily calcified evaporative modules must be replaced.
- In mild calcification the packet can be cleaned by adding decalcifying treatment to the circulating water (shut down the AHU before adding decalcified treatment). After that, clean the section and tubes properly with fresh water.

9.6.4 High-pressure humidifiers

Carry out the maintenance according to the instructions of the manufacturer of the high-pressure humidifiers.

9.6.5 Steam humidifiers

Carry out the maintenance according to the instructions of the manufacturer of the steam humidifiers. Additionally, the instructions of **chapter 9.6.1** are to be applied analogously as well as considering the following issues:

- Check steam distribution for deposits.
- Check steam supply for leaks and integrity.
- Check function of the condensate drain.
- Check electrical contacts of the pump for corrosion.
- Measure the current consumption.
- Clean entire piping system, control and safety devices.
- Measure the humidifier performance after maintenance.

9.7 UV section

The UV section has to be checked and cleaned regularly. Broken lamps must be replaced before the next commissioning. Avoid direct contact with the lamps.

9.8 Dampers

EUROCLIMA dampers of Type J are nearly maintenance free. Check for dirt, damage and corrosion, clean if necessary with compressed air or steam jet. Check the function and correct rotation. Spray the wheels with silicone spray if necessary.

Warning!

Gears cannot be treated with organic oils! Check linkages are functioning, tighten the screws if necessary.

9.9 Sound attenuators

Acoustic baffles are basically maintenance-free. However, they must be checked for damage within major maintenance work and shall be replaced or properly repaired, if required.

9.10 Weather louver

Check for dirt, damage and corrosion and that it is free from leaves, paper, etc.

9.11 Energy recovery systems

The manual of the component manufacturer must be read and followed when undertaking cleaning works.

9.11.1 Plate heat exchangers

Plate heat exchangers are made of highly corrosion-resistant high-grade aluminum and have no drive or moving parts. The lifetime is nearly unlimited, as long as the differential pressure between the plates does not exceed the maximum allowed and operating instructions are followed.

The only maintenance required is cleaning:

- Clean the condensate drain, inspect and fill the U-trap. The plate pack is normally self-cleaning.
 - o Remove fibers and dust at the exchanger inlet with a brush.
 - o Clean oils and fats with hot water, household cleaners or degreasing steam.
- Check for proper operation of the differential pressure switch – for function refer to **chapter 7.8 (Differential pressure restriction for plate heat exchangers)**.
- If there is a bypass damper, please refer to **chapter 9.8 (Dampers)**.



NOTICE!

Attention!

Heat exchanger must not be damaged mechanically or chemically through cleaning.

9.11.2 Heat wheels

Check the drive unit according to the heat wheels manufacturer's instructions.

In general:

- The construction of the storage mass is nearly completely self-cleaning.
- The rotor can be cleaned with compressed air, water, steam and grease-dissolving household cleaning products.
- The sliding seal, which seals the rotor, is to be checked and adjusted if necessary.

9.11.3 Heat pipes

Heat pipe components have no drive or moving parts, maintenance is limited to cleaning:

- Clean the drain pan and check the siphon. Fill the siphon, if necessary.
- Fins cleaned by:
 - o Compressed air against the air flow direction or
 - o Spraying with low pressure water, if required add household cleaning detergent.
- If bypass dampers exist, please refer to **chapter 9.8 (Dampers)**.

9.11.4 Accublocks

Electrical connection:

The Accublock is supplied including a controller supplied loosely (configured with default values), including operating instruction. On site, the following must be provided:

- Power supply 3x400 V (efficiency according to technical data sheet)
- Control signal 0-10 V

All bearings are self-lubricating ball bearings or bronze bearings. These should not be re-lubricated. It is important to ensure that the sensor is about 2 mm away from the motor. This can be checked with a 2 mm thick piece of sheet metal. If necessary, the distance can be readjusted. The inner side of the sensor is accessible through the open damper with a wrench SW17.



WARNING!

Caution! Switch off before installation and secure against accidental reconnection.

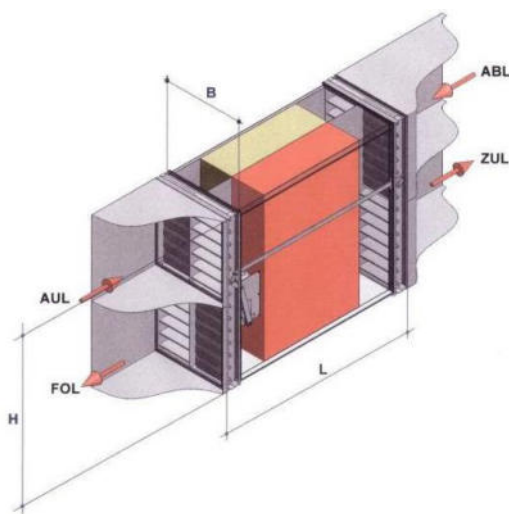


Figure 233: Scheme of an accubloc



Figure 234: Position of the sensor

The only maintenance required is periodic cleaning of the memory blocs. The cleaning intervals can be considered, depending on the need, by visual inspection. The contamination of the memory blocs depends on the exhaust air filter stage used, as well as the degree of contamination of the exhaust air. By switching the air direction, the memory blocs are kept largely clean.

The memory blocs are to be taken off as follows for cleaning:

1. Switch the safety switch to OFF, it must be ensured that the Accublock - control is off.
2. Dismount the AHU wall on the access side.
3. Dismount the cover sheet for the damper linkage.
4. Dismount the damper linkage.
5. Unscrew the metal cover.
6. On site an adapted devise must be mounted on the Accublock frame, which allows the extraction of the memory blocs. The device should contain a guide and an end stop, similar to the internal guide rails. **Be careful!** The memory blocs move very easily.
7. The second memory bloc is reachable when the wall between the memory blocs is pulled out. Therefore, there are two handle holes on the upper half.
8. The memory blocs could be cleaned with compressed air or with a high-pressure-cleaner. Thereby, the distance of the nozzle lance must be big enough, to ensure that the structure of the memory blocs do not get damaged. If chemical cleaning additives are used, only for aluminum suitable and non-alkaline cleaning agents are allowed.

9.12 Refrigeration circuit

To make sure that the environmental requirements are implemented and that the operational reliability and a long lifetime of refrigeration circuit is ensured, periodic leakage checks, maintenance and visual inspections are required.

9.12.1 Leakage checks

- Have to be performed according to EU-regulations indicated in *Records for refrigeration circuit application in air-conditioning units* supplied by EUROCLIMA. The checks must be executed by a certified refrigeration technician. The intervals for the checks depend on the refrigerant filling quantity.
- Have to be documented in *Records for refrigeration circuit application in air-conditioning units*.

The type of refrigerant and the refrigerant filling quantity is attached on a sticker applied next to compressor.

Refrigerant contains fluorinated hydrocarbons indicated in the Kyoto Protocol with the following global warming potential (GWP = Global Warming Potential), based on CO₂:

- R32: GWP = 675
- R407C: GWP = 1650
- R410A: GWP = 1980
- R134A: GWP = 1300

The greenhouse potential and the amount of refrigerant used in the device will determine the maintenance intervals of the device.

Example:

Specification: refrigerant R407C, capacity 30 kg

CO₂ equivalent: 1650 x 30 kg = 49500 kg = 49.5 t

Maintenance interval: 5 t ≤ 49.5 t < 50 t → at least every 12

Maintenance intervals for the corresponding limits are given in **Table 21**.

9.12.2 Maintenance

- Has to be performed only by qualified personal and at least once a year.
- Has to be documented in supplied *Records for refrigeration circuit application in air-conditioning units*. Also, adhere to local regulations.

Whole system:

- Check pressures and temperatures of the system.
- Pay attention to unusual operating noises and to possible vibrations.
- Possible dust deposits around components have to be removed.

Compressor:

- When the compressor is switched on, there must be oil visible through the sight glass (if present). If oil is not visible, ensure that there has not been a loss of oil (even outside of the AHU is possible). Optionally, add oil directly by an oil pump into the compressor suction side. Only use oil that is approved by the compressor manufacturer.
- During standstill periods of the compressor operation, the compressor crankcase heater switches on in order to avoid an accumulation of refrigerant in the oil. Too much refrigerant in the oil causes dilution of the oil, resulting in loss of viscosity, leading to reduced lubrication of all moving parts. To start the compressor manually, it has to be commenced as described in **chapter 8.2.2 (Manually starting the compressor via EUROCLIMA control system)**.

- Follow the maintenance and inspection requirements of the compressor manufacturer. These instructions are supplied by EUROCLIMA or can be ordered from EUROCLIMA.

Filter drier:

Each refrigeration circuit is equipped with a filter drier. If the refrigeration circuit has to be repaired, the filter drier must be replaced.

Sight glass in liquid line and on receiver

Liquid line sight glass contains a moisture indicator for refrigerant, operating as follows:

Indicator green	=	dry
Indicator yellow	=	wet

If the indicator shows wet refrigerant, at least the filter drier must be changed. Further measures may be necessary.

The correct quantity of refrigerant can be checked at the operating refrigeration circuit. In both sight glasses (note: sight glass on receiver according to circuit execution not always supplied) refrigerant must be visible. The sight glass in liquid line must be filled completely.

Expansion valve:

- Check superheating of expansion valve, which should amount about 5 to 10K. Check that the temperature sensor is correctly fitted as well as the pressure compensation pipe.
- If an electronic expansion valve is used, necessary values must be entered into the corresponding controller. Instructions of the controller from the valve manufacturer are included in the scope of delivery or can be requested from EUROCLIMA.

High pressure safety switch:

The high pressure switch stops the compressor when the allowed equipment pressure limit is exceeded. A functional check must be carried out during commissioning and must be performed during each undertaking of any maintenance work.

Low pressure safety switch:

The low pressure switch stops the compressor when the equipment pressure falls below the allowed low pressure limit. A functional check must be carried out during commissioning and must be performed at each time maintenance work is undertaken.

Handling:

If the unit goes into high or low pressure mode, the problem must be rectified at the control panel for the compressors to start again.

Electrical superheat controller

The Electronic-Superheat-Controller has an internal battery, so that the valve closes securely even during power failures. Without this feature, the valve remains open, resulting in liquid hammering in the compressor at the restart. Liquid hammering can cause damage to the compressor.



Therefore, annual replacement of the battery is recommended for safety reasons.

NOTICE!

9.12.3 Inspection

Inspection work may be carried out by the operator in trimestral intervals.

All equipment:

- Have a look for loose links, fasteners etc., tighten if necessary.
- Pay attention to unusual noise.
- Have a look for oil leakage on components and joints.
- Have a look at corrosion around piping of the refrigeration circuit, if necessary spraying again with acrylic varnish.

Air-cooled condenser, direct expansion evaporator:

Clean fin surface if necessary. Dirty fins reduce the transmission of heat, which could result in unacceptable condensing / evaporation temperatures. Be careful not to damage the fins. Clean with compressed air or a vacuum cleaner.

Compressor:

Check oil sight glass in the crankcase (if mounted). Pay attention to unusual noise. To start the compressor manually, it has to commence as described in **chapter 8.2.2 (Manually starting the compressor via EUROCLIMA control)**.

Coolant contents:

Check the inspection glass in the liquid line, to see whether or not the inspection glass is completely full. At maximum capacity, if bubbles appear in the inspection window, the contents are defective and must be rectified by a specialist. Importantly, the appearance of bubbles under partial capacity can occur under certain performance windows and is not a sign of a prevailing fault with the refrigerant.

Condensate tray and outlet:

- Examine condensate outlet and tray for dirt and clean if necessary.
- Clean or rinse out condensate outlet from time to time.

9.13 Hygienic AHUs

The maintenance plan for EUROCLIMA AHUs you will find in **chapter 0** of the instruction manual. EUROCLIMA recommends maintenance depending on the following:

- VDMA 24186 part 1 and
- VDI 6022 part 1. In chapter 7 of VDI 6022 part 1, you can find detailed requests on operation and maintenance.

EUROCLIMA recommends as cleaning agent *Allrain* or *Multirain*, as disinfectant *Sanosil* or *Sanirain of Hygan*.

9.14 Duct smoke detector

The duct smoke detector must be cleaned, checked, and maintained regularly according to the manufacturer's instructions.

9.15 Gas sensor

To guarantee permanently the safety function of the gas sensor, it must be cleaned, checked, and maintained regularly according to the manufacturer's instructions.

9.16 Maintenance plan

The maintenance intervals specified in **Table 21** are based on empirical values for normal operating conditions. They are designed for continuous operation (24 hours / day) in moderate temperate climates and low dust areas, such as in offices or shopping malls. Widely differing operating conditions, particularly with respect to air temperature, humidity and dust can significantly shorten the intervals.

Ch = Check and take appropriate measures if necessary, **CI** = Clean, **M** = Maintenance

Component	Action	Section	month ly	¼ year	½ year	year	Reference chapter
AHU, all components	Ch / CI / M	The entire air handling unit and all components, general			X		9.1 General information
	Ch / CI	Housing inside and outside			X		
	Ch / M	Door seals				X	
Electrical con- nection, control cabinet	Ch	Electrical connections and bolts				X	9.2 Electrical connection, control cabinet
	Ch	Main switch				X	
	M	Filter					
	Ch	Fan				X	
	Ch	Heater				X	
	Ch	Function of the electrical com- ponents	local, national and international rules and reg- ulations must be observed				
Fan / motor group	Ch	Repair switch				X	9.3 Fan / motor group
	Ch	Vibration check	according to specification of the manufacturer				9.3.1 Vibrations
	Ch / CI / M	Fan, general			X		9.3.2 Fan
	Ch	Flexible connection			X		
	Ch	Vibration isolators			X		
	Ch	Protection grid			X		
	Ch	Water drain			X		
	Ch / CI / M	Fan bearings		X			
	Ch / CI / M	Fan bearings with lubricating	according to Table 17 (Lubrication intervals for fan bearings)				
	Ch / CI	Impeller			X		
	Ch / CI / M	Motor, general			X		9.3.3 Motor
	Ch / M	Motor bearings		X			
	Ch / CI / M	Motor bearings with lubricating nipples	according to Table 19 (Lubrication intervals for motor bearings (in month))				
	Ch	Check current consumption		X			
	Ch / CI / M	Belt drive, general		X			9.3.4 V-belt drive
	Ch / M	Belt tension	first time after operation of 10 hours				9.3.5 Re-tensioning of belts
			X				
	M	Belt change	if necessary / at least after 2 years				9.3.6 Replacing of belts
Filter	Ch	Filter, general	X				9.4 Air filters
	Ch / CI / M	Panel filters	X				9.4.1 Panel filters
	Ch / CI / M	Bag filters	X				9.4.2 Bag filters
	CI / M	HEPA filters		X			9.4.3 HEPA filters
	C / M	Activated carbon filters		if saturation is reached			9.4.4 Activated carbon filters
	Ch / CI / M	Electrostatic filters	acc. manufacturer specifications				9.4.5 Electrostatic filters
Heat exchanger	Ch / CI	Heat exchanger, general		standstill/refill			9.5 Heat exchangers
	Ch / CI	Fins				X	9.5.1 Medium water / steam
	Ch	Frost protection				X	
	Ch / CI	Drain pan				X	
	Ch / CI	Droplet eliminator				X	
	Ch	Steam coil			X		
	Ch	Direct evaporator or conden- ser coil			X		9.5.2 Medium refrigerant
Electric heater	Ch / CI	E-heater			X		9.5.3 Electric Heater
		Check e-heater section for thermal damages after mains supply failure!					

Humidifier	Ch / CI / M	Humidifier, general	X	9.6.1 General indications		
	Ch / M	Pump	X			
	Ch / M	Check door seals for tightness and integrity	X			
	Ch / CI / M	Spray humidifier, general	X	9.6.2 Spray humidifier		
	Ch	Spray humidifier tubing	X			
	M	Flexible connector change	Substitute flexible connector every 5 years.			
	Ch / CI / M	Evaporative humidifier	X	9.6.3 Evaporative humidifiers		
	Ch	Bleed off settings / valves	X			
	Ch / CI / M	High pressure humidifer	X	9.6.4 High-pressure humidifiers		
	Ch / CI / M	Steam humidifier	X	9.6.5 Steam humidifiers		
UV section	Ch / CI	UV-C-lamps	X	9.7 UV section		
Dampers	Ch / CI	Dampers	X	9.8 Dampers		
Silencer	Ch / CI	Silencer	X	9.9 Sound attenuators		
Weather louver	Ch / CI	Weather louver, grid and hood	X	9.10 Weather louver		
Energy recovery	Ch / CI	Plate heat exchanger	X	9.11.1 Plate heat exchangers		
	Ch / CI	Heat wheel	X	9.11.2 Heat wheels		
	Ch / CI	Heat pipes	X	9.11.3 Heat pipes		
	Ch / CI	Accublock	X	9.11.4 Accublocks		
Refrigeration circuit	Ch	Leakage check	≥ 500 Data in tons of CO ₂ -equivalent	≥ 50	≥ 5	9.12.1 Leakage checks
	Ch / CI	Maintenance		X		9.12.2 Maintenance
	Ch	Inspection	X			9.12.3 Inspection
Duct smoke detector	Ch / CI	Duct smoke detector		X		9.14 Duct smoke detector
Gas sensor	Ch / CI / M	Gas sensor		X		9.15 Gas sensor
	M	Replacement gas sensor	at least every 5 years			

Table 21: Maintenance plan

10 Information on airborne noise emitted by the AHUs - on request

Sound data can be printed on request on the technical data sheet, sample see **Figure 235**. The sound power is specified as A-weighted sound power level:

- **Line 1:** Sound power over the casing
- **Line 2:** Sound power inlet
- **Line 3:** Sound power outlet

The sound through the openings (sound power level in line 2 and 3) is the basis for the calculation of the on-site sound emissions from the environment.

AHU sound levels		63	125	250	500	1000	2000	4000	8000	Tot db (A)
1>	Sound power level casing [db] +/- 4 dB	88,0	81,0	78,4	62,0	56,2	50,7	41,1	32,6	71,9
2>	Sound power level air inlet [db] +/- 4 dB	93,2	90,0	96,0	87,0	77,0	74,0	72,0	66,0	89,7
3>	Sound power level air outlet [db] +/- 4 dB	97,0	98,0	99,0	89,0	86,0	82,0	79,0	75,0	93,8
4>	Sound press. for 1 [m] distance from AHU	68,7	61,7	59,1	42,7	36,9	31,4	21,8	20,0	52,6
5>	Sound press. for 1 [m] distance from air inlet	85,8	83,3	90,0	81,5	71,7	68,8	67,1	61,1	83,9
6>	Sound press. for 1 [m] distance from air outlet	89,6	91,3	93,0	83,5	80,7	76,8	74,1	70,1	88,1
Calculated sound pressure levels are indicative only. It corresponds to : free field hemispheric sound radiation from the unit casing (4), the inlet (5) and the outlet (6) opening. Other sound sources, acoustic character of the room, air flow noise, duct connections and vibrations can influence the sound pressure in dependence. In practice, therefore measured values on site may be different from the calculated ones.										

Figure 235: Sound data information

11 AHUs in ATEX execution

11.1 Specific instructions for ATEX AHUs

The ignition hazard assessment was performed according to EN ISO 80079-36:2016 and EN 1127-1:2019-10. Applied protection: EN ISO 80079-37:2016-12 Protection by constructional safety "c".

Declaration of conformity in accordance to the EU - Directive 2014/34/EU

EUROCLIMA declares conformity to ATEX. The technical documentation in accordance with EU – Directive 2014/34/EU is deposited at TÜV South Germany. The declaration of conformity to ATEX applies only to the original delivery AHU and with proper repair and maintenance. When changes on the AHU are made, which are not agreed in writing, the declaration of conformity loses its validity.

The safety instructions in **chapter 2.3 (Indications for minimizing specific hazards)**, in particular the special safety instructions in **chapter 2.3.3 (ATEX AHUs)** must be observed. The instructions in **chapter 2.5 (Staff selection and qualification)** also apply accordingly.

The following conditions must prevail:

- On the intake side and in the vicinity of the device, the temperature shall not exceed -20 °C to +40 °C.
- An atmosphere with pressures from 0.8 bar to 1.1 bar shall be present in the environment of the AHU.

Based on the risk analysis, devices can basically be manufactured with the following definition (applies to inside and outside)

Gas: **II 2G Ex h IIB T4 Gb (inside / outside)**

Dust: **II 3D Ex h IIIB T170 Db (inside / outside)**

11.2 The ATEX type key

Example of designation:

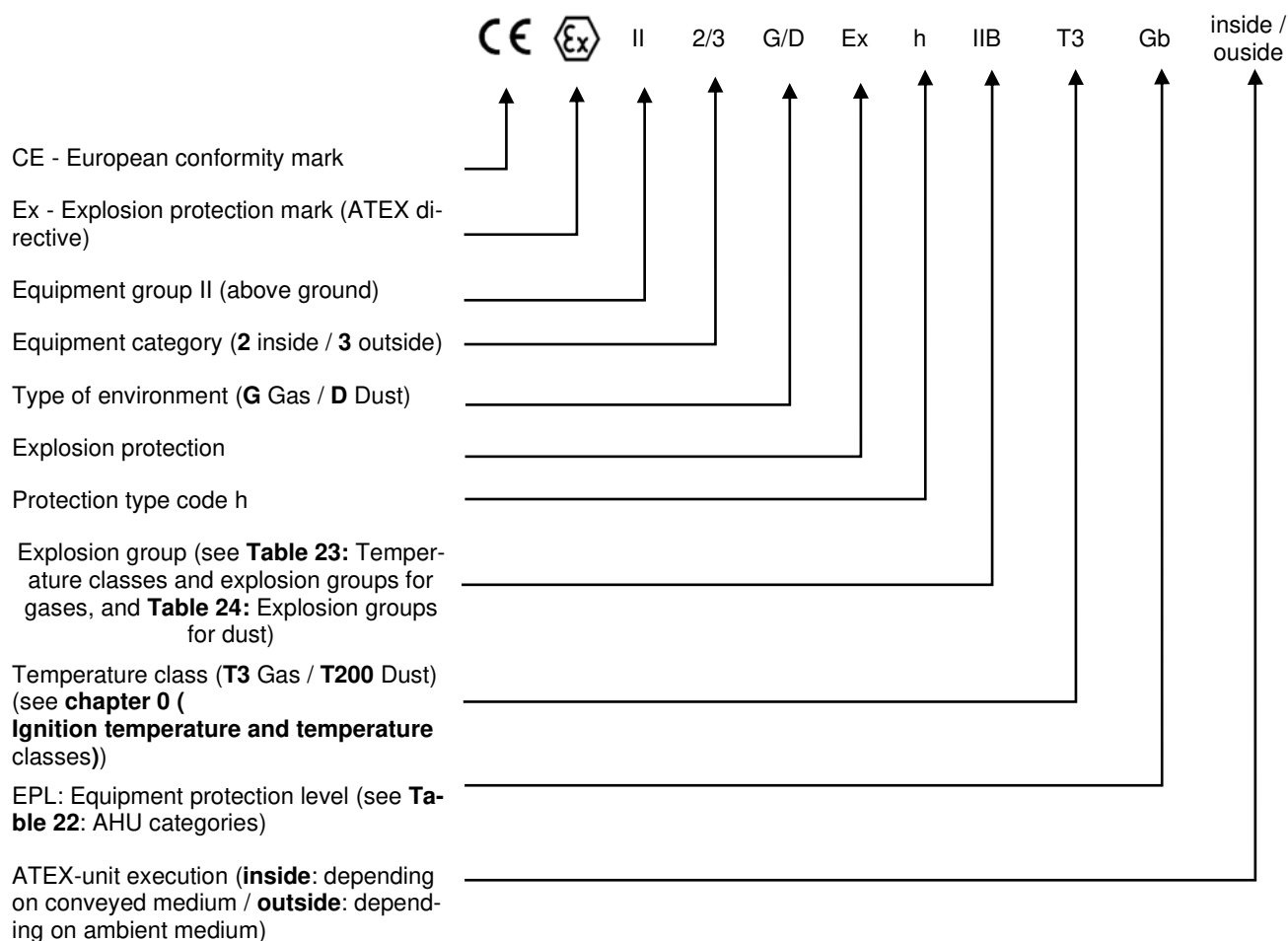


Figure 236: Example ATEX type key

Examples of applications:

CE Ex II 3G Ex h IIB T3 Gc (inside)

The AHUs are designed for processing and transport of explosive atmospheres of Zone 2 but not for installation in Zone 2.

Equipment in this category ensures in normal operation, the required level of security.

CE Ex II 2G Ex h IIB T3 Gb (inside)

The AHUs are designed for processing and transport of explosive atmospheres of zone 1 but not for installation in Zone 1.

The device-specific explosion protection measures of this category must provide the necessary security, even though lots of disturbances and error states, which usually must be considered, occur.

CE Ex II 2G Ex h IIB T3 Gb (inside)
II 3G Ex h IIB T3 Gc (outside)

The AHUs are used for processing and transport of explosive atmospheres of zone 1 and for installation in Zone 2.

The device-specific explosion protection measures of this category (inside) must provide the necessary security at disturbances and error states, which usually must be considered.

The device-specific explosion protection measures of this category (outside) must provide the necessary security at disturbances and error states, which usually must be considered.

11.3 Supplementary notes on AHU design

Unit category	Designed for kind of explosive atmosphere	Usage in zone	Explanation	EPL: Equipment protection level
1 G	gas / air mixture or steam air mixture or fog	0	Explosive atmosphere permanently present	Ga: Safety in normal operation usual and rare operation disturbances / in case of 2 independent failures
2 G	gas / air mixture or steam air mixture or fog	1	Explosive atmosphere occasionally present	Gb: Safety during normal operation and usual operation disturbances
3 G	gas / air mixture or steam air mixture or fog	2	Explosive atmosphere rarely and only for a short time	Gc: Safety in normal operation
1 D	Dust air mixture	20	Explosive atmosphere permanently present	Da: Safety in normal operation usual and rare operation disturbances / in case of 2 independent failures
2 D	Dust air mixture	21	Explosive atmosphere occasionally present	Db: Safety during normal operation and usual operation disturbances
3 D	Dust air mixture	22	Explosive atmosphere rarely and only for a short time	Dc: Safety in normal operation

Table 22: AHU categories

11.4 Ignition temperature and temperature classes

The ignition temperature of a flammable gas, vapor or dust is the lowest temperature of a heated surface at which the ignition of the gas/air mixture or vapor/air mixture occurs. It is practically the lowest temperature value at which a hot surface can ignite the corresponding volatile atmosphere and lead to explosion.

Temperature classes at gases:

Temperature class gas	T1	T2	T3	T4	T5	T6
Max. surface temperature [°C] gas	450	300	200	135	100	85
Explosion group: IIA	Acetone Ammonia Benzene Acetic acid Ethane Ethyl acetate Ethyl chloride Carbon monoxide Methane Methanol Methyl chloride Naphtalin Phenol Propane Toluene	Cyclohexanone Acetic acid-anhydride n-Butane n-butyl alcohol	Petrol Diesel Fuels Aviation fuels Fuel oils n-Hexane			
Explosion group: IIB	City gas	Ethyl alcohol Ethylene	Hydrogen sulfide Ethyl glycol	Ethyl Ether		
Explosion group: IIC	Hydrogen	Acetylen				Carbon disulfide



Use of AHUs only possible in addition with other measures, e.g. special explosive atmosphere



Use of AHUs in appropriate design possible

Table 23: Temperature classes and explosion groups for gases

Maximum surface temperature for dust

For combustible dusts, no classification into temperature classes is made. The maximum surface temperature is given in absolute values in °C, e.g. T 200°C.

Dust Explosion groups

 Electrical equipment of group III is further subdivided according to the features of the hazardous atmosphere for which it is intended, see **Table 24**. The hazard potential of dust rises in connection with the operation of electrical equipment from IIIA to IIIC. A device with IIIC classification is also suitable for group IIIA and IIIB.

	IIIA	Combustible fibres and lint e.g.: textiles
	IIIB	Non-conductive dusts e.g.: wood dust, flour dust
	IIIC	Conductive dusts e.g.: metal dust, carbonaceous dust

Table 24: Explosion groups for dust



DANGER!

The maximum allowable surface temperature must always be lower than the ignition temperature of the explosive atmosphere. Safety factors are considered.

11.5 Additional instructions for foundation and erection, assembly, connection and commissioning, maintenance and repair

In addition to these specific specifications, the general instructions in this manual (in case of differing specifications, the ATEX-specific specifications must be observed in priority) and the instructions in the manuals of the component manufacturers (e.g. fan and motor manufacturers, etc.) must be observed. See also **chapter 1.7 (Documentation)** of this instruction manual.

The following measures are necessary to ensure the Equipment Protection Level (EPL):

- All conductive parts, components and connections (HE piping, siphon, ducts, etc.) must be connected to a potential compensation. Before opening and closing such connections, For example, when removing or replacing parts, bridging by means of connecting cables with an appropriate cross-section is necessary.
- For indoor AHUs, all electrically conductive parts must be connected with a professional grounding measure (potential equalization). This prevents electrical potential differences, which can be a potential ignition source.
- Outdoor AHUs must be equipped with a professional lightning protection system and all metal parts must be connected to the ground conductors.
- It must be ensured that parts that are necessary to achieve the degree of protection, cannot be removed accidentally or unintentionally.
- Before the commissioning of the AHU, it must be ensured that all doors are closed and properly sealed so that there are no leaks. All doors are equipped with a closure device. The doors must be locked, and the key removed



DANGER!

During assembly and maintenance work it is important to take care that no tools or other objects remain in the AHU or duct system, to avoid malfunctions and sparks. – **RISK OF EXPLOSION!**

11.5.1 Foundation and erection

- The AHU must be connected to an external protective conductor system.
- In case of zone reduction between inside and outside of the AHU, an air exchange rate in the room of 6 times per hour must be ensured, for indoor installation.
- For outdoor installation, a free air flow along an axis is the precondition for zone freedom outside the AHU.

11.5.2 Assembly, connection and commissioning

11.5.2.1 Ensure the tightness of the AHU

To avoid zone entrainment during operation, the casing must comply with tightness class L1 according to EN 1886. Tightness class **L1** corresponds to a maximum air leakage rate of **0.15 l / (s*m²)** at a vacuum of 400 Pa.

Air leakage rate:

To comply with the required air leakage rate after the assembly of the AHU, the following points must be considered:

- The tightness depends very much on the onsite performed tightness, such as the tightening of the AHU separations / sections, cable glands, probes, etc.
- After completion of the work, the tightness must be checked appropriately and must be documented.

11.5.2.2 Motor

- The connecting cables must comply with the specification EN 60079-14 (Section 9: Potentially **explosion risks**, Part 14: Planning, selection and installation of electrical installations).
- Standard main switches must be assembled outside the hazardous area.

11.5.2.3 Fan section

- Belt: Use only electrically conductive, flame retardant and self-extinguishing belts (ISO 9563 or ISO 1813).
- **Use original spare parts.**
- The operating speed specified on the technical data must not be exceeded. The maximum permissible fan speed must not exceed 80%.

11.5.2.4 Air filters

- Only use electrostatic deductive filter.
- **Use original spare parts.**
- Each individual filter cell must be permanently and electrically conductively connected with a potential equalization cable to the inner casing of the AHU.
- To prevent the formation of **explosion risks** by stirring up of dust deposits, the equipment has protective systems and components designed to avoid deposits of combustible dusts as far as possible. Therefore, for all components corresponding service openings are provided.
- The AHU must be cleaned at regular intervals to prevent dust deposits.

11.5.2.5 Heat exchangers / steam humidifiers



DANGER!

The heat exchange medium temperature and the steam humidifier surface temperature specified in the technical data sheet must not be exceeded. In any case, these must be below the maximum admissible surface temperature or temperature class of the AHU. Otherwise, the specified temperature class and the EPL: Equipment Protection Level is no longer valid, the declaration of conformity loses its validity, and there is an acute **DANGER OF EXPLOSION!**

11.5.2.6 Field devices

- On site assembled field devices must comply the ATEX classification specified by EUROCLIMA.
- The electrical components (switches, lights, sensors, motors, etc.) must be approved for operation when there is a risk of explosion and must be equipped with an appropriate marking.
- The cabling must meet the relevant standards.
- Appropriate potential equalization must be prepared.

11.5.3 Maintenance and repair

- In addition to the information in this chapter, maintenance and repair must be carried out according to **chapter 2.3.3 (ATEX AHUs)** and **chapter 9.16 (Maintenance plan)**. If the specifications differ, the ATEX-specific specifications in this chapter and in **chapter 2.3.3 (ATEX AHUs)** must be given priority.

12 Disassembly and disposal

12.1 Disassembly

At disassembly, the safety instructions of **chapter 2 (Safety instructions)** must be considered. It also applies to the instructions in **chapter 3 (Reception control / unloading / transportation to installation site)**. The housing can be disassembled relatively easy:

Disassembly of the housing:

- Disassembly of the external panels and removal of the insulation.
- Loosening of the screw connections.
- Loosening of the rivet connections by drilling out the rivets.

Disassembly of the built-in parts:

- Secure slender and or larger components against tipping over.
- Use of appropriate scaffolds and load carrying equipment.
- The AHU components must be raised with suitable load carrying equipment (e.g. strop/ belt with hook or shekel with chain) and have to be secured until the components are safely fixed in the AHU – see **Figure 237**.
- Handling: securing with belt/ strop– see **Figure 238**.



Figure 237: Lifting with chain hoist



Figure 238: Securing with belt

12.2 Disposal

The operator is responsible for the disposal of the shipment (packing material), operation (filters, tools, spare parts etc.), and for the disposal of the AHU itself.

The disposal of the material must be carried out by qualified technicians according to the international, national and local regulations.

A standard AHU consists of 95 % recyclable metallic materials.

Components (examples)	Material	CER / EWC European Waste Code
Casing panels, built-in components, base frames, heat exchangers	VZ and VZB sheet metal	170405
	Stainless steel	170405
	Aluminum	170402
	Copper tube	170401
Copper cable	Copper cable	170411
Casing insulation	Mineral wool	170604
Air filter	Plastic, metal	150106
	Filters which have caught toxic and/or pathogenic pollutants must be disposed of as chemical waste. National rules and regulations apply.	
Electrostatic air filters	Disposal instructions can be found in the corresponding operating instructions of the manufacturer. These are available online via the QR code on the first page of these instruction manual	
Droplet separator slats	Plastic	150102
Insulation profile		
Sealing tape		
Piping		
EC – motor	Guidelines for the disassembly and instructions for the disposal can be found in the appropriate previous chapters of this instruction manual or on the homepage of the component manufacturer. Detailed information of the component manufacturer can be found on the component.	
Electronic components		

Table 25: Information for disposal

Electrical and electronic components



Electrical and electronic components can contain substances that are hazardous to health and the environment. These must not be disposed of in domestic or commercial waste facilities. Furthermore, electrical and electronic components may contain valuable materials (e.g. precious metals). They must therefore be sorted for recycling or disposal by a specialist disposal company for electrical and electronic equipment.

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