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

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.
# Table of contents

1 Introduction ............................................................................................................................ 6
   1.1 Type key .......................................................................................................................... 6
   1.2 Intended use / foreseeable misuse ................................................................................. 7
      1.2.1 Intended use .............................................................................................................. 7
      1.2.2 Foreseeable misuse ................................................................................................. 8
   1.3 Modular design ............................................................................................................... 8
   1.4 Documentation .............................................................................................................. 8

2 Safety instructions / Guidelines to conformity to laws and directives ......................... 10
   2.1 Indications for minimizing specific hazards ................................................................. 10
      2.1.1 General indications ................................................................................................. 10
      2.1.2 Refrigeration circuit ................................................................................................. 12
      2.1.3 ATEX AHUs ............................................................................................................ 13
   2.2 CE-conformity / installation instructions for safe operation ........................................ 14
      2.2.1 EC declaration of conformity in accordance to EC machinery directive 2006/42/EC .... 14
      2.2.2 Installation instructions for the proper installation in the building system .......... 15
   2.3 Conformity to laws and directives ............................................................................... 16
      2.3.1 General .................................................................................................................... 16
   2.4 ErP conformity according to commission regulation (EU) Nr. 1253/2014 ...................... 17
   2.5 Staff selection and qualification ................................................................................... 17

3 Reception control / unloading / transportation to installation site ............................... 18
   3.1 Reception control ......................................................................................................... 18
   3.2 Lifting by forklift / lift truck .......................................................................................... 20
   3.3 Further necessary actions for the overlifting of both, delivery sections on crane lugs as well as monoblocs ......................................................... 21
   3.4 Overlifting of AHU sections with crane lugs ............................................................... 22
      3.4.1 Control of weight limits of delivery sections .......................................................... 22
      3.4.2 Necessary actions before lifting delivery sections with crane lugs ......................... 23
      3.4.3 Mounting of base frame crane lugs ........................................................................ 25
      3.4.4 Lifting by crane lugs ............................................................................................... 27
   3.5 Overlifting of monoblocs ............................................................................................. 27
      3.5.1 Weight details for monoblocs ................................................................................ 27
      3.5.2 Lifting of monoblocs ............................................................................................. 27
   3.6 Lifting when heat wheel or plate heat exchanger casing is delivered in parts .......... 29
      3.6.1 Assembly order of disassembled delivered casing parts ....................................... 29
      3.6.2 Lifting of heat wheel or plate heat exchanger ......................................................... 30
      3.6.3 Assembly of flat crane lugs ................................................................................... 30
   3.7 Storage......................................................................................................................... 32

4 Foundation / erection ........................................................................................................ 33
   4.1 Foundation ................................................................................................................... 33
   4.2 Erection ....................................................................................................................... 34
      4.2.1 Potential risks that may arise at the erection site .................................................... 34
      4.2.2 Actions to prevent potential risks ........................................................................... 35
      4.2.3 General indications for the erection ....................................................................... 35
      4.2.4 Special guidelines for flat AHUs – ceiling AHUs .................................................. 36

5 Assembly ............................................................................................................................ 38
   5.1 Assembly of casing ....................................................................................................... 38
      5.1.1 Actions before the assembly of casing ................................................................ 38
      5.1.2 Standard connections and connection components .............................................. 41
      5.1.3 Detailed solutions and connection components ................................................... 43
      5.1.4 Establishing the screw connection of AHU parts ................................................... 45
      5.1.5 Special features for roof AHUs and device separations at wet areas ................. 47
      5.1.6 Cable gland .......................................................................................................... 51
      5.1.7 Transport lock ...................................................................................................... 52
Instruction Manual ZHK

5.1.8 Securing the position of AHUs ................................................................. 53
5.2 Doors .............................................................................................................. 53
5.3 Dampers ......................................................................................................... 58
5.4 Air filters ......................................................................................................... 59
  5.4.1 Panel filter and/or bag filter laterally removable ........................................ 59
  5.4.2 Panel filter and/or bag filters in filter frame ............................................. 59
  5.4.3 Laterally removable bag filters with clamping mechanism ....................... 60
  5.4.4 HEPA filters .............................................................................................. 61
  5.4.5 Activated carbon filter ............................................................................... 63
5.5 Dampers with external gear wheels ............................................................. 63
5.6 Hygienic AHUs .............................................................................................. 64

6 Installation ........................................................................................................ 64
  6.1 Heat exchanger connection ......................................................................... 64
    6.1.1 General notes .......................................................................................... 64
    6.1.2 Steam heat exchanger ........................................................................... 67
    6.1.3 Plate heat exchangers for refrigeration circuits ....................................... 67
  6.2 Humidifier, indirect adiabatic cooling ......................................................... 68
    6.2.1 Water quality .......................................................................................... 68
    6.2.2 Protection of the drinking water against pollution .................................. 69
    6.2.3 Special indications for different humidification systems ....................... 69
      6.2.3.1 Spray humidifier – Installation of the pump circuit ......................... 69
      6.2.3.2 Evaporative humidifier .................................................................... 74
      6.2.3.3 High pressure spray humidifier ....................................................... 74
      6.2.3.4 Steam humidifier ............................................................................. 74
    6.2.4 Connection of indirect adiabatic cooling ................................................. 74
  6.3 Drain for condensate and excess water ....................................................... 75
    6.3.1 Standard siphons ................................................................................... 75
    6.3.2 Ball siphons ............................................................................................ 76
  6.4 Duct connection – airside connection to AHU ............................................. 78
    6.4.1 Requirements ......................................................................................... 78
    6.4.2 Insulation of fresh air damper ................................................................. 81
  6.5 Pumps ............................................................................................................. 81
  6.6 Freeze protection measures .......................................................................... 81

7 Electrical connection ......................................................................................... 82
  7.1 Connecting to an external protective conductor system .............................. 82
  7.2 AC motors .................................................................................................... 82
  7.3 EC motors ..................................................................................................... 86
  7.4 Main switch (emergency stop switch) ............................................................ 87
  7.5 Variable, frequency-controlled drives (VFD, frequency converters) ............ 88
  7.6 Electric heaters .............................................................................................. 88
    7.6.1 AHUs equipped from EUROCLIMA with control ................................ 89
    7.6.2 AHUs which are not equipped from EUROCLIMA with control .......... 91
  7.7 Differential pressure restriction for plate heat exchangers ........................ 92
    7.7.1 General indications ................................................................................ 92
    7.7.2 Prevention measures ............................................................................... 92
    7.7.3 Pressure monitoring with differential pressure switch ............................ 93
  7.8 Frost protection for plate heat exchanger .................................................... 95
  7.9 Lighting .......................................................................................................... 95
  7.10 UV section .................................................................................................. 95

8 Commissioning ................................................................................................. 96
  8.1 Preliminary steps .......................................................................................... 96
    8.1.1 Variable frequency controlled drives (frequency converter) - parameters 97
    8.1.2 Airflow measurement by differential pressure measurement at the fan 99
    8.1.3 Heat exchanger ...................................................................................... 100
    8.1.4 Electric heater ......................................................................................... 101
    8.1.5 Air filters ............................................................................................... 101
8.3 Test run ....................................................................................................................... 104
8.3.1 Adjusting variable pulleys ................................................................................... 104
8.3.2 Vibration verification .......................................................................................... 105

9 Maintenance................................................................................................................ 106
9.1 Electrical connection, control cabinet ...................................................................... 107
9.2 Fan / motor group ..................................................................................................... 107
9.2.1 Vibrations ........................................................................................................... 107
9.2.2 Fan ...................................................................................................................... 108
9.2.3 Motor ................................................................................................................. 109
9.2.4 V-belt drive ........................................................................................................ 110
9.2.5 Re-tensioning of belts ....................................................................................... 111
9.2.6 Replacing of belts ............................................................................................. 113
9.3 Air filters .................................................................................................................. 113
9.3.1 Panel filters ....................................................................................................... 114
9.3.2 Bag filters ......................................................................................................... 114
9.3.3 HEPA filters ..................................................................................................... 114
9.3.4 Activated carbon filters ..................................................................................... 115
9.4 Heat exchangers ..................................................................................................... 115
9.4.1 Medium water / steam ..................................................................................... 115
9.4.2 Refrigerant ....................................................................................................... 116
9.4.3 Electric Heater .................................................................................................. 116
9.5 Humidifiers ............................................................................................................ 116
9.5.1 General indications ......................................................................................... 116
9.5.2 Spray humidifier .............................................................................................. 117
9.5.3 Evaporative humidifiers ................................................................................ 117
9.5.4 High pressure spray humidifier ..................................................................... 117
9.5.5 Steam humidifiers .......................................................................................... 117
9.6 UV section .............................................................................................................. 117
9.7 Dampers ............................................................................................................... 118
9.8 Sound attenuators ............................................................................................... 118
9.9 Weather louver ..................................................................................................... 118
9.10 Energy recovery systems ..................................................................................... 118
9.10.1 Plate heat exchangers .................................................................................... 118
9.10.2 Heat wheels .................................................................................................... 118
9.10.3 Heat pipes ...................................................................................................... 119
9.10.4 Accublocs ....................................................................................................... 119
9.11 Refrigeration circuit ............................................................................................. 120
9.11.1 Leakage checks ............................................................................................... 120
9.11.2 Maintenance ................................................................................................... 120
9.11.3 Inspection ....................................................................................................... 122
9.12 Hygienic AHUs .................................................................................................... 122
9.13 Maintenance plan ............................................................................................... 122

10 Information on airborne noise emitted by the AHUs - on request .......................... 124

11 AHUs in ATEX execution ....................................................................................... 124
11.1 Specific instructions for ATEX AHUs .................................................................. 124
11.2 The ATEX type key......................................................................................................................... 125
11.3 Supplementary notes on AHU design.............................................................................................. 126
11.4 Ignition temperature and temperature classes.................................................................................. 126
11.5 Additional instructions for foundation and erection, assembly, connection and commissioning, maintenance and repair........................................................................................................... 128
  11.5.1 Foundation and erection.............................................................................................................. 128
  11.5.2 Assembly, connection and commissioning.................................................................................... 128
    11.5.2.1 Ensure the tightness of the AHU........................................................................................... 128
    11.5.2.2 Motor................................................................................................................................... 129
    11.5.2.3 Fan section........................................................................................................................... 129
    11.5.2.4 Air filters.............................................................................................................................. 129
    11.5.2.5 Heat exchangers / steam humidifiers ................................................................................... 129
    11.5.2.6 Field devices......................................................................................................................... 129
  11.5.3 Maintenance and repair................................................................................................................ 129
12 Disassembly and disposal...................................................................................................................... 130
  12.1 Disassembly..................................................................................................................................... 130
  12.2 Disposal.......................................................................................................................................... 131
Figure index .................................................................................................................................................. 132
Table index ................................................................................................................................................ 137

- Original Instructions -
1 Introduction
This is the instruction and operation manual for an air handling unit, hereinafter designated as 'AHU'.

1.1 Type key

![Figure 1: Example AHU type key](image)

**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-TB2
- ZHK NANO: compact AHU series with thermally decoupled version T2-TB2
- ETA XXX: key ETA; including control
- ETA POOL: compact AHU for pool dehumidification with refrigeration circuit (option)
- ETA PAC: indirect adiabatic cooling
- 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 \(15/6 = 1525 \times 610\) mm (clear width x clear height)

<table>
<thead>
<tr>
<th>Index</th>
<th>3</th>
<th>4</th>
<th>6</th>
<th>9</th>
<th>12</th>
<th>15</th>
<th>18</th>
<th>21</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension (mm)</td>
<td>305</td>
<td>457.5</td>
<td>610</td>
<td>915</td>
<td>1220</td>
<td>1525</td>
<td>1830</td>
<td>2135</td>
<td>2440</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Index</th>
<th>27</th>
<th>30</th>
<th>33</th>
<th>36</th>
<th>39</th>
<th>42</th>
<th>45</th>
<th>48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension (mm)</td>
<td>2745</td>
<td>3050</td>
<td>3355</td>
<td>3660</td>
<td>3965</td>
<td>4270</td>
<td>4575</td>
<td>4880</td>
</tr>
</tbody>
</table>

This information applies both to the ratios of the supply air and the exhaust air.
1.2 Intended use / foreseeable misuse

1.2.1 Intended use

The AHU is used, depending on the chosen purpose for:
- transportation and conditioning of air in and out of buildings, in which humans stay
- creation of a desired room air quality in the occupied area of humans
- creation of an acceptable comfort or desired working conditions
- depending on the AHU type, the air conditioning is done primarily by:
  - Air change
  - Control of air temperature and air humidity
  - Filtration of normal polluted air
  - 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 operation at 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 of the series ZHK 2000 and ZHK INOVA, as described in this manual are designed, built and delivered according to customer requirements. 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 the responsibility, because the AHU is built according to the confirmed specifications.

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.
For AHUs with components provided by the customer no EC declaration of conformity is generated due to this reason.

**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 safety aspects.

### 1.2.2 Foreseeable misuse

Other than above use, is considered as improper and must be excluded totally:
- The commissioning of equipment, prior to performing the steps indicated in the assembly instructions and operating with the fan section door open, is a serious security risk.
- Opening the AHU, without securing the main switch in the off position, represents a massive security risk.
- 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 an explosive atmosphere 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 2.1.3 (ATEX AHUs) and chapter 11 (AHUs in ATEX execution).
- Handling of air with corrosive / aggressive components.
- Pressure-sided doors can detach suddenly while opening. So, there is a risk of injury for the user. See chapter 5.2 Doors.

### 1.3 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 seen on the technical data sheet - see chapter 1.4 (Documentation).

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

### 1.4 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 cardboard box for 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:

- Components operation manual
- There is a cardboard box for loosely delivered parts inside of the AHU, or can be downloaded from the homepage of the component manufacturers
AHU drawing applied on each delivery section
Wiring diagram for ETA in control cabinet
Operation manual control ETA MATIC / ETA POOL in control cabinet

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

- K-value for airflow measurement
- Belt drive and tension data
- Data point list
- Piping & instrumentation diagram
- Records for refrigeration circuit application

There is a cardboard box for loosely delivered parts inside of the AHU.

The above mentioned documentation must always be available when working on the AHU!

You will also find stickers with warning 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

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 component manufacturer. In case of contradiction between this manual and instruction manuals of the component manufacturer for safety instructions, the most restrictive 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 Indications for minimizing specific hazards

2.1.1 General indications

An improperly performed maintenance can pose a security risk!

Risk of thin sheets, when working on AHU

During work on AHU (or on parts), there is a substantial risk of cutting with thin sheets as e.g. 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.

- If the AHU is part of the smoke extraction concept, then the specifications of this concept have to be observed.
- Otherwise, the power supply of the AHU must be interrupted 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
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:

- Indentation of body parts in moving parts (belt drive, fan impeller, external damper gear wheels ...).
- Burns and scalds on hot AHU components such as heat registers, heat exchangers, ...
- 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…
- all current-carrying 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 a re-activation during the work. The housing of the AHU interior lighting (can have separate supply) is not current-carrying.
- all moving parts, especially the fan wheel, motor and heat wheel have come to a standstill; wait at least 5 minutes after switching off 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 key from doors with door lock before entering in the casing of the AHU. Keep the key out of reach of unauthorized persons.
- Check that the hot media supply such as steam is interrupted and all the heat registers, heat exchangers, etc. are cooled to ambient temperature.

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 working and before the start 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
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
To prevent the fire spreading, fire dampers shall be installed into the ducts between the fire compartments.

Prevention of exposure caused by antifreeze agents
Avoid body contact with antifreeze agents, because they may cause burns. Always wear appropriate protective clothing (e.g. gloves, goggles, ...).
In case of fire, avoid the danger zone and meet different safeguards. 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
By hot steam there is a danger of burns. Therefore, make sure that no steam pressure is present and the system is cooled before working on the steam piping.
Avoid any type of ignition source when cleaning the humidifier and the associated components and circuits by means of descaling agent. With strong descaling agents, direct sunlight can already cause a fire.

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, …) and ventilate the room well.

Prevention of hazards caused by suddenly falling out door panels while opening of removable panels

Removable door panels can fall out after detaching the connections and lead to injuries. Particular care should be taken when removing pressure sided doors because they can be firmly in place then suddenly detach. The user must be able to carry the weight of the door. At doors with a surface of > 0.5 m² two persons are necessary.

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

2.1.2 Refrigeration circuit

Preventing the risk of exceeding the maximum operating pressures PS

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

Risk of burns on hot surfaces

On the compressor casing, pipelines and circuit components and on the oil sump heater surface temperatures of far higher than 100 °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

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 °C!

Prevent the risk of suffocation

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!
- For more information refer to chapter 8.2.3 (Refrigerant).
### 2.1.3 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 in ATEX execution) 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 19 (chapter 11.3 (Supplementary notes on AHU design)) described.

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 2.1 (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 non-explosive atmosphere.
- The creation of an explosive atmosphere needs to be counteracted by adequate ventilation.
- If necessary, it could be also required to flush the system with fresh air, in order to remove or dilute an explosive atmosphere.
- 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 may be required to carry out a clearance measurement with a gas detector before starting work and during work.
- Work may only be carried out if there are no zones or ignition sources are avoided. It is particularly important to ensure that all work equipment is approved for the corresponding zone (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 explosive atmospheres by whirling 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.

2.2 CE-conformity / installation instructions for safe operation

2.2.1 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.

The AHU is always only a part of the building system and requires supplements on-site, that means in responsibility of the customer. Therefore, for a safe operation, the general in chapter 2.2.2 (Installation instructions for the proper installation in the building system) and in particular in the following chapters described on-site work must be carried out exactly before the initial start-up. The AHU must be mounted and operated professionally, according to the specifications in this operation 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 and operation 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.


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 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
2.2.2 Installation instructions for the proper installation in the building system

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 persons accessing from the outside to 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 1.2.1 (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
As a basis for on-site sound measures calculation (such as for sound attenuators) the on request available sound data can be used. 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
Also, 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 7.6 (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 7.7 (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, wa-ter-glycol mixture, aqueous vapor, refrigerant ...), it must be ensured by the customer that the re-sulting assembly meets the pressure equipment directive 'PED' 2014/68/EU.

Field equipment for roof AHUs
On site mounted field devices for roof AHUs, e.g. damper position motors or pressure switches must be weather-protected in case of insufficient IP class and - depending on the installation situa-tion - possibly also protected against icing.

Freeze protection
The customer must ensure sufficient freeze protection measures. See indications in chapters 4.2.1 (Potential risks that may arise at the erection site), 4.2.2 (Actions to prevent potential risks), 6.6 (Freeze protection measures) and 7.8 (Frost protection for plate heat exchanger).

Venting, draining of heat exchangers
See chapter 8.1.3 (Heat exchanger).

2.3 Conformity to laws and directives

2.3.1 General
The AHU will be built and delivered according to the agreed specifications and exactly to your re-quirements. It is important to note that the AHU is a part of a system and that the AHU is only after assembling and connection to the system ready for operation. It is normal, that the AHU is ready for operation only after installation-work.

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 obligated – before commis-sioning of the AHU to check the conformity of the entire system to the valid laws and di-rective.

If there are any doubts about the conformity of the AHU with the local (on site) valid laws and direc-tives, the AHU is only allowed to be put into operation, if the conformity of the AHU in the system is unequivocally guaranteed.
2.4 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 controlling. They will be triggered if the pressure drop at the filter exceeds the maximum permissible value. See chapter 9.3 (air filters).

If above mentioned equipment is not included in delivery by EUROCLIMA, it has 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 may 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 recognize 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.

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 warnings 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 (Overlifting 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 the package for completeness and any damage.
- Loose supplied parts and assembly materials are in a nylon bag or a box in the AHU.
- If damages are found, immediately complete a damage report and send it to EUROCLIMA. Only then the transport company can make the claim with the insurer (Note 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 recognized, 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 like e.g. motor shafts, fan shafts, pulleys, clamping bushes, sheet cutting edges, and so forth. The resulting corrosion layer protects the underlying material from further corroding and does not represent a defect of the component or the device (see also chapter 9).

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

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

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

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

- Delivery in parts allow the supply of major equipment in small sections and provides more easily insertable parts.
- 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

- 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](image)

![Figure 6: Transport incorrect](image)

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

![Figure 7: Center of gravity centrally between the forks](image)

For the overlifting directly by crane from the truck applies the following chapter 3.4 (Overlifting 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

- Make sure that nobody is under the raised load.
- The AHU sections or monoblocks must be lifted with appropriate equipment e.g. 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 means must allow a favourable 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 the like will not be stressed or damaged.
- Load carrying equipment shall not run over sharp edges and is not allowed to be knotted.
- The load carrying equipment must be secured against slipping off.
- Before lifting, check 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 further lifting, check by visual inspection that no conspicuous deformations can be detected on the suspension means.
- Avoid jerky lifting.
- Never lift AHU sections or monoblocs on heat exchanger connections or other attachments.

Figure 8: Permitted angle for load carrying equipment guidance
3.4 Overlifting of AHU sections with crane lugs

Chapter 3.3 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 1.

<table>
<thead>
<tr>
<th>Base frame height H (mm)</th>
<th>Max. section weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>1.500</td>
</tr>
<tr>
<td>100</td>
<td>1.500</td>
</tr>
<tr>
<td>200</td>
<td>4.000</td>
</tr>
</tbody>
</table>

Table 1: Maximum AHU part weights for lifting by crane lugs

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, ... on the drawing and with the same number on the section itself. Example, refer to Figure 10: Delivery section L5 = 601 kg

Figure 9: Base frame height
3.4.2 Necessary actions before lifting delivery sections with crane lugs

Opening 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:

![Delivery section with mounted damper](image)
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
3.4.3 Mounting of base frame crane lugs

For mounting crane lugs on AHU casing sections when plate heat exchanger and heat wheel parts are delivered disassembled see chapter 3.6.2 (Lifting of heat wheel or plate heat exchanger).

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

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
Bolts and nuts are delivered with the lifting lugs and must be tightened with the torque according to Table 2. If the lifting lugs are already mounted by EUROCLIMA, the screws must be checked before lifting of the AHU.

<table>
<thead>
<tr>
<th>Base frame height $H$ (mm)</th>
<th>Screw type</th>
<th>Nm</th>
<th>Strength class</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>M8x20</td>
<td>10</td>
<td>min. 8.8</td>
</tr>
<tr>
<td>100</td>
<td>M8x20</td>
<td>10</td>
<td>min. 8.8</td>
</tr>
<tr>
<td>200</td>
<td>M12x30</td>
<td>30</td>
<td>min. 8.8</td>
</tr>
</tbody>
</table>

Table 2: 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 (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](image1)

![Figure 20: Uniform force effect](image2)

3.5 Overlifting of monoblocs

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

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 verifying 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 slipping off of the load carrying equipment

**Lifting with monobloc crane lifting lugs**
- In the counter frame are drilling holes for mounting monobloc crane lifting lugs with bolt connections. The bolts are 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 monobloc crane lugs is agreed.
- In accordance with the length and the weight of the monobloc AHU 2, 3 or more crane lifting lugs have be mounted at each side of the AHU.
- The weight must be applied evenly over all monobloc crane lugs.
- Dismount the crane lugs after pre-positioning of the AHU.
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 supplier and for lifting the heat wheel or plate heat exchanger, the lifting instructions and specifications of the respective manufacturer must be observed. 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 applies particularly if the heat wheel or plate heat exchanger has been delivered in several individual parts. Regarding 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)).

![Diagram](image)

**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**.

![Diagram](image)

**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.
Bolts and nuts are delivered with the lifting lugs and must be tightened with the torque according to Table 3. If the lifting lugs are already mounted by EUROCLIMA, the bolts must be checked before lifting of the AHU.

<table>
<thead>
<tr>
<th>Bolt type</th>
<th>Nm</th>
<th>Strength class</th>
</tr>
</thead>
<tbody>
<tr>
<td>M6x16</td>
<td>7-8</td>
<td>min. 8.8</td>
</tr>
</tbody>
</table>

**Table 3:** Tightening torque for bolts
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](image)

### 3.7 Storage

The delivery sections generally are packed in nylon. This package is suitable to protect the AHU during loading and unloading from bad weather, but not for outdoor storage. The insertion into a dry area after unloading is therefore essential for the preservation of the AHU.

#### Standstill maintenance

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 may be formed within a short time on galvanized surfaces. It can further arise that an excessively high temperature is created under the packaging, which can also cause damages to the components.

If you want to please to yourself, the planner, the owner and other observers of the AHU, then we strongly recommend covering and protect the AHU against dirt and damage during the installation and commissioning process, see Figure 33.
4 Foundation / erection

Space requirements:
At the location, proper maintenance and the removability of build in components shall be physically possible. Therefore, a free working space of AHU width + 300 mm shall be available. On the back site for mounting a 600 mm width passage should remain free.

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 may not have fall in any direction or uneven surfaces.

AHUs must weigh down the foundation on the base frame in longitudinal and cross direction either in strips or points. The distance of the strip or point contact surfaces must not exceed 1,500 mm in length and width of the AHU.

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 complying the conditions must be taken (e.g. distance sheets with appropriate thickness).

Attention!
If these structural conditions are not met, this may be the cause of jammed doors and dampers and other problems with the AHU.
The installation of underlayment 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 used absorbent material must be adjusted to the load to achieve optimum noise insulation. Each contact point between AHU and foundation must be noise insulated. Additionally, the respective design criteria of the manufacturer must be complied. For the weight specifications of the AHU see the technical data sheet.

4.2 Erection

4.2.1 Potential risks that may 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 become leaky or loose, so that inside or outside of the AHU water or the medium exits.
- Cooling processes can cause dehumidification and the associated formation of condensation in the AHU. The AHU is then equipped with condensate collecting trays and outlets. Nevertheless, condensate can exit from the AHU in case of errors on the AHU, under inadmissible or extreme operating conditions. Errors on the AHU, inadmissible or extreme operating conditions can also cause the formation of condensate on the outer surfaces of the AHU, which may then drip down.
- Internal and external cleaning - also wet cleaning - can be performed on the AHU. When performing this work, an exit/dripping down 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:

Figure 34: Solid foundation and strip foundation
4.2.2 Actions to prevent potential risks

These risks can be prevented by the following actions:
- It does not matter, whether or not the AHU is floor standing, heightened (e.g. on a scaffold) or suspended from the ceiling, the easy assembling and maintenance of the AHU has always to be guaranteed on site.
- Depending on the erection, suitable protective actions must be taken to ensure that persons, buildings and equipment are not jeopardized by falling parts (e.g. tools, screws, etc.) and possible exit of water or other fluids.
- The ground around the erection site should be watertight and have with a downward gradient to a sufficiently sized outlet.
- Where this is not met, the erection of the AHU in a sufficiently sized collecting tray with an outlet may be an appropriate solution.
- A humidity sensor with alarm transmitter can represent an additional action to protect critical operating conditions.
- For AHUs suspended from the ceiling, it is recommended in any case to provide a sufficiently dimensioned collecting tray with outlet under the AHU.
- To avoid freezing of components, the customer must ensure, that the AHU is protected against weather, which could lead to such problems. Additionally, the customer must take further measures to provide freeze protection. Some possibilities for that purpose are:
  - Complete drainage of the heat exchanger if it is not used
  - 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 take the decision on appropriate actions, with knowledge of the situation on site. The installation technician and the operator of the AHU have to ensure the preventive protection in accordance with the instructions mentioned herein. In this context, it is recommended to conclude an 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 shall be mounted on the ceiling, then the device must be fixed with the base frame on an encompassing suspension see Figure 35 right. The handling of the structure-borne noise insulation is analogously as for floor AHUs.
AHU which are not designed to stack, may not be stacked (one on top of the other). Spray humidifier will need either one-both sides higher foundations or on one-both sides feet, which are supplied if ordered, refer to Figure 36.

**Treatment of GfK air washer and plastic parts**
Thermoplastics are compared with steel impact and shock sensitive. At low temperatures an additional brittleness exists. Please treat 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 under a ceiling.

**Assembly of the individual components of the flat AHUs**
- The individual components are screwed together by use of easy connection – see Figure 53 (chapter 5.1.2).
- The assembly should still be done 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 of the suspension and fixture must be carried out on site and has to be adapted 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 bottom side, 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 37, or of transverse profiles with additional longitudinal profiles (longitudinal to the air flow), see Figure 38.
- 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, processes of wells, etc. are not blocked by them, see Figure 37.
- 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 is recommended to use sound-absorbing material between suspension and AHU. A possible solution is shown in Figure 35.

![Figure 37: Suspension with transverse profiles](image1)

![Figure 38: Suspension with longitudinal and transverse profiles](image2)
5 Assembly

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

![Figure 39: Do not climb on the AHU!](image)

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 40) must be applied at all section connections before assembling, see Figure 41.

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 hood …

![Figure 40: Sealing strip](image)  
**Figure 41: Applying the sealing strip**
Section connection points, screw connections between inside and outside, connection openings and bushings, and all other openings which penetrate the casing must additionally be sealed with SIKAFLEX (e.g. heat exchanger connections, mounting screws, duct connections, measuring openings, etc.), as shown on Figure 42 and Figure 43.

For roof AHUs as well as at device separations directly before or after a wet area (e.g. cooler, humidifier, spray humidifier), special actions must be done for sealing. For that purpose, the supplied sealing agent Sikaflex (Figure 42) must be used. Further information will follow in chapter 5.1.5 (Special features for roof AHUs and device separations at wet areas).

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

The AHU sections can be pulled together with belts which attach on the base frame, as shown on Figure 44 and Figure 45.

Remove external panels at butt joints
For aligning and connecting the delivery sections, the external panels shall be removed, unless heat exchanger fittings or similar components prevent this.
Procedure:

- **ZHK 2000 – Housing type: Snap in construction** – To remove the external panel - start at the corners - use a screwdriver – refer to Figure 47. After removing the external panel, remove the insulation.

- **ZHK INOVA – Housing type: screwing construction** – The external panel is located on the inner panel and is screwed to it using TORX screws (see Figure 48). After removing all screws, the outer panel can be removed and the insulation can then be removed.
5.1.2 Standard connections and connection components

The connection via base frame must be always made at all AHUs, see Figure 51 and Figure 52.

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

**ZHKO INOVA:**
1. Easy Connection, see Figure 53 up to Figure 56
2. Connection angle, connection frame, see Figure 57 up to Figure 61
3. Connection via panels, see Figure 62 and Figure 63

**ZHKO 2000:**
1. Connection angle, connection frame, see Figure 57 up to Figure 61
2. Connection via panels, see Figure 62 and Figure 63
Figure 53: Easy Connection

Figure 54: Connection via Easy Connection

Figure 55: Easy Connection at two-storey AHUs

Figure 56: mounted Easy Connection at two-storey AHUs

Figure 57: Hexagon bolt with locknut M8x20

Figure 58: Connection angle

Figure 59: Connection via connection angle
5.1.3 Detailed solutions and connection components

- Connection between door frame / door frame and door frame / internal panel
  Screw spacing: 152 mm
- Connection of 3 mm thick casing components without holes

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

- Connection of internal and external panel (ZHK INOVA)
5.1.4 Establishing the screw connection of AHU parts

The exact alignment of the AHU parts and pulling together of the AHU parts as close as possible, as described in chapter 5.1.1 (Actions before the assembly of casing), are requirements for establishing screw connection.

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 80 left).
- If accessible, in the connection angles located in the upper corners of the AHU (Figure 80 bottom center).
- If accessible, in the circumferential connection frame (Figure 80 top center).
- In the panels (Figure 80 right).
- For roof AHUs in the roof flange.

If only one side is accessible (panels and connection frame) the tapping screws ø8 x 11 or Ejot ø8 x 16 shall 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.

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

Figure 80: 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 (Figure 81).

Figure 81: Removing the protective film
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 87 and Figure 93). 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 88), then the joints (Figure 89) 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 86: Sealing surfaces at wet areas

Figure 87: Sealing the frontal joints

Figure 88: AHU separation accessible via door

Figure 89: Sealing the section connection (joint) with the sealing agent

For roof AHUs, also the roof flange is to seal, refer to Figure 90.

Figure 90: Sealing the roof flange
Sealing of loose delivered base frame cover
Sealings have to be provided at following positions (see Figure 31):
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 has to be checked.

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 92.
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 94).

- A metal sheet roof, which overlaps the entire width with pre-punched holes. Those are for screwing the metal sheet roof and the casing.
- Sealant (Sikaflex) (see Figure 96)
- Drilling screws with sealing ring. (see Figure 95)
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.
- Transmit the hole pattern of the roof sheet to the corner profiles of the inner panel.
- Remove the roof sheet.
- Remove the protective foil from the double-sided tape. (see Figure 94)
- Put on the roof sheet 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 98)

5.1.6 Cable gland

For the connection of engines, pumps, electric heaters, sensors, etc., EUROCLIMA loosely supplies material for cable glands (Figure 102), which must be installed 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 4 (by using a step drill – see Figure 99).

<table>
<thead>
<tr>
<th>Size (of the cable gland)</th>
<th>External drilling diameter (for screwing)</th>
<th>Internal drilling diameter (for sleeve)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 16</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>M 20</td>
<td>21</td>
<td>23</td>
</tr>
<tr>
<td>M 25</td>
<td>26</td>
<td>28</td>
</tr>
<tr>
<td>M 32</td>
<td>33</td>
<td>35</td>
</tr>
<tr>
<td>M 40</td>
<td>41</td>
<td>43</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>M 50</th>
<th>51</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 63</td>
<td>64</td>
<td>71</td>
</tr>
</tbody>
</table>

**Table 4:** Drilling diameters for cable glands

3. Insert sleeve (inside – see **Figure 100**) and screwing (outside – see **Figure 101**) into the drillings and screw them together (see **Figure 102**).

![Step drill](image)

**Figure 99:** Step drill

A drill with the diameter for the corresponding gland diameter (see **Table 4**, 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 103** 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
5.1.8 Securing the position of AHUs

Floor AHUs must be fixed on the foundation to secure the position. A direct coupling, see Figure 104 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 104 right).

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)

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 105.
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 106.
Doors which allow access to the fan section
- are equipped with a door lock. **Figure 107** shows the lock in the position 'locked', locking slit is in vertical position.
- offer a physical barrier as a protection against the danger zone
- stay securely in position and can be opened only by using a key
- during the operation do not permit access to the fan section

The keys are provided attached to the handle, refer to **Figure 108**.

Abovementioned doors with locks are an effective safety device according to EN ISO 12499: there is no situation where entering during fan operation is required, refer also to chapter 2.1 (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 109** (closed position) and **Figure 110** (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.
Hinged doors in INOVA-execution differ just in the casing and hinge execution from the 2000-execution (see figure beneath).

**Readjustment of the door panel position**

Because of the handling of AHU sections, the position of the door panel can move (see Figure 114 or Figure 117). 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 115 or Figure 118) must be loosened. Then, the door panel can be brought in the correct position (Figure 116 or Figure 119) and the screws can be tightened again.
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 execute doors as a removable door panel. Clamping means, which are on 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 get access to the components inside.

The removal of the door panel from the casing can proceed as follows:
1. Pull forward the black plastic handles.
2. Rotate black plastic handles by 90 degrees.
3. Take door panel with both hands and remove it.

![Figure 120: fixed door panel (TRA)](image1)
![Figure 121: opened door panel (TRA)](image2)
![Figure 122: removed door panel (TRA)](image3)

**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 fixation of the door panel is made by screws. The screws are put through the prepared holes at the border of the door panel and screwed to the door frame.
Removable door panel ZIB (ZHK)
Beside the hinged doors, the access to the inside of AHUs with INOVA-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**).

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

Attention: Pressure-sided doors represent an increased risk of injury. While opening. They can firstly adhere due to the pressure-difference, and then suddenly detach and fall against the user. The user could also be skidded backwards.
Therefore, particularly when opening pressure-sided doors, it must be done very carefully. Open the door panel carefully and detach it slowly from the sealing. At the sudden detaching of the panel, the user must be able to carry the weight of the door. At doors with a surface of > 0.5 m² 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 129 and Figure 130). The handle will be turned till this lever connects at the profile. Now, the pressure can escape. Then the door panel can be opened completely.

5.3 Dampers

The closing position of the dampers can be identified in two different ways, see Figure 131 and Figure 132.

- It is not permitted to drill in the damper, otherwise it may cause damage to the gear wheels and the function of the damper is no longer ensured.
- The dampers must not be strained.
5.4 Airfilters

- Filters, with the exception of laterally removable prefilters, 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 noted, that the filter bags will not be clamped or damaged. Each filter bag must freely adjust itself in the airstream.

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

5.4.1 Panel filter and / or bag filter laterally removable

At laterally removeable filters a pull-out mechanism is included in the scope of supply, see Figure 134.

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.

5.4.2 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 135).
2. Four filter clips have to be inserted in the respective brackets according to Figure 136.
3. Finally, the filter must be fixed by the clips in the filter frame (Figure 137).
Bag filters are installed similarly. Bags shells hang vertically.

5.4.3 Laterally removable bag filters with clamping mechanism

When inserting and fixing the laterally 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 138).
2. Slide one filter after the other in the filter frame (Figure 139).
3. Press the last filter of the row against the rear panel. Then press with the lever the filter cells against the sealing (Figure 140).

Attention: For soft bags the lower bags of the filter cells need to lift up in order to prevent damage with the clamping system (Figure 141)!
Attention: If different widths of filter 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 142: filter frame for different filter sizes

Figure 143: consider the order according the filter frame raster

Figure 144: filter section with inserted filters

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 146)

Figure 145: pushing and clamping of the filters to the rear wall

Figure 146: check, if filter lie on the sealing

5.4.4 HEPA filters

If a sealing is not included in the 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 147 and Figure 148.
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 149 and Figure 150.

2. Filter types with metal frames shall be fixed with tensioning corners and additional pressure plates as shown in Figure 151.
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.

5.4.5 Activated carbon filter
Activated carbon filter cartridges (Figure 152) are delivered loosely and must be inserted into the dedicated base plate (Figure 153) using the integrated bayonet fastenings.

5.5 Dampers with external gear wheels
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).
5.6 Hygienic AHUs

- In addition to the actions mentioned here, the instructions according to chapter 9.12 (Hygienic AHUs) have to be observed.
- After assembly all grooves and joints at the connection positions must be sealed with the supplied sealing agent.
- In case of replacement of components sealing must be restored.
- Access of components is ensured by door positions upstream and downstream of the component, therefore components are accessible or side removable for cleaning and maintenance.
- Carry out installation of ducts, tubes and electrical installation in order to ensure access and function of doors.

6 Installation

6.1 Heat exchanger connection

6.1.1 General notes

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

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.

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 screwing (Figure 155).

Figure 155: 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 158). 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 a damage of the copper pipe of the heat exchanger due to mechanical force, a ring is used to reinforce the copper pipe (Figure 156 and Figure 157).

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 acting assembler is fully responsible for this task.

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

The connection of the heat exchanger is to execute as indicated on the label on the AHU (connection diagrams in Figure 160).
The heat exchanger operates according to the (cross-)counter-flow principle. Only 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. Preheat exchanger if there is a freezing risk and can be requested - parallel flow

Hydraulic connection schemes of heating or cooling coil should be carried out as shown in the scheme **Figure 161** with a three way valve 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.

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.
6.1.2 Steam heat exchanger

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:

- 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 missing airflow

6.1.3 Plate heat exchangers for refrigeration circuits

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 164:

- Bottom inlet
- Top outlet
Application of plastic water tubes are not allowed because refrigerant - and therefore also plate heat exchanger - may reach temperatures of 110 °C or higher!

- Never add the chlorination in front of the water inlet of the plate heat exchanger. The chlorination should be added as far away from the plate heat exchanger as possible (see Figure 165).
- The water inlet should be close to the surface and the outlet near 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 165).

Warning: Unfortunately, in practice, the chlorination 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 165: 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 a sufficient operation safety, the circulation water quality should be in following range:

<table>
<thead>
<tr>
<th>Quality</th>
<th>Air conditioning system for Standard climate requirements</th>
<th>Data-processing areas</th>
<th>Sterile and clean rooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Clear, colorless and without sediment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH-value</td>
<td>7 – 8.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total salt content</td>
<td>GSG g/m³</td>
<td>&lt; 800</td>
<td>&lt; 250</td>
</tr>
<tr>
<td>El. conductivity (at reference temperature 20 °C)</td>
<td>mS/m</td>
<td>&lt; 100</td>
<td>&lt; 30</td>
</tr>
<tr>
<td></td>
<td>µS/cm</td>
<td>&lt; 1000</td>
<td>&lt; 300</td>
</tr>
<tr>
<td>Calcium</td>
<td>Ca++ mol/m³</td>
<td>&gt; 0.5</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>g/m³</td>
<td>&gt; 20</td>
<td>-</td>
</tr>
<tr>
<td>Carbonate hardness</td>
<td>KH °dH</td>
<td>&lt; 4</td>
<td>-</td>
</tr>
<tr>
<td>Carbonate hardness with hardness stabilization</td>
<td>KH °dH</td>
<td>&lt; 20</td>
<td>-</td>
</tr>
<tr>
<td>Chloride</td>
<td>Cl⁻ mol/m³</td>
<td>&lt; 5</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>g/m³</td>
<td>&lt; 180</td>
<td>-</td>
</tr>
<tr>
<td>Sulphate</td>
<td>SO₄²⁻ mol/m³</td>
<td>&lt; 3</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>g/m³</td>
<td>&lt; 290</td>
<td>-</td>
</tr>
<tr>
<td>KMnO₄-consumption</td>
<td>g/m³</td>
<td>&lt; 50</td>
<td>&lt; 20</td>
</tr>
<tr>
<td>Germ count</td>
<td>KBE/ml</td>
<td>&lt; 1000</td>
<td>&lt; 100</td>
</tr>
<tr>
<td>Legionella bacteria</td>
<td>KBE/ml</td>
<td>&lt; 1</td>
<td></td>
</tr>
</tbody>
</table>

Table 5: water quality of supply of humidifier following VDI 3803

The necessity of a stationary sterilization facility depends mainly on the operation 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 against contamination due to backflow. Before commissioning, such appropriate measures must be executed by the operator on site to ensure the 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 166:

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.

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, please follow strictly the described 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 167.
- in case that costumer applied lubricant at the flexible tube during installation.

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

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 6. 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.
Table 6: 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 167.
   - 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.
2. **Install the flexible tube and clamps**
   - Clean the plastic tubes and flexible connector tube carefully with a dry and clean cloth
   - Check to use the correct clamps: The clamps are imprinted with “NORMA” and the size range must be as indicated in Table 6.

   **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 of the connection.**

   **Do not use any cleanser of benzene, 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 167.
   - 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.
5. **Installation of threaded strut**

The threaded strut is mounted on the pressures side and holds the pressure side tube in position, in order to relieve the pressure side flexible tube connection from axial forces. The strut shall be fixed near to the vertical tube coming from the pump pressure side as shown in **Figure 169**.

For installing the threaded strut, the following parts are needed (included in the scope of supply by EUROCLIMA), **Figure 169**:
1. Clamp for threaded strut
2. Threaded strut (M10)
3. Base support for 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 tie down slightly the tube assembly.

In case of problems or needing support with your product, do not hesitate to contact EUROCLIMA for any further clarification.
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 indicated 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 indicated on the wiring diagram. The scope of supply includes a drainage solenoid valve, a conductivity sensor, two water level switches (maximum/minimum) and a tacosetter, see Figure 170. If no EUROCLIMA control is included, the electronic components must be integrated in the customer's control. The water amount of the drainage can be set manually at the tacosetter. At the customer's request simplified systems will be delivered.

![Figure 170: Components of an evaporative humidifier system with circulation water operation](image)

6.2.3.3 High pressure spray humidifier
The manufacturer of the high pressure spray humidifier must be contacted for the installation.

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

6.2.4 Connection of indirect adiabatic cooling
ETA-PAC AHUs are equipped with an indirect adiabatic cooling device. Carry out connection to piping system as shown in Figure 171.
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 detailed information.

The following conditions are essential for correct operation:

- At each drain a siphon must be connected.
- Several drains may 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 provided on site.

The heights $H_1$, $H_2$ and $H_3$ 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:

\[ \begin{align*}
\text{Total pressure} & \quad p_{\text{ges}} & = & 1196 \text{ Pa} \\
\text{Dynamic pressure} & \quad p_{\text{dyn}} & = & 83 \text{ Pa} \\
\text{Total static pressure} & \quad p_{\text{stat}} = p_{\text{ges}} - p_{\text{dyn}} & = & 1113 \text{ Pa} \\
1 \text{ mmWS} & = 9.81 \text{ Pa} \\
H_1 > 1113/9.81 & = 114 \text{ mm} + 15 \text{ mm (Safety)} = \text{about 130 mm} \\
H_2 & = 65 \text{ mm} \\
\end{align*} \]

**Siphon on suction side (in direction of airflow before the fan), see Figure 172.**

- $H_1 (\text{mm}) > p \, (\text{mm WS})$
- $H_2 (\text{mm}) > p/2 \, (\text{mm WS})$
Siphon on pressure side (in direction of airflow after the fan), see Figure 173.
H3 (mm) > p (mm WS)
H4 (mm) ≥ 0

6.3.2 Ball siphons
If ball siphons with the below shown design are supplied by EUROCLIMA, then the following instructions should be observed 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 174) corresponds to the flow direction.

- Pa = suction side
+ Pa = pressure side

Figure 174: Observe the mounting position - flow direction according to the arrow
Siphon on suction side (in direction of airflow before the fan)

Figure 175: 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 177).

Figure 176: Pressure side execution
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 shall be observed.
- 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 tension and torsion free. 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 shall 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 a proper performance of the AHUs, the observance 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

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 179)!
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 7 and Figure 180.

Table 7: Information on the screw distances

<table>
<thead>
<tr>
<th>Length or width</th>
<th>Additional number of screws</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 915</td>
<td>0</td>
</tr>
<tr>
<td>&gt;= 915</td>
<td>&lt;= 1220</td>
</tr>
<tr>
<td>&gt;= 1372,5</td>
<td>&lt;= 1830</td>
</tr>
<tr>
<td>&gt;= 1982,5</td>
<td>&lt;= 2592,5</td>
</tr>
<tr>
<td>&gt; 2745</td>
<td>&lt;= 3202,5</td>
</tr>
<tr>
<td>&gt;= 3355</td>
<td>&lt;= 3660</td>
</tr>
<tr>
<td>&gt; 3812,5</td>
<td>&lt;= 3965</td>
</tr>
</tbody>
</table>
6.4.2 Insulation of fresh air damper

Before connecting the duct section, the flange of the fresh air damper must be insulated in the course of the fresh air duct insulation on site. This action is urgently required to prevent the formation of condensation by heat transfer.

If fresh air dampers are not integrated in the AHU casing, then also 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 is listed beneath:

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 for alarm triggering (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 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 in ATEX execution).

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.

Lightning protection for roof AHUs
A lightning protection, especially for roof AHUs, must be professionally installed on site according to national rules. Otherwise, a fire can be caused 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 done 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.

Admissible operating range of the motor:
- To ensure an adequate motor cooling the minimum frequency during 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 8.3.2 (Vibration verification).

EUROCLIMA recommends therefore the continuously monitoring of the operating conditions.

**Two or three speed motors**

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

These motors are not suitable for 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 all pools in case 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.

**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 an 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 \(\geq 11\) kW
- As an option for smaller capacities available
- For all plug fan motors

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 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 connection diagram refer to Figure 181.

![Wiring diagram for thermistors](image)

Figure 181: 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

Voltagess 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 182.

![Figure 182: Wiring diagram for thermal contacts](image)

**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 dependent on the used supply voltage, according to the information on the rating plate (see Figure 183) and in the terminal box (see Figure 184) of the motor.

![Figure 183: Motor rating plate](image) ![Figure 184: Motor terminal box](image)

**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 187, for plug fan refer to Figure 185, for fan with housing refer to Figure 186.

Before connecting the motor check the rotating field of mains connection with a suitable device. Afterwards, connect the phases accordingly to motor terminal or main switch (if supplied and wired by EUROCLIMA).
Fastening torque for electrical connections on the control panel refer to Table 8:

<table>
<thead>
<tr>
<th>Thread Ø</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nm</td>
<td>min.</td>
<td>1.2</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>max.</td>
<td>1.2</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Table 8: Torques for the motor terminal board

Before connecting to the local power network, check that the local power supply coincides 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. When using residual current circuit breakers (RCDs), the supply line must be protected by means of a pulsed current (type A) or an all-current sensitive (type B) residual current circuit breaker.
- 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 8.3.2 (Vibration verification).

EUROCLIMA recommends therefore the continuously monitoring of the operating conditions.

**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. In OFF position 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 7.9 (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 188: Main switch](image)
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
  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 of the client
- Is to carry out independent from EUROCLIMA supply of main switch for fan motor. Fan motor main switch cuts just the motor off.
- Furthermore, on responsibility of the client must be ensured 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

7.5 Variable, frequency-controlled drives (VFD, frequency converters)
If the frequency converter is supplied from someone else than EUROCLIMA, please 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 ...)
- If the frequency converter will be mounted in the fan section, the frequency converter must be equipped with a separate display unit.

![Caution Symbol]
In this case, the display is 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 Electric heaters
An electric heater is designed to heat the airflow, which is stated 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 carried out 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)
Fire risk!
With the electric heater in operation, the heating elements may arrive to a temperature of several hundred °C. In case of malfunction, for example, heater in operation without adequate airflow, inadmissible temperatures may occur. Furthermore, plastic parts for example, filters, gaskets, droplet eliminators etc. close to electric heater may 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 mentioned risks, EUROCLIMA provides, as standard, electric heaters with 2 independent safety thermostats.

7.6.1 AHUs equipped from EUROCLIMA with control

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

The 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 especially observed, when the AHU is only operated with a partial air flow (e.g. in times of reduced use of the building).

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 in the AHU.

Avoid overheating of AHU components by residual heat of electric heater

In order to avoid excessive heating of components by residual heat of electric heater control ensures that fan motor keeps on running for at least 5 min after cutting off of electric heater! By using an enabling contact (see Figure 192) the control engineering also ensures that the electric heater can only start its operation when the fan is running.

If in case of main power failure (for example lightning stroke) this automatic run cannot be ensured, AHU may become damaged by the residual heat of the electric heater.

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 2 contactors in serial connection!
The 2 safety thermostats protect the AHU in two independent ways:
Firstly: By hardware via contactors in the power supply. Secondly: By software via controlling. In case of failure contactors immediately cut off the electric heater from power supply.
- The 2 safety thermostats are connected in serial connection.
- The 2 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 189 and Figure 190)**
- Position of thermostat body: fastened 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 stop in case of over temperature because of low airflow issues

![Figure 189: Thermostat with cover cap on the reset button](image)

![Figure 190: Thermostat with uncovered reset button](image)

**Thermostat 2 (Figure 191)**
- Position of the thermostat casing: fastened 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 stop in case of over temperature because of missing airflow

![Figure 191: Thermostat 2](image)

Connection box may 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:

![Connection scheme for electric heater](image)

**Figure 192:** Connection scheme for electric heater

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

### 7.6.2 AHUs which are not equipped from EUROCLIMA with control

Supply of EUROCLIMA contains:
- 2 independent safety thermostats
- assembly of the safety thermostats

The safety related correct implementation of control has to be carried out on site and is the full responsibility of the client to do so.

The minimum safety requirements described in chapter 7.6.1 (AHUs equipped from EUROCLIMA with control) have to be ensured and is the full responsibility of the customer to do so.
7.7 Differential pressure restriction for plate heat exchangers

7.7.1 General indications

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 may 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 193. In the part of the technical data of the exhaust air this value is not given, see Figure 194.

Possible causes for inadmissible pressure increase:
The following factors can cause pressure increasing and destroy the plate heat exchanger:
- Dampers are closed or will be closed or open in delay.
- 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.

7.7.2 Prevention measures
General measures:

It must be ensured on site, that all dampers, which have a pressure-increasing effect. For example, outside air dampers, exhaust air dampers, dampers in ducts, are not completely closed 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 7.7.3 (Pressure monitoring with differential pressure switch).

### 7.7.3 Pressure monitoring with differential pressure switch

Additionally, to the general measures, pressure monitoring may protect the plate exchanger against damage caused by 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 195 to Figure 198.
- 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 electrical) as follows.

**Airside connection of the pressure switch depending on the fan arrangement**

- **Figure 195**: supply air sucking, exhaust air pressing; 1 pressure switch (S), 2 measuring points (+/-)
- **Figure 196**: supply air pressing, exhaust air sucking; 1 pressure switch (S), 2 measuring points (+/-)
- **Figure 197**: supply air sucking, exhaust air sucking; 2 pressure switch (S), 4 measuring points (+/-)
- **Figure 198**: supply air pressing, exhaust air pressing; 2 pressure switch (S), 4 measuring points (+/-)
**Electrical connection**

The electrical connection of the fans must be done on site, that means it is in the area of responsibility of the customer, that when exceeding the maximum allowable differential pressure, the fan motors will immediately be disconnected from the power supply until the restart by hand. For an example for connection diagram: refer to Figure 199.

![Figure 199: Electrical connection scheme](image)

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

**Value to be set:**

The setting of the differential pressure switch must be done on site, based on the actual pressure situation on site. The actual differential pressures must be measured at the commissioning with the target volume flows – measuring points depending on the fan arrangement can be found in Figure 195 to Figure 198. 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, for example, filter pressures losses or other additional pressure losses must be added. This calculated pressure must be adjusted at the differential pressure switch as trigger value.

| It must be confirmed, that this calculated value does not exceed the maximum admissible differential pressure according to the technical data, see Figure 193. |
| 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 commissioning. The correct connection of the measuring hoses, according to Figure 195 to Figure 198, must be ensured before commissioning.

| 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. |
7.8 Frost protection for plate heat exchanger

At low temperatures and high air speeds, the condensate in the plate heat exchanger can freeze and cause its icing.

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.

7.9 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 will have lights 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).

7.10 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 nothing else 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 in 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 and led to the junction box (inclusive switch) outside of the AHU by EUROCLIMA.

- The safety instructions in chapter 2.1 (Indications for minimizing specific hazards) and the user manual of the lamp manufacturer (delivered with the present instruction manual) have to be considered.
- Due to the high voltage of the lamp, maintain it safely and do not work with it whilst it is on. Danger of 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 unscreened products. Use them just in a closed environment, which protects the user against radiation.

- It is highly unlikely that a lamp break has impacts on your health. If a lamp breaks, air the room for 30 minutes and remove the broken pieces, preferable with cut resistant gloves. Put them into a sealed plastic bag and take them to the local recycling station. Don not use a vacuum cleaner.

### 8 Commissioning

#### 8.1 Preliminary steps

- Clean thoroughly the AHU and all components of dust, swarf and other debris.
- Remove all loose parts like tools, 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. Not mounted filters can overload the fan motor.
- All cables must be checked for damage to the insulation and replaced if necessary.

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 200, tightening torque depends on the type of bush, according to Table 9.

<table>
<thead>
<tr>
<th>Socket</th>
<th>1108</th>
<th>1210</th>
<th>1215</th>
<th>1610</th>
<th>1615</th>
<th>2012</th>
<th>2517</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nm</td>
<td>5,7</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>32</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 9: Tightening torque for variable pulleys
- Check the tension of the belt and the alignment of the pulleys, refer to chapter 9.2.5 (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 not done by EUROCLIMA (please refer to technical data sheet): parameterization using the following Table 10 respectively the provided manufacturer's operating instructions and data from EUROCLIMA technical data sheet.

- Observe safety instructions of chapter 2.1 (Indications for minimizing specific hazards) and safety instructions of manufacturer (supplied by EUROCLIMA).
- Observe safety instructions of fan manufacturer (supplied from EUROCLIMA) regarding fan minimum starting up time. Otherwise fatigue fracture of impeller may occur.
### Parameters for Danfoss frequency converter FC102

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

**Connections control cables:**
- PTC/Clixon: Clamp 50 and 54
- Start: Clamp 12 and 18
- Release: Clamp 12 and 27

Table 10: 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:

<table>
<thead>
<tr>
<th>Formula A</th>
<th>Formula B</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>In this formula, a variable air density is not taken into account. Instead, a &quot;fixed&quot; air density of 1.20 kg/m³ is assumed.</td>
</tr>
</tbody>
</table>

With the following formulas, the airflow rate can be determined from the pressure signal:

- Airflow rate calculation

\[
\dot{V} = K_A \cdot \sqrt{\frac{2 \cdot \Delta p_w}{\rho_v}}
\]

- Airflow rate calculation

\[
\dot{V} = k_B \cdot \sqrt{\Delta p_w}
\]

<table>
<thead>
<tr>
<th>$\dot{V}$</th>
<th>Nominal airflow rate</th>
<th>m³/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>$K_A$</td>
<td>$K_A$ – factor for formula A</td>
<td>m²s/h</td>
</tr>
<tr>
<td>$\Delta p_w$</td>
<td>Measured diff. pressure</td>
<td>Pa</td>
</tr>
<tr>
<td>$\rho_v$</td>
<td>Air density at the fan</td>
<td>kg/m³</td>
</tr>
<tr>
<td>$\dot{V}$</td>
<td>Nominal airflow rate</td>
<td>m³/h</td>
</tr>
<tr>
<td>$k_B$</td>
<td>$k_B$ – factor for formula B</td>
<td>m³/(h*Pa^{0.5})</td>
</tr>
<tr>
<td>$\Delta p_w$</td>
<td>Measured diff. pressure</td>
<td>Pa</td>
</tr>
</tbody>
</table>

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 $\Delta p_w$ can be determined for a certain airflow rate (e.g. for dimensioning a pressure sensor, for constant airflow rate control):

- Target differential pressure calculation

\[
\Delta p_{w.set} = \frac{\dot{V}^2 \cdot \rho_v}{K_A^2 \cdot 2}
\]

- Target differential pressure calculation

\[
\Delta p_{w.set} = \frac{\dot{V}^2}{k_B^2}
\]

| $\Delta p_{w.set}$ | Target differential pressure | Pa |
| $\dot{V}$ | Target airflow rate | m³/h |
| $K_A$ | $K_A$ – factor for formula A (s.a.) | m²s/h |
| $\rho_v$ | Air density at the fan (Nominal value) | kg/m³ |
| $\Delta p_{w.set}$ | Target differential pressure | Pa |
| $\dot{V}$ | Target airflow rate | m³/h |
| $k_B$ | $k_B$ – factor for formula B (s.a.) | m³/(h*Pa^{0.5}) |

Table 11: Formulas for airflow rate measurement

For entry into a display or control unit, please check whether this is programmed according to formula A or formula B and enter the corresponding value $K_A$ or $k_B$. 

V07-20.0
The corresponding K-factors of the fan are shown in 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. 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 in the EUROCLIMA delivery a device for airflow measurement is included, then this must be configured on site and this is responsibility of the client before commissioning!

**Airflow rate indicator type PREMASREG 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 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:

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

*Table 12: 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 is using.

### 8.1.3 Heat exchanger

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

**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.
- Water valve is to open fully, 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!
For a temporary shutdown of the system, because of frost and corrosion, it is important to avoid that condensate is remaining in the pipes.

8.1.4 Electric heater
Observe specifications of chapter 7.6 (Electric heaters) -safety thermostats.

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

8.1.5 Air filters
- Before the commissioning, all filters should be checked for tightness, as otherwise they could be sucked in and could 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 set to the final pressure drop. Information regarding final pressure drop can be found at the technical data sheet.
- In addition, the output of a warning message when the final pressure loss is reached must be ensured during the commissioning. The resulting maintenance actions are described in chapter 9.3 (Air filters).

8.1.6 Humidifier / Air washer
8.1.6.1 General indications

Drain pans must be cleaned thoroughly. Pollution from construction dust can cause failure of the pump. In this case, there is no warranty.

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

- Check the pump rotation direction (arrow on the pump). Measure the current consumption. 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 suck in.
- 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 check after 10 hours of operation.
- When 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 pressure side valve accordingly.
- Check pump strainer, washer nozzles and tubes for proper fit.
- Check 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 201).
- Fins made from cellulose material can have initially an odor that is normal and will soon disappear.

\[ Figure 201: \text{Installation of honey comb and droplet separator packages} \]

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 5, 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 component must be contacted directly.

8.1.6.5 Steam Humidifier
The indications 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 up the refrigeration circuit only if it was properly installed, evacuated and filled - Never start a compressor under vacuum.
- It is essential that the glide 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
Refrigerants used by EUROCLIMA are halogenated hydrocarbons, preferably R407C and R134a. These are also known as safety refrigerants (safety group A1 according to EN378 part 1) 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.

Refrigerant vapors, which escape from leaking cylinders or refrigeration plants, will be mix undetected with air and therefore the risk of suffocation arises with concentration through the displacement of the breathing of essential oxygen. Humans are not able to detect oxygen deficiency with their senses. As refrigerant vapor is heavier than air, they concentrate at ground level and in lower-lying areas of the building. In order to avoid the occurrence of higher concentrations, workplaces must always be ventilated well.

Halogenated refrigerants can also have narcotic effect. In case of high refrigerant concentration (e.g. tube leakage) the technical room, the room must be evacuated immediately. Enter only after adequate room ventilation occurs.

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 and medically suitable people or other professionals.
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 in the system is to avoid strictly!
- For R407C and R134a scroll compressors use Emkarate RL 32 3MAF oil.

8.3 Test run
After having done the preparatory work the AHU can be started for the test run.
- For testing the device and 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, because by eliminating the system-side pressure drop measurement errors will be the result.

Before starting the fan open the dampers! Fan may not run against closed dampers.

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 is maybe a faulty connection. 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.
- e.g. closed fire or VAV dampers in the duct

8.3.1 Adjusting variable pulleys

![Figure 202: Smallest working diameter](image)
![Figure 203: Biggest working diameter](image)

<table>
<thead>
<tr>
<th>Belt type</th>
<th>Pulley type</th>
<th>Min. working diameter (mm)</th>
<th>H max. (mm)</th>
<th>Max. working diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPZ</td>
<td>RST 84</td>
<td>62</td>
<td>9</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>RST 95</td>
<td>73</td>
<td>9</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>RST 100</td>
<td>78</td>
<td>9</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td>RST 108</td>
<td>90</td>
<td>7</td>
<td>104</td>
</tr>
<tr>
<td>SPA</td>
<td>RST 108</td>
<td>76</td>
<td>13</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>RST 120</td>
<td>88</td>
<td>13</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>RST 129</td>
<td>97</td>
<td>13</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>RST 139</td>
<td>109</td>
<td>12</td>
<td>133</td>
</tr>
<tr>
<td></td>
<td>RST 146</td>
<td>116</td>
<td>12</td>
<td>140</td>
</tr>
</tbody>
</table>
Changing the working diameter of a variable pulley:
1. Decrease the belt tension.
2. Open the over the disk circumference distributed screws (position see Figure 205)
3. Twist the outer ring (the outer rings for pulleys with 2 slots) to the desired diameter, observe the limits as per Figure 202 and Figure 203.
4. Fix the Allen screws.
5. Tighten the belts (refer to chapter 9.2.5 (Re-tensioning of belts)).

<table>
<thead>
<tr>
<th></th>
<th>RST 156</th>
<th>126</th>
<th>12</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RST 164</td>
<td>134</td>
<td>12</td>
<td>158</td>
</tr>
<tr>
<td></td>
<td>RST 177</td>
<td>149</td>
<td>11</td>
<td>171</td>
</tr>
<tr>
<td></td>
<td>RST 187</td>
<td>159</td>
<td>11</td>
<td>181</td>
</tr>
<tr>
<td>SPB</td>
<td>RST 156</td>
<td>117</td>
<td>19</td>
<td>149</td>
</tr>
<tr>
<td></td>
<td>RST 164</td>
<td>125</td>
<td>19</td>
<td>157</td>
</tr>
<tr>
<td></td>
<td>RST 178</td>
<td>139</td>
<td>19</td>
<td>171</td>
</tr>
<tr>
<td></td>
<td>RST 187</td>
<td>148</td>
<td>19</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>RST 200</td>
<td>161</td>
<td>19</td>
<td>193</td>
</tr>
<tr>
<td></td>
<td>RST 250</td>
<td>211</td>
<td>19</td>
<td>243</td>
</tr>
</tbody>
</table>

Table 13: Data of pulley types

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
You can determine 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 if you require support on this matter, please contact EUROCLIMA.

8.3.2 Vibration verification
Check on the quiet running of the fan. There should be no unusual rocking or vibration. Check for untypical bearing noises. To prevent damage, operation above the permissible vibration values must be absolutely excluded. The maximum permissible vibration speed according to the specifications of the fan-motor-unit manufacturer must be strictly observed.
On commissioning of the AHU, a 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 206 shows a typical vibration curve.

![Typical vibration curve](image)

**Figure 206**: Typical vibration curve

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

In partial load, operation it could be that the operating point may coincide with the resonant range. In such situations, this operation must be prevented on site by 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 in the software must be done at the commissioning process.

9 Maintenance

EUROCLIMA AHUs are built mostly maintenance free and easy to maintain when required. The maintenance intervals (see Table 18) 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 needs are necessary to ensure a permanent safety operation and functionality of the AHU.

The entire AHU and all components must be checked regularly for pollution, corrosion, damage and fixing and, if necessary, they must be cleaned or repaired. 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.

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

Please note that we are not responsible for damage caused by improper handling of solvents and cleaning agents, and we would not be liable for mechanical damage. Solvents and cleaning agents may not contain alcohol for use on coated surfaces.

In order to avoid corrosion, in the case of components made of stainless steel like drain pans or bases, ensure that fragments of carbon steel laying around are removed and stainless steel parts are cleaned from swarf of carbon steel.

To order spare parts please contact your EUROCLIMA sales partner.

EUROCLIMA recommends, depending on the specified AHU execution, performing checks, maintenance and repair work in compliance to the specifications according to VDI 6022 sheet 1, requirements regarding operation and maintenance.

9.1 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 and eliminated immediately.

The following maintenance work is recommended for the control cabinet of AHUs with integrated control:
- annual change of the filter
- annually check the function of the fan for the control cabinet ventilation (if present)
- annually check the function of the heater (installed in outdoor AHUs)
- annually check of screw connections and electrical connections and if necessary retighten
- cleaning of possible dust deposits

9.2 Fan / motor group

9.2.1 Vibrations

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

During operation of the AHU, an excessive vibration level can occur due an unfavorable air flow, accumulation of dirt and dust, missing 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 manufacturer's specifications, and the results must be recorded. The maximum vibration speed according to the manufacturer's specifications must be strictly observed. If the admissible vibration values are exceeded, it is absolutely necessary to identify the cause and take immediately appropriate measures.

**9.2.2 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 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, should be lubricated annually in accordance with Table 14 below and this should be done with lithium soap grease (see Table 15) for recommended grease types. After three 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.

<table>
<thead>
<tr>
<th>Ambient conditions</th>
<th>Temperature range °C</th>
<th>Lubrication interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean</td>
<td>0 &lt; T &lt; 50</td>
<td>6 - 12 month</td>
</tr>
<tr>
<td></td>
<td>50 &lt; T &lt; 70</td>
<td>2 - 4 month</td>
</tr>
<tr>
<td></td>
<td>70 &lt; T &lt; 100</td>
<td>2 - 6 weeks</td>
</tr>
<tr>
<td></td>
<td>100 &lt; T</td>
<td>1 week</td>
</tr>
<tr>
<td>Dusty</td>
<td>T &lt; 70</td>
<td>1 - 4 weeks</td>
</tr>
<tr>
<td></td>
<td>70 &lt; T &lt; 100</td>
<td>1 - 2 weeks</td>
</tr>
<tr>
<td></td>
<td>100 &lt; T</td>
<td>1 - 7 days</td>
</tr>
<tr>
<td>Extreme humidity</td>
<td>1 week</td>
<td></td>
</tr>
</tbody>
</table>

*Table 14: Lubrication intervals for fan bearings*

*Figure 207: Fan bearing with grease nipple (example Comefri NTHZ)*
<table>
<thead>
<tr>
<th>Supplier</th>
<th>Type</th>
<th>Basis</th>
<th>Temp. range</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINA</td>
<td>Marson HTL 3</td>
<td>Lithium</td>
<td>30 °C / +120 °C</td>
</tr>
<tr>
<td>SHELL</td>
<td>Alvania Fett 3</td>
<td>Lithium</td>
<td>-20 °C / + 130 °C</td>
</tr>
<tr>
<td>ESSO</td>
<td>Beacon 3</td>
<td>Lithium</td>
<td>-20 °C / + 130 °C</td>
</tr>
<tr>
<td>MOBIL</td>
<td>Mobilux EP3</td>
<td>Lithium</td>
<td>-30 °C / + 130 °C</td>
</tr>
</tbody>
</table>

Table 15: 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 break!
- Visual inspection: Check the wheel for any particular weld cracking.

9.2.3 Motor
- Check the motor for cleanliness and clean if necessary.
- Measure current consumption, which must not exceed the rated current indicated on the name-plate.

Motor bearings
- In case of irregular or unusual sounds, the corresponding bearing must be replaced.
- Small and medium sized motors are equipped with closed bearing, running 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 operating instructions of the motor manufacturer. After three 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 16.

<table>
<thead>
<tr>
<th>Size</th>
<th>2-pole 3000 1/min</th>
<th>4-pole 1500 1/min</th>
<th>6-pole 1000 1/min</th>
<th>8-pole 750 1/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>bis 180</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>bis 250</td>
<td>6</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>280</td>
<td>3</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 16: 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 relubrication of motor bearings can be taken from Table 15 chapter 9.2.2 (Fan).
9.2.4 V-belt drive

The V-belt drive is a reliable, low-maintenance component, provided that unfavorable working conditions as shown in Figure 208 up to Figure 211, 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 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 208

![Figure 208: Unfavorable operating conditions (1)](image)

- Slippage / pulley too small / overloading / damaged disc / eccentricity, wobble – Figure 209

![Figure 209: Unfavorable operating conditions (2)](image)

- Disc worn / grooved not uniform / dust, dirt / moisture, humidity – Figure 210

![Figure 210: Unfavorable operating conditions (3)](image)

- Alignment / offset wheels / non-parallel plates / discs rotated to each other – Figure 211.
9.2.5 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 212 and Table 17. This should be checked after each tensioning with a straight edge.

<table>
<thead>
<tr>
<th>Pulley diameter ( d_{d1}, d_{d2} ) in mm</th>
<th>Max. distance ( x_1, x_2 ) in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt; 112)</td>
<td>0.5</td>
</tr>
<tr>
<td>(&lt; 224)</td>
<td>1</td>
</tr>
<tr>
<td>(&lt; 450)</td>
<td>2</td>
</tr>
<tr>
<td>(&lt; 630)</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 17: 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 213.
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 tension new and used belts can be found on the tensioning data sheet, which see sample in Figure 214.

**BELT TRANSMISSION AND TENSIONING DATA**

<table>
<thead>
<tr>
<th>Belt section</th>
<th>A [mm]</th>
<th>Supply air</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ELVEM 6XH 132S-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.450 1min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.50 kW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.SPB 190</td>
</tr>
<tr>
<td></td>
<td></td>
<td>190.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2012-38</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Belt section</th>
<th>A [mm]</th>
<th>NEW BELTS</th>
<th>USED BELTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>295,0</td>
<td>226,9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75,0</td>
<td>75,0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>27,0</td>
<td>20,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28,0 [±10%]</td>
<td>24,0 [±10%]</td>
</tr>
</tbody>
</table>

**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 data
- 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 CONFIRMATION BY EUROCLIMA

**IMPORTANT FREQUENCY CONTROLLER PARAMETERS**

<table>
<thead>
<tr>
<th>nom. freq. [Hz]</th>
<th>max freq. [Hz]</th>
<th>max. current [A]</th>
</tr>
</thead>
<tbody>
<tr>
<td>50,1</td>
<td>77,0</td>
<td>19,9</td>
</tr>
</tbody>
</table>

Following two methods to determine the 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 is 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 a way, that during the measurement you measure the same frequency as indicated on the fan data sheet.

### 9.2.6 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 215).

![Figure 215: Multi-groove pulleys – attaching the belts](image_url)

- 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 9.2.5 (Re-tensioning of belts).
- Repeat these steps until alignment and belt tension are correct.

### 9.3 Air filters
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.

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. Please view the technical data for getting this information (Figure 216).
All filters should be checked for tightness, because otherwise they could be sucked in and could lead to damage.

If AHUs are equipped with EUROCLIMA control, then a corresponding warning message is displayed on the HMI (see Figure 217) when the differential pressure limitation is reached.

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

9.3.1 Panel filters
Dry panel air filters (cleanable). 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.

9.3.2 Bag filters
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.

9.3.3 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 if necessary.
- Check filter sealing and fastening. The filter clamps must be tightened evenly. Tighten the clamps clockwise in two stages.
9.3.4 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 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 considered for cleaning works.

9.4.1 Medium water / steam

Special maintenance for heat exchangers is not required, only occasional 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.

Cleaning

Cleaning is to be carried out on the mounted state with a strong vacuum cleaner from the dust airside. For strongly adhering dust, the heat exchanger can be dismounted and cleaned with water. Galvanized steel coils can be cleaned with a steam cleaner or by washing the fins with a strong water jet. You could take a soft brush to help, but do not damage the fins.

The fins of copper-aluminum heat exchangers are particularly sensitive, therefore, use 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 for the correct setting.

Drain pan

Drain pan and drain should be checked for debris and cleaned, if necessary – Figure 218.

Figure 218: Cleaning of air coolers

Droplet eliminator

Check the droplet eliminator about once per year for contamination. Remove fins and clean if necessary. Please make sure that the fins are installed properly and are not bent.
Pollutants can cause poor performance of the AHU as well as damage due to drop flight.

Steam Coil
Check automatic vapor supply stop and automatic fan run for some minutes, after the AHU is shut down.

9.4.2 Refrigerant
For the medium refrigerant (direct evaporator or condenser coil) the same actions apply as described in chapter 9.4.1 (Medium water / steam). For additional actions to be taken see chapter 9.11 (Refrigeration circuit).

9.4.3 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.

9.5 Humidifiers

9.5.1 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 pumps and motors must be done according to the manufacturer’s instructions.
- Regular cleaning of all components largely determines the 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. Drain the pump as well.
- Fill 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 an insufficiently effective 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.
9.5.2 Spray humidifier

The instructions of chapter 9.5.1 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.
- Disassemble 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 doing this process.
- Check pump piping for leaks.
- Check the hose clamps for proper fit.
- Check the flexible tube connections in the air washer circuit on fissures and for damages every three months. In the case of visible damages, cracks in the surface, signs of aging or deterioration, the flexible tubes must be substituted immediately.
- Substitute flexible connector tube on pressure side and suction side every 5 years.

9.5.3 Evaporative humidifiers

The instructions of chapter 9.5.1 are to be applied analogously.

- The float valve has to close securely at a water level of 15 – 20 mm below the overflow to ensure bubble free suction. Possible readjustments have to be performed in the course of any regular inspections.
- Heavily calcified evaporative modules must be renewed.
- In mild calcification the packet can be cleaned by adding decalcifier to the circulating water (shut down the AHU before adding decalcifier). After that, clean the section and tubes properly with fresh water.

9.5.4 High pressure humidifiers

Carry out the maintenance according to the instructions of the manufacturer.

9.5.5 Steam humidifiers

Carry out the maintenance according to the instructions of the manufacturer. Additionally, the instructions of chapter 9.5.1 are to be applied analogously as well as following issues:

- Check steam distribution for deposits.
- Check steam supply for leaks.
- 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.

9.6 UV section

The UV section has to be checked and cleaned regularly. Broken lamps have to be replaced before the next commissioning. Avoid direct contact with the lamps.
9.7 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, tighten the screws if necessary.

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

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

9.10 Energy recovery systems
The manual of the component manufacturer must be read and considered for cleaning works.

9.10.1 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.

The only maintenance required is cleaning:
- Clean the condensate drain, control and fill the U-trap. The plate pack is normally self-cleaning.
  - Remove fibers and dust at the exchanger inlet with a brush.
  - 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 7.7 (Differential pressure restriction for plate heat exchangers).
- If there is a bypass damper, please refer to chapter 9.7 (Dampers).

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

9.10.2 Heat wheels
Check the drive unit according to the 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.
9.10.3 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:
  - Compressed air against the air flow direction or
  - Spraying with low pressure water, if required add household cleaning detergent.
- If bypass dampers exist, please refer to chapter 9.7 (Dampers).

9.10.4 Accublocs

Electrical connection:
The accubloc 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 engine. 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.

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

Figure 219: Scheme of an accubloc
Figure 220: Position of the sensor

The only maintenance required is periodic cleaning of the memory blocs. The cleaning intervals can be defined by visual inspection.

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 accubloc - 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 accubloc 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 aluminium suitable and non-alkaline cleaning agents are allowed.

9.11 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 visible checks are required.

9.11.1 Leakage checks

- Must 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 (data from EN378 part 1):
- R407C: GWP = 1650
- R410A: GWP = 1980
- R134A: GWP = 1300

The greenhouse potential and the amount of refrigerant used in the device determine the maintenance interval 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 18*.

9.11.2 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, local regulations must be observed.

**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 pour 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 a dilution of the oil, resulting in a loss of viscosity leading to reduced lubrication of all moving parts. To start the compressor manually, it has to be proceeded 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 (according to the instructions of the valve manufacturer). Instructions from the valve manufacturer are supplied by EUROCLIMA.

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

Handling:
If the unit goes into high or low pressure mode, the problem must be acknowledged 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 of the compressor.
Therefore, the annual replacement of the battery is recommended for safety reasons.

9.11.3 Inspection

Inspection work may be carried out by the operator in trimestrial 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 proceed 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 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. 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.

9.12 Hygienic AHUs

The maintenance plan for EUROCLIMA AHUs you will find in chapter 9.13 of the instruction manual. EUROCLIMA recommends maintenance in dependence on:
- 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.

9.13 Maintenance plan

The maintenance intervals specified in Table 18 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.
### Table 18: Maintenance plan

<table>
<thead>
<tr>
<th>Component</th>
<th>Action</th>
<th>Section</th>
<th>month</th>
<th>¼ year</th>
<th>½ year</th>
<th>year</th>
<th>Reference chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>Ch / Cl</td>
<td>Housing inside and outside</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fan / motor</td>
<td>Ch</td>
<td>Corrosion check</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.2.2 Fan</td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Flexible connection</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Vibration isolators</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Protection grid</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Water drain</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch / Cl / M</td>
<td>Fan bearings</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch / Cl / M</td>
<td>Fan bearings with lubricating according to Table 14 (Lubrication intervals for fan bearings)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch / Cl / M</td>
<td>Motor, general</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.2.3 Motor</td>
</tr>
<tr>
<td></td>
<td>Ch / M</td>
<td>Motor bearings</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch / Cl / M</td>
<td>Motor bearings with lubricating nipples according to Table 16 (Lubrication intervals for motor bearings (in month))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Check current consumption</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch / Cl / M</td>
<td>Belt drive, general</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.2.4 V-belt drive</td>
</tr>
<tr>
<td></td>
<td>Ch / M</td>
<td>Belt tension first time after operation of 10 hours</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>Belt change if necessary / at least after 2 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filter</td>
<td>Ch / Cl / M</td>
<td>Panel filters</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.3.1 Panel filters</td>
</tr>
<tr>
<td></td>
<td>Ch / Cl / M</td>
<td>Bag filters</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.3.2 Bag filters</td>
</tr>
<tr>
<td></td>
<td>Cl / M</td>
<td>HEPA filters</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.3.3 HEPA filters</td>
</tr>
<tr>
<td></td>
<td>Cl / M</td>
<td>Activated carbon filters</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.3.4 Activated carbon filters</td>
</tr>
<tr>
<td>Heat exchanger</td>
<td>Ch / Cl</td>
<td>Fins</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.4 Heat exchangers</td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Frost protection</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch / Cl / M</td>
<td>Drain pan</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch / Cl / M</td>
<td>Droplet eliminator</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Steam coil</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.4.1 Medium water / steam</td>
</tr>
<tr>
<td>Electric heater</td>
<td>Ch / Cl</td>
<td>E-heater</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.4.3 Electric Heater</td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Check e-heater section for thermal damages after mains supply failure!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humidifier</td>
<td>Ch / M</td>
<td>Pump</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.5.1 General indications</td>
</tr>
<tr>
<td></td>
<td>Ch / Cl</td>
<td>Decalify / cleaning</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.5.2 Spray humidifier</td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Drain pan</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch / Cl / M</td>
<td>Spray humidifier tubing</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Flexible connector change Substitute flexible connector every 5 years.</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch / Cl / M</td>
<td>Evaporative humidifier</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.5.3 Evaporative humidifiers</td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Bleed off settings / valves</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch / Cl / M</td>
<td>High pressure humidifier</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.5.4 High pressure humidifiers</td>
</tr>
<tr>
<td></td>
<td>Ch / Cl / M</td>
<td>Steam humidifier</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.5.5 Steam humidifiers</td>
</tr>
<tr>
<td>UV section</td>
<td>Ch / Cl</td>
<td>UV-C-lamps</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.6 UV section</td>
</tr>
<tr>
<td>Dampers</td>
<td>Ch / Cl</td>
<td>Dampers</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.7 Dampers</td>
</tr>
<tr>
<td>Silencer</td>
<td>Ch / Cl</td>
<td>Silencer</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weather louver</td>
<td>Ch / Cl</td>
<td>Weather louver, grid and hood</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy recovery</td>
<td>Ch / Cl</td>
<td>Plate heat exchanger</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.10.1 Plate heat exchangers</td>
</tr>
<tr>
<td></td>
<td>Ch / Cl</td>
<td>Heat wheel</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.10.2 Heat wheels</td>
</tr>
<tr>
<td>Refrigeration circuit</td>
<td>Ch</td>
<td>Leakage check &gt;= 500 Data in tons of CO₂-equivalent</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.11.1 Leakage checks</td>
</tr>
<tr>
<td></td>
<td>Ch / Cl</td>
<td>Maintenance</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.11.2 Maintenance</td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Inspection</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.11.3 Inspection</td>
</tr>
<tr>
<td>Control cabinet</td>
<td>M</td>
<td>Filter</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>9.1 Electrical connection, control cabinet</td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Fan</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Heater</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>Bolts, electrical connections</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 221. 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.

<table>
<thead>
<tr>
<th>AHU sound levels</th>
<th>63</th>
<th>125</th>
<th>250</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
<th>8000</th>
<th>Total dB (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&gt; Sound power level casing [dB] +/- 4 dB</td>
<td>88.0</td>
<td>81.0</td>
<td>78.4</td>
<td>82.0</td>
<td>56.2</td>
<td>59.7</td>
<td>41.1</td>
<td>32.5</td>
<td>71.9</td>
</tr>
<tr>
<td>2&gt; Sound power level air inlet [dB] +/- 4 dB</td>
<td>93.2</td>
<td>90.0</td>
<td>96.0</td>
<td>87.0</td>
<td>77.0</td>
<td>74.0</td>
<td>72.0</td>
<td>66.0</td>
<td>89.7</td>
</tr>
<tr>
<td>3&gt; Sound power level air outlet [dB] +/- 4 dB</td>
<td>97.0</td>
<td>98.0</td>
<td>99.0</td>
<td>89.0</td>
<td>86.0</td>
<td>82.0</td>
<td>79.0</td>
<td>76.0</td>
<td>93.8</td>
</tr>
<tr>
<td>4&gt; Sound press. for 1 [m] distance from AHU</td>
<td>88.7</td>
<td>81.7</td>
<td>89.1</td>
<td>82.7</td>
<td>73.9</td>
<td>71.4</td>
<td>21.6</td>
<td>20.0</td>
<td>52.6</td>
</tr>
<tr>
<td>5&gt; Sound press. for 1 [m] distance from air inlet</td>
<td>86.8</td>
<td>83.3</td>
<td>90.0</td>
<td>81.5</td>
<td>71.7</td>
<td>68.8</td>
<td>67.1</td>
<td>61.1</td>
<td>83.9</td>
</tr>
<tr>
<td>6&gt; Sound press. for 1 [m] distance from air outlet</td>
<td>89.6</td>
<td>91.3</td>
<td>93.9</td>
<td>83.5</td>
<td>80.7</td>
<td>76.8</td>
<td>74.1</td>
<td>70.1</td>
<td>88.1</td>
</tr>
</tbody>
</table>

Figure 221: 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

The manufacturer 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 2.1 (Indications for minimizing specific hazards), in particular the special safety instructions in chapter 2.1.3 (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:

CE - European conformity mark
Ex - Explosion protection mark (ATEX directive)
Equipment group II (above ground)
Equipment category (2 inside / 3 outside)
Type of environment (G Gas / D Dust)
Explosion protection
Protection type code h
Explosion group (see Table 20: Temperature classes and explosion groups for gases, and Table 21: Explosion groups for dust)
Temperature class (T3 Gas / T200 Dust) (see chapter 11.4 (Ignition temperature and temperature classes))
EPL: Equipment protection level (see Table 19: AHU categories)
ATEX-unit execution (inside: depending on conveyed medium / outside: depending on ambient medium)

Figure 222: Example ATEX type key

Examples of applications:

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.

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.

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

<table>
<thead>
<tr>
<th>Unit category</th>
<th>Designed for kind of explosive atmosphere</th>
<th>Usage in zone</th>
<th>Explanation</th>
<th>EPL: Equipment protection level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 G</td>
<td>gas / air mixture or steam air mixture or fog</td>
<td>0</td>
<td>Explosive atmosphere permanently present</td>
<td>Ga: Safety in normal operation usual and rare operation disturbances / in case of 2 independent failures</td>
</tr>
<tr>
<td>2 G</td>
<td>gas / air mixture or steam air mixture or fog</td>
<td>1</td>
<td>Explosive atmosphere occasionally present</td>
<td>Gb: Safety during normal operation and usual operation disturbances</td>
</tr>
<tr>
<td>3 G</td>
<td>gas / air mixture or steam air mixture or fog</td>
<td>2</td>
<td>Explosive atmosphere rarely and only for a short time</td>
<td>Gc: Safety in normal operation</td>
</tr>
<tr>
<td>1 D</td>
<td>Dust air mixture</td>
<td>20</td>
<td>Explosive atmosphere permanently present</td>
<td>Da: Safety in normal operation usual and rare operation disturbances / in case of 2 independent failures</td>
</tr>
<tr>
<td>2 D</td>
<td>Dust air mixture</td>
<td>21</td>
<td>Explosive atmosphere occasionally present</td>
<td>Db: Safety during normal operation and usual operation disturbances</td>
</tr>
<tr>
<td>3 D</td>
<td>Dust air mixture</td>
<td>22</td>
<td>Explosive atmosphere rarely and only for a short time</td>
<td>Dc: Safety in normal operation</td>
</tr>
</tbody>
</table>

Table 19: AHU categories

### 11.4 Ignition temperature and temperature classes

The ignition temperature of a flammable gas, vapour or dust is the lowest temperature of a heated surface at which the ignition of the gas/air mixture or vapour/air mixture occurs. It is practically the lowest temperature value at which a hot surface can ignite the corresponding explosive atmosphere.
## Temperature classes at gases:

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
<th>T6</th>
</tr>
</thead>
<tbody>
<tr>
<td>gas</td>
<td>450</td>
<td>300</td>
<td>200</td>
<td>135</td>
<td>100</td>
<td>85</td>
</tr>
<tr>
<td>Max. surface temperatur [°C]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Explosion group: IIA**
- Acetone
- Ammonia
- Benzene
- Acetic acid
- Ethane
- Ethyl acetate
- Ethyl chloride
- Carbon monoxide
- Methane
- Methanol
- Methyl chloride
- Naphtalin
- Phenol
- Propane
- Toluene

**Explosion group: IIB**
- City gas
- Ethylene
- Hydrogen
- Ethyl alcohol
- 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 20: 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 21. The hazard potential of dust rises in connection with the operation of electrical equipment from IIA to IIC. A device with IIC classification is also suitable for group IIIA and IIB.

| IIIA | Combustible fibres and lint  
       | e.g.: textiles             |
|------|----------------------------|
| IIB  | Non-conductive dusts       
       | e.g.: wood dust, flour dust |
| IIC  | Conductive dusts           
       | e.g.: metal dust, carbonaceous dust |

**Table 21: Explosion groups for dust**
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 1.4 (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, ...) must be connected to a potential compensation. Before opening and closing such connections, e.g. 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

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 explosive atmospheres, 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 an explosive atmosphere 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
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
- Onsite assembled field devices must comply the ATEX classification specified by EUROCLIMA.
- The electrical components (switches, lights, sensors, motors, etc.) must be approved for operation in explosive atmospheres 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 2.1.3 (ATEX AHUs) and chapter 9 (Maintenance). If the specifications differ, the ATEX-specific specifications in this chapter and in chapter 2.1.3 (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 apply 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 the rivets.

Disassembly of the built-in parts:
- Secure slender 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. belt with hook or shekel with chain) and have to be secured until the components are safely fixed in the AHU – see Figure 223.
- Handling: securing with belt – see Figure 224.

Figure 223: Lifting with chain hoist

Figure 224: 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 done by qualified technicians according to the international, national and local regulations.

A standard AHU consists of 95 % recyclable metallic materials.

<table>
<thead>
<tr>
<th>Components (examples)</th>
<th>Material</th>
<th>CER / EWC European Waste Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing panels, built-in components, base frames, heat exchangers</td>
<td>VZ and VZB sheet metal</td>
<td>170405</td>
</tr>
<tr>
<td></td>
<td>Stainless steel</td>
<td>170405</td>
</tr>
<tr>
<td></td>
<td>Aluminum</td>
<td>170402</td>
</tr>
<tr>
<td></td>
<td>Copper tube</td>
<td>170401</td>
</tr>
<tr>
<td>Copper cable</td>
<td>Copper cable</td>
<td>170411</td>
</tr>
<tr>
<td>Casing insulation</td>
<td>Mineral wool</td>
<td>170604</td>
</tr>
<tr>
<td>Air filter</td>
<td>Plastic, metal</td>
<td>150106</td>
</tr>
<tr>
<td></td>
<td>Filters which have caught toxic and/or pathogenic pollutants must be disposed of as chemical waste. National rules and regulations apply.</td>
<td></td>
</tr>
<tr>
<td>Droplet separator slats</td>
<td>Plastic</td>
<td>150102</td>
</tr>
<tr>
<td>Insulation profile ZHK INOVA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sealing tape</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC – motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronic components</td>
<td>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 manufacturer. Detailed information of the manufacturer can be found on the component.</td>
<td></td>
</tr>
</tbody>
</table>

Table 22: Information for disposal
Figure index

Figure 1: Example AHU type key ................................................................. 6
Figure 2: Do not climb on the AHU! ............................................................. 18
Figure 3: Delivery in parts ................................................................. 19
Figure 4: Delivery as monobloc ............................................................... 19
Figure 5: Transport correct ................................................................. 20
Figure 6: Transport incorrect .............................................................. 20
Figure 7: Center of gravity centrally between the forks ....................... 20
Figure 8: Permitted angle for load carrying equipment guidance ....... 21
Figure 9: Base frame height ................................................................. 22
Figure 10: AHU section drawing with weight details ......................... 23
Figure 11: Delivery section with mounted damper ....................... 23
Figure 12: Delivery section with dismounted damper ..................... 24
Figure 13: Delivery section with mounted crane lugs ....................... 24
Figure 14: Delivery section with mounted flexible connection ........... 24
Figure 15: Delivery section with dismounted flexible connection ...... 25
Figure 16: Delivery section with mounted crane lugs ....................... 25
Figure 17: Left-side type and right-side type of crane lugs .......... 26
Figure 18: Mounting of base frame crane lugs ......................... 26
Figure 19: Load carrying equipment guided over front side ......... 27
Figure 20: Uniform force effect ......................................................... 27
Figure 21: Guiding of load carrying equipment (monobloc) .......... 28
Figure 22: Uniform load of the form tubes ........................................ 28
Figure 23: Securing against slipping off of the load carrying equipment ............ 28
Figure 24: Factory-made preparation for monobloc lifting lugs .... 29
Figure 25: Positioning of the monobloc crane lifting lug at the counter frame .... 29
Figure 26: Fixing of the metal sheet and the monobloc crane lifting lug with nuts .... 29
Figure 27: Monobloc crane lifting lugs mounted ..................... 29
Figure 28: Assembly order of disassembled heat wheel or plate heat exchanger casing section ....... 30
Figure 29: Correct alignment of the lifting accessories when lifting plate heat exchangers ...... 30
Figure 30: Flat crane lugs ................................................................. 31
Figure 31: Assembly of flat crane lugs .............................................. 31
Figure 32: Impermissible assembly of crane lugs ....................... 32
Figure 33: Protection against dirt .......................................................... 33
Figure 34: Solid foundation and strip foundation ......................... 34
Figure 35: Suspension of ceiling AHUs .................................................. 36
Figure 36: Spray humidifier with both sides feet ....................... 36
Figure 37: Suspension with transverse profiles ................................. 37
Figure 38: Suspension with longitudinal and transverse profiles .... 37
Figure 39: Do not climb on the AHU! ....................................................... 38
Figure 40: Sealing strip ................................................................. 38
Figure 41: Applying the sealing strip ............................................. 38
Figure 42: Sealing agent (Sikaflex) ..................................................... 39
Figure 43: Applying the sealing agent ............................................. 39
Figure 44: Pulling AHU sections together ............................................. 39
Figure 45: Pulling AHU sections together (detail) ......................... 39
Figure 46: Removable external panels ................................................. 40
Figure 47: Removal of the external panel .......................................... 40
Figure 48: Fitting the external panels .................................................. 41
Figure 49: External panel with unscrewed screws ......................... 41
Figure 50: Removal of the external panels .......................................... 41
Figure 51: Hexagon bolt with locknut M8x20 / M10x30 / M12x40 ........... 41
Figure 52: Bolt connection of base frames .......................................... 41
Figure 53: Easy Connection .............................................................. 42
Instruction Manual ZHK

Figure 54: Connection via Easy Connection................................................................. 42
Figure 55: Easy Connection at two-storey AHUs............................................................ 42
Figure 56: mounted Easy Connection at two-storey AHUs............................................ 42
Figure 57: Hexagon bolt with locknut M8x20............................................................... 42
Figure 58: Connection angle.......................................................................................... 42
Figure 59: Connection via connection angle............................................................... 42
Figure 60: Hexagon bolt with nut M6x6 ........................................................................ 43
Figure 61: Connection frame......................................................................................... 43
Figure 62: Hexagon bolt with nut M6x16.................................................................... 43
Figure 63: Hole spacing of the internal panel............................................................... 43
Figure 64: Tapping screw ø8 x 11 ............................................................................. 43
Figure 65: Tapping screw Ejot ø8 x 16 ....................................................................... 43
Figure 66: Joint on the AHU drawing........................................................................ 44
Figure 67: Connection between door frame / internal panel........................................ 44
Figure 68: Self-tapping screw ø6,3 x 22...................................................................... 44
Figure 69: Application of self-tapping screws............................................................. 44
Figure 70: Self-tapping screw TORX 25 ø4,8 x 16 ..................................................... 44
Figure 71: Joint on the AHU drawing........................................................................ 44
Figure 72: Joint at the AHU ....................................................................................... 44
Figure 73: Self-tapping pan head screw TORX 25 ø4 x 25 ....................................... 45
Figure 74: Screw connection of internal and external panel.......................................... 45
Figure 75: Hexagon bolt with nut (stainless steel) M6x16 ........................................... 45
Figure 76: Connection of roof plates.......................................................................... 45
Figure 77: Self-tapping screw ø6,3 x 22..................................................................... 45
Figure 78: Connection frame and partition wall (not screwed yet).............................. 45
Figure 79: Screwing of the parts .............................................................................. 45
Figure 80: Bolting delivery sections together.............................................................. 46
Figure 81: Removing the protective film ................................................................. 46
Figure 82: Pushing in the external panel................................................................. 47
Figure 83: Insertion of the outer panel..................................................................... 47
Figure 84: Outer panel not screwed ........................................................................ 47
Figure 85: Screwed panel......................................................................................... 47
Figure 86: Sealing surfaces at wet areas ............................................................... 48
Figure 87: Sealing the frontal joints................................................................. 48
Figure 88: AHU separation accessible via door......................................................... 48
Figure 89: Sealing the section connection (joint) with the sealing agent................. 48
Figure 90: Sealing the roof flange........................................................................ 48
Figure 91: Sealing of the base frame cover......................................................... 49
Figure 92: Mounting of the sliding bar................................................................. 49
Figure 93: Applying the sealing agent on the frontal joints................................... 50
Figure 94: Part of the AHU prepared for assembly of metal sheet roof.................... 50
Figure 95: Drilling screw countersunk head TORX 25 with sealing ring ø 4,8 x 30 51
Figure 96: applied sealant (Sikaflex)................................................................. 51
Figure 97: Metal sheet roof mounted................................................................. 51
Figure 98: Closing of the joints with sealant......................................................... 51
Figure 99: Step drill ............................................................................................. 52
Figure 100: Sleeve ................................................................................................. 52
Figure 101: Screwing ............................................................................................. 52
Figure 102: Cable gland......................................................................................... 52
Figure 103: Transport lock ..................................................................................... 53
Figure 104: Securing the position on the foundation............................................. 53
Figure 105: Door ‚open‘ ...................................................................................... 54
Figure 106: Door ‚closed‘, not ‚locked‘................................................................. 54
Figure 107: Door ‚closed‘ and ‚locked‘................................................................. 54
Figure 108: Delivery of the keys ........................................................................... 54
Figure 109: ‘Closed’ .......................................................................................................................... 54
Figure 110: ‘Open’ ............................................................................................................................. 54
Figure 111: Hinged door (ZIS) ......................................................................................................... 55
Figure 112: Hinge for INOVA-execution ......................................................................................... 55
Figure 113: opened hinged door (ZIS) ............................................................................................ 55
Figure 114: Inclined door panel – varying slit width ...................................................................... 55
Figure 115: Adjustment of the door panel (EU.T) ......................................................................... 55
Figure 116: Adjusted – constant slit width (EU.T) ....................................................................... 55
Figure 117: Inclined door panel - varying slit width ...................................................................... 55
Figure 118: Adjustment of the door panel (ZIS) ........................................................................... 55
Figure 119: Adjusted - constant slit width (ZIS) ......................................................................... 55
Figure 120: fixed door panel (TRA) ............................................................................................... 56
Figure 121: opened door panel (TRA) ............................................................................................ 56
Figure 122: removed door panel (TRA) ........................................................................................ 56
Figure 123: fixed door panel (TRA-E) ........................................................................................... 57
Figure 124: Undoing the door panel (TRA-E) from the door frame .............................................. 57
Figure 125: door frame without door panel (TRA-E) .................................................................... 57
Figure 126: fixing screw with clamping piece (ZIB) ...................................................................... 57
Figure 127: fixing mechanism at door frame (ZIB) ....................................................................... 57
Figure 128: fixed door panel (ZIB) ............................................................................................... 57
Figure 129: Safety device – catching lever ................................................................................... 58
Figure 130: Assembly of safety device on door panel ................................................................. 58
Figure 131: Closed position, characterized by a sheet metal position indicator ......................... 58
Figure 132: Closed position, characterized by a marking on the gear wheel ............................. 58
Figure 133: Pulling out the filters ................................................................................................... 59
Figure 134: Pull-out mechanism ..................................................................................................... 59
Figure 135: Delivery of the clips ....................................................................................................... 60
Figure 136: Insertion of the clips ..................................................................................................... 60
Figure 137: Fixed filter ................................................................................................................... 60
Figure 138: Loosen the clamps ....................................................................................................... 60
Figure 139: Slide in the filters ........................................................................................................ 60
Figure 140: Clamping the filters ..................................................................................................... 60
Figure 141: Lifting the filter bags ................................................................................................... 60
Figure 142: filter frame for different filter sizes ............................................................................ 61
Figure 143: consider the order according the filter frame raster .................................................. 61
Figure 144: filter section with inserted filters .............................................................................. 61
Figure 145: pushing and clamping of the filters to the rear wall .................................................. 61
Figure 146: check, if filter lie on the sealing ................................................................................... 61
Figure 147: Attaching the brackets ............................................................................................... 62
Figure 148: Inserting the filter cell ................................................................................................. 62
Figure 149: Inserting the clamps ................................................................................................... 62
Figure 150: Clamping the filter cell ............................................................................................... 62
Figure 151: Filter tensioner with pressure plate ........................................................................... 62
Figure 152: Activated carbon filter cartridge ................................................................................ 63
Figure 153: Base plate for activated carbon filters ....................................................................... 63
Figure 154: Damper with external gear wheels ............................................................................ 63
Figure 155: Holding against with a pipe wrench ......................................................................... 64
Figure 156: copper pipe with reinforcing ring ............................................................................. 65
Figure 157: copper pipe with inserted reinforcing ring ................................................................. 65
Figure 158: STRAUB coupling ..................................................................................................... 65
Figure 159: mounted STRAUB coupling ...................................................................................... 65
Figure 160: Heat exchanger connection ........................................................................................ 66
Figure 161: Hydraulic connection scheme .................................................................................... 66
Figure 162: Drain valve .................................................................................................................. 67
Figure 163: Vent valve .................................................................................................................... 67
Figure 164: Condenser for warming pool water ........................................................................ 67
Figure 165: Notes concerning plate heat exchangers ............................................................ 68
Figure 166: Parts of spray humidifier pump circuit ................................................................. 70
Figure 167: Correct positioning of the flexible connecting tube (black); dimensions in mm ....... 72
Figure 168: Mounted clamps .................................................................................................. 73
Figure 169: Position and parts for installing the strut ............................................................... 73
Figure 170: Components of an evaporative humidifier system with circulation water operation .... 74
Figure 171: Indirect adiabatic cooling ..................................................................................... 75
Figure 172: Siphon on suction side ......................................................................................... 76
Figure 173: Siphon on pressure side ....................................................................................... 76
Figure 174: Observe the mounting position - flow direction according to the arrow ............... 76
Figure 175: Suction side execution ........................................................................................... 77
Figure 176: Pressure side execution ......................................................................................... 77
Figure 177: Pressure side installation: remove the black closing plug ...................................... 78
Figure 178: Airside duct connection directly on the external panel of the AHU ......................... 79
Figure 179: Mounting of duct components on the external panel of the AHU ......................... 80
Figure 180: Information on the screw distance ....................................................................... 81
Figure 181: Wiring diagram for thermistors .......................................................................... 84
Figure 182: Wiring diagram for thermal contacts .................................................................... 85
Figure 183: Motor rating plate .................................................................................................. 85
Figure 184: Motor terminal box .............................................................................................. 85
Figure 185: Rotation marking of plug fans .............................................................................. 86
Figure 186: Rotation marking of housing fans ........................................................................ 86
Figure 187: Rotation marking of EC fans ............................................................................... 86
Figure 188: Main switch .......................................................................................................... 87
Figure 189: Thermostat with cover cap on the reset button .................................................... 90
Figure 190: Thermostat with uncovered reset button .............................................................. 90
Figure 191: Thermostat 2 ........................................................................................................ 90
Figure 192: Connection scheme for electric heater ................................................................. 91
Figure 193: Plate exchanger section in technical data – supply air – maximum admissible differential pressure ............................................................................................................... 92
Figure 194: Plate exchanger section in technical data – exhaust air ....................................... 92
Figure 195: supply air sucking, exhaust air pressing; 1 pressure switch (S), 2 measuring points (+/-) .................................................................................................................................. 93
Figure 196: supply air pressing, exhaust air sucking; 1 pressure switch (S), 2 measuring points (+/-) .................................................................................................................................. 93
Figure 197: supply air sucking, exhaust air sucking ;2 pressure switch (S), 4 measuring points (+/-) .................................................................................................................................. 93
Figure 198: supply air pressing, exhaust air pressing; 2 pressure switch (S), 4 measuring points (+/-) .................................................................................................................................. 93
Figure 199: Electrical connection scheme ................................................................................ 94
Figure 200: Fixing screws ....................................................................................................... 96
Figure 201: Installation of honey comb and droplet separator packages .................................. 102
Figure 202: Smallest working diameter ................................................................................... 104
Figure 203: Biggest working diameter .................................................................................... 104
Figure 204: Schematic structures of a variable pulley .............................................................. 105
Figure 205: Position of the Allen screws on variable pulleys .................................................. 105
Figure 206: Typical vibration curve ......................................................................................... 106
Figure 207: Fan bearing with grease nipple (example Comefri NTHZ) .................................... 108
Figure 208: Unfavorable operating conditions (1) ................................................................... 110
Figure 209: Unfavorable operating conditions (2) ................................................................... 110
Figure 210: Unfavorable operating conditions (3) ................................................................... 110
Figure 211: Unfavorable operating conditions (4) ................................................................... 111
Figure 212: Adjustment of pulleys ......................................................................................... 111
Figure 213: Adjustment of pulleys via threaded rods .............................................................. 112

Instruction Manual ZHK
Figure 214: Belt transmission and tensioning data sheet ............................................................ 112
Figure 215: Multi-groove pulleys – attaching the belts .............................................................. 113
Figure 216: extract (filter section) of technical data ................................................................. 114
Figure 217: Warning message filter .......................................................................................... 114
Figure 218: Cleaning of air coolers .......................................................................................... 115
Figure 219: Scheme of an accubloc ....................................................................................... 119
Figure 220: Position of the sensor .......................................................................................... 119
Figure 221: Sound data information ........................................................................................ 124
Figure 222: Example ATEX type key ..................................................................................... 125
Figure 223: Lifting with chain hoist ....................................................................................... 130
Figure 224: Securing with belt ............................................................................................... 130
Table index

Table 1: Maximum AHU part weights for lifting by crane lugs ........................................................ 22
Table 2: Tightening torque for screws ........................................................................................... 26
Table 3: Tightening torque for bolts ............................................................................................... 31
Table 4: Drilling diameters for cable glands ................................................................................... 52
Table 5: water quality of supply of humidifier following VDI 3803 .................................................. 69
Table 6: Specifications - size and number of clamps for flexible connecting tubes ...................... 71
Table 7: Information on the screw distances .................................................................................. 80
Table 8: Torques for the motor terminal board .............................................................................. 86
Table 9: Tightening torque for variable pulleys ............................................................................. 96
Table 10: parameters for Danfoss frequency converter FC102 ..................................................... 98
Table 11: Formulas for airflow rate measurement ......................................................................... 99
Table 12: Notes for airflow rate indicators, which are included in the scope of delivery ............... 100
Table 13: Data of pulley types ..................................................................................................... 105
Table 14: Lubrication intervals for fan bearings ............................................................................ 108
Table 15: Recommended grease types ....................................................................................... 109
Table 16: Lubrication intervals for motor bearings (in month) ...................................................... 109
Table 17: Maximum deviation at adjustment of pulleys ................................................................ 111
Table 18: Maintenance plan ........................................................................................................ 123
Table 19: AHU categories ........................................................................................................... 126
Table 20: Temperature classes and explosion groups for gases ................................................... 127
Table 21: Explosion groups for dust ............................................................................................ 127
Table 22: Information for disposal ............................................................................................... 131
Due to its commitment of continuous product development and improvement, Euroclima reserves the right to change specifications without notice.