Foreword
These instructions are given as a guide to good practice in the installation, start-up, operation, and maintenance by the user, of Trane CCEB Air Handling Units. They do not contain full service procedures necessary for the continued successful operation of this equipment. The services of a qualified technician are required to ensure the good operation of the units.

Warnings and cautions
Warnings and Cautions appear at appropriate sections throughout this manual. Your personal safety and the proper operation of this machine require that you follow them carefully. The constructor assumes no liability for installations or servicing performed by unqualified personnel.

Indicate safety instructions

Indication to avoid damage

Safety recommendations
To avoid death, injury, equipment or property damage, the following recommendations should be observed during maintenance and service visits:
1. The maximum allowable pressures for system leak testing on low and high pressure side are given in the chapter "Installation". Always provide a pressure regulator.
2. Disconnect the main power supply before any servicing on the unit.
3. Service work on the refrigeration system and the electrical system should be carried out only by qualified and experienced personnel.

Reception
On arrival, inspect the unit before signing the delivery note.

Reception in France only:
In case of visible damage: The consignee (or the site representative) must specify any damage on the delivery note, legibly sign and date the delivery note, and the truck driver must countersign it. The consignee (or the site representative) must notify Trane Epinal Operations - Claims team and send a copy of the delivery note. The customer (or the site representative) should send a registered letter to the last carrier within 3 days of delivery.
Note: for deliveries in France, even concealed damage must be looked for at delivery and immediately treated as visible damage.

Reception in all countries except France:
In case of concealed damage: The consignee (or the site representative) must send a registered letter to the last carrier within 7 days of delivery, claiming for the described damage. A copy of this letter must be sent to Trane Epinal Operations - Claims team.

Warranty
Warranty is based on the general terms and conditions of the manufacturer. The warranty is void if the equipment is repaired or modified without the written approval of the manufacturer, if the operating limits are exceeded or if the control system or the electrical wiring is modified. Damage due to misuse, lack of maintenance or failure to comply with the manufacturer's instructions or recommendations is not covered by the warranty obligation. If the user does not conform to the rules of this manual, it may entail cancellation of warranty and liabilities by the manufacturer.
Maintenance contract
It is strongly recommended that you sign a maintenance contract with your local Service Agency. This contract provides regular maintenance of your installation by a specialist in our equipment. Regular maintenance ensures that any malfunction is detected and corrected in good time and minimizes the possibility that serious damage will occur. Finally, regular maintenance ensures the maximum operating life of your equipment. We would remind you that failure to respect these installation and maintenance instructions may result in immediate cancellation of the warranty.

Training
To assist you in obtaining the best use of it and maintaining it in perfect operating condition over a long period of time, the manufacturer has at your disposal a refrigeration and air conditioning service school. The principal aim of this is to give operators and technicians a better knowledge of the equipment they are using, or that is under their charge. Emphasis is particularly given to the importance of periodic checks on the unit operating parameters as well as on preventive maintenance, which reduces the cost of owning the unit by avoiding serious and costly breakdown.
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1 Introduction

1.1 Intended use / foreseeable misuse

1.1.1 Intended use

An AHU is used, depending on the chosen model, to create a desired indoor air quality. Parameters are:
- Air change
- Air temperature and humidity
- To filter normal contaminated air
- In special cases for filtering air for clean room applications

The units are suitable for:
- A ambient air temperature range of -20 °C to +70°C and for the supplied air from -20°C to +40°C
- Normal air

Operation at other conditions must be agreed in writing.

If products and components are used, these must be recommended or approved by Trane.

On-site changes are in full safety responsibility of the operator.

1.1.2 Foreseeable misuse

Other than above use, is considered as improper and must be excluded totally:
- The commissioning of equipment, prior performing the steps indicated in the assembly instructions and operating with an open fan unit door is a serious security risk.
- The operation of an AHU equipped with electric heater while fan-motor is cut off, or if fan is working at a limited airflow for example caused by closed dampers or similar, but with 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. Application of ATEX units, see chapter Atex units
- Handling of air with corrosive / aggressive components

1.2 Modular design

Because of the modular AHU design, the 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 Documentation.

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

1.3 Documentation

The AHU will be supplied with the following documentation:

Manual AH-SVX01D

Depending on AHU type and execution:
Components operating manual
AHU-drawing
Wiring diagram for ETA
Operating instruction control ETA MATIC / ETA POOL

Depending on type of accessories:
K-value for airflow measurement
Belt drive and tension data
Data point list
Piping & instrumentation diagram
Records for refrigeration circuit application

cardboard box / nylon bag in fan section

cardboard box / nylon bag in the fan section
applied on each delivery section
in control cabinet
in control cabinet
inside of fan section door
inside of fan section door
in control box
in control box
in control box
The above-mentioned documentation must be always available when working on AHU. You will also find stickers with warning labels and other instructions on and in the AHU.

In addition to the contents of this manual, the instruction manuals of the component manufacturers must be followed. In the corresponding chapters is pointed on the manuals. In case of contradiction between manual (for safety instructions) CCEB and components manufacturer, the most restrictive interpretation is valid.

2 Safety instructions

2.1 CE-conformity / installation instructions for safe operation

2.1.1 CE-installation declaration according to Machinery Directive 2006/42/EC

An AHU supplied by Trane (or any part thereof) is by definition of Machinery Directive 2006/42/EC as an incomplete machine, because it is limited in function and is only a part of the building system. According to the directive, Trane provides for the air conditioner, as part of a system, an installation declaration in accordance with the machine directive.

2.1.2 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 on responsibility of the client:

Assembly of delivery sections
The deliver sections of the AHU must be assembled and linked together, according to the drawing supplied on inner face of fan section door. See the chapters Foundation / installation and Assembly

Secure inlet and outlet openings
All the inlet and outlet openings must be connected to ducts to prevent effectively access from the outside to moving parts (such as fan wheels) during operation.

Repair switch
See chapter Repair switch (emergency stop switch)

Measures regarding noise attenuation
As basis for on-site sound measures calculation (such as for sound attenuators) the sound data available on request can be used. Information regarding the emitted sound power level over the openings - see the technical data sheet available on request - refer to chapter Information on airborne noise emitted by the air conditioning units - on request.

Motor connection
See chapter AC motors

Frequency controller for Plug fans
Also if not supplied by Trane a frequency converter must be installed to reach the calculated operating point. For details see chapter Variable frequency-controlled drives (VFD, frequency converters)

Connecting to an external protective conductor system
See chapter Connecting to an external protective conductor system

Electric heater
Installation (if not supplied by Trane) and connection of thermostats for safety shutdown, see chapter Electric heater page 36

Plate heat exchanger
Installation (if not supplied by Trane) and connecting of differential pressure switch to protect the plate heat exchanger from damage in chapter Differential pressure restriction for plate heat exchangers

U-traps
Connecting according to chapter Condensate drain

Flexible connection
Installations (if not supplied by Trane) refer to chapter Duct connection.
Frost protection for heat exchangers
Venting, draining of heat exchangers

2.2 Indications for minimizing specific hazards

2.2.1 General indications

Risk of thin sheets
During work on AHU (or on pieces of equipment), there is a substantial risk of cutting with thin sheets as for ex. roof sheets, fins of heat exchangers, corners and edges - Use personal protective equipment: wear long protective clothing, gloves and safety shoes.

Lighting
Provide adequate lighting when working on AHU (maintenance and inspection work).

Exposure to rotating parts / hot heat exchanger / electrocution
When working on AHU note the following risks:

- Injury of body parts in moving parts (belt drive, fan impeller…)
- Burns on hot heat exchangers
- Electrocution on parts such as electric motors, frequency converters, electric heaters, control cabinets etc.

Therefore must be ensured prior working on the unit that:

- All current-carrying parts such as fan motors, valves, motors and electric heater are disconnected from the power supply by using the emergency stop devices and that the switch is lock in position 'off' in order to prevent a re-activated while the work effectively.
- Wait until all moving parts, especially fan wheel, motor and heat wheel have come to a standstill; wait at least 2 minutes after switching off before opening the doors.
- For maintained by frequency controlled motors, a waiting time of 15 minutes is recommended- (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 exchanger are cooled to ambient temperature.

Start of the AHU
Be ensured after working and before the start that:

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

Risk of burns and scalds on hot surfaces
Piping, which is filled with high temperature media, must be isolated to avoid damages, burns and scalds.

Storage of potential energy in gases and fluids
All heat exchangers can be operating up to a max pressure of 15 bar. If the media is under higher pressures, the safety and tightness cannot be guaranteed.
Prevention of hazards caused by contact or inhalation of toxic liquids, gases, vapors, mists or dusts
Heat exchanger with refrigerant medium may be serviced only by qualified personnel. The refrigerant medium must be disposed as hazardous waste.

**Preventing the risk of explosion and fire spread**
To prevent the fire from spreading into the ducts, between the fire compartments, fire dampers shell be installed.

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

### 2.2.2 Refrigeration circuit

**Preventing the risk of exceeding the maximum operating pressures**
Never exceed the maximum operating pressures (even not for test purposes). Damage may limit the security and lifetime of the system. Never operate the refrigeration system with closed discharge line valve.

**Risk of burns on hot surfaces**
On the compressor casing, pipelines and circuit components surface temperatures of far higher than 100 °C may occur which may cause burns. Wear the required personal protective equipment (protective goggles, gloves,...)

**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 odourless and tasteless, can replace oxygen in a technical room and cause suffocation (MAK-value 1000 ppm). In case of refrigerant leaks leave immediately the affected room. Enter only with breathing protection or care for 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 create as soon as in touch with open flame toxic substances. Do not inhale!
Do not smoke in the technical room!
For more information refer to chapter Refrigerant.

### 2.3 Staff selection and qualification

All persons who are authorized to work on the air conditioner must, have read and understood this manual - in particular the chapter Safety. Before this is not guaranteed, 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, recognize and avoid potential hazards.

**Execution of the assembly, installation, electrical connection, commissioning and disposal:** By qualified electricians.
**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 and according to EU-directive 303/2008 certified refrigeration technicians.

Subsequently, warning triangles indicate warnings that must be followed to minimize risks to persons who are entrusted with the work on the air conditioner.
3 Reception control / unloading / transportation to installation site

3.1 Reception control

Upon arrival of the equipment, please check immediately the package for completeness and damage. Loose supplied parts and assembly materials are in a nylon bag or a box in the unit. If damages are found, immediately a damage report must be created and sent to Trane. Only then the transport company can make the claim against the insured. (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. In case of complaints please inform immediately the Trane office.

3.2 Unloading / transportation to installation site

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.

The unit parts are delivered on a pallet and can be unloaded and moved by forklift. Forces must always act on the base frame.

In accordance with the Trane drawing the AHU will be delivered as one or more delivery section(s).

Do not climb on devices. If unavoidable, weight must be divided by use of boards.

Figure 1
Forklift, movers transport

Center of gravity must be centrally located between the forks. For large parts use several movers, see Figure 2

![Figure 2](image)

- Belts shall not run over sharp edges
- Avoid jerky lifting
- Make sure that nobody is under the raising load
- Never lift AHU sections on heat exchanger connections or other attachments. Do not turn fan sections on side, the shock absorber may be damaged

Opening accessories such as dampers, flexible connections, hoods, etc. must be removed before lifting, see Figure 3. This equipment must be lifted separately on a pallet and then be re-installed.

![Figure 3](image)

Installation of the lifting lugs:

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

The blunt corner must always point upward

Screws and nuts are delivered with the lifting lugs and must be tightened with the torque according to Error! Reference source not found.:
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>150</td>
<td>4.000</td>
</tr>
<tr>
<td>200</td>
<td>4.000</td>
</tr>
</tbody>
</table>

The weight of the 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 5: Delivery section L5 = 628 kg
- The delivery sections must be lifted with appropriate equipment.
- Recommended minimum load capacity per belt, 50% of the total delivery section weight
- The length of the belt should permit a favorable course
- The belts shall not exceed an angle of maximum 15 ° to the vertical and must be spread apart to avoid damage to the casing, refer to Figure 6. After a slow lifting from the floor for a few centimeters the correct course of the belts should be checked.
- 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 5](image)

**Figure 5**

- 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. An introduction to a dry area after unloading is therefore essential for the preservation of the unit.

**Standstill maintenance**

![Figure 6](image)

**Figure 6**

- 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. An introduction to a dry area after unloading is therefore essential for the preservation of the unit.

**Standstill maintenance**

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

To avoid damage to 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, the bearing must be replaced. Also components such as belts must be checked and if necessary replaced.

**IF** You want to please the planner, the owner and other observers of the AHU

**Then** We strongly recommend to cover and protection the unit against dirt and damage during the installation and commissioning, see Figure 7
4 Foundation / installation

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

4.1 Foundation

Solid foundations of reinforced concrete are recommended, as shown in Figure 8, left, or strip foundations, as shown in Figure 8, right. For strip foundations, concrete or steel beams shall be used, see Figure 8, bottom-right. Steel beam constructions must have an appropriate stiffness in relation to the unit size. The foundation must be flat and leveled; it may not slope in any direction or have uneven surfaces.

Warning!
If these requirements are not met, this may cause jammed doors and other problems with the AHU.
4.2 Installation

The AHU must be precisely aligned 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 AHU.

After collocation AHU-sections can be pulled together with belts which act on the base frame, as shown on Figure 9 and Figure 10.

For noise insulation, it is recommended, depending on the location of the installation, to underlay the AHU with cork, Ma-fund plates or Sylomer strips. The absorbent material used must be adjusted to the load to achieve optimum noise insulation. The providers of such products indicate the respective design criteria. For weight specifications see the technical data sheet. For standard units without feet the maximal allowed distance between the layup points is 1500 mm. Floor units must be fixed on the foundation to secure the position. A direct coupling, see Figure 11, left, should be avoided because of structure-borne sound transmission. If you use structure-borne sound insulation underlay, fixing lugs are particularly suitable to avoid the displacement of the AHU in all directions (Figure 11, right).

Special ceiling units (for units up to size CCEB 3) can directly be mounted or better with structure-borne sound insulating material to the ceiling with a special edge profile used for this units, refer to Figure 12.

Note: The static requirements for the ceiling construction must be checked!

If floor units are mounted on the ceiling, the device must be attached on the base frame on an encompassing suspension see Figure 12 right. For the noise insulation is to procedures such as floor units.
AHU which are not designed to stack may not be stacked (one on the other). Air washer will need either higher foundations on one or both sides or feet on one or both sides. Feet are supplied if ordered, refer to Figure 13.

Figure 13

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.

5 Assembly
5.1 Assembly of casing
5.1.1 Assembly material

Sealing of the joining points

<table>
<thead>
<tr>
<th>Sealant</th>
<th>Joining –points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sealant-strip</td>
<td>Joining -points</td>
</tr>
</tbody>
</table>
## Baseframe

<table>
<thead>
<tr>
<th>*</th>
<th>Hexagon bolt with locknut</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8 x 20</td>
<td>M10 x 30</td>
</tr>
</tbody>
</table>

## Baseframe connection:

## General casing connection

<table>
<thead>
<tr>
<th>*</th>
<th>Hexagon bolt with nut</th>
</tr>
</thead>
<tbody>
<tr>
<td>M6 x 16</td>
<td></td>
</tr>
</tbody>
</table>

### A

Connection between panels, every 305 mm

Standard unit connection up to unit height <= 610

---

### B

Inside connection with connection angle, Unit height >= 915

...n x 305

### C

Connection with connection frame, not less than every 305 mm

Standard unit connection greater or equal unit width 2440 mm

---

In case of proper alignment of the units with connection angle (B) or connection frame (C), the connection with angle or frame will be sufficient. If not or in case that the access inside is not possible, the connection between the panels (A) should also be done.
**Solution details for the connection of specific casing components.**

<table>
<thead>
<tr>
<th>Component Description</th>
<th>Connection Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet metal screw M8x11</td>
<td>Connection between two doorframes and the connection between two doorframes and panels, every 152 mm</td>
</tr>
<tr>
<td>Self-tapping screw with hexagon screw head 6,3x22</td>
<td>Connection of 3 mm parts without holes</td>
</tr>
<tr>
<td>Self-tapping screw with TORX TORX 25- 4,8x16</td>
<td>Connection between panel casing front side</td>
</tr>
<tr>
<td>Hexagon bolt with nut General Stainless steel M6 x 16</td>
<td>Connection of roof panels, every 305 mm</td>
</tr>
</tbody>
</table>

**5.1.2 Assembly**

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

Assembly of several AHU parts
If several AHU are to connect, proceed as follows: The supplied self-adhesive sealing strip is to be stuck on the inner flange of the AHU, refer to Figure 14.
For wet areas or roof units the supplied sealant should be used and applied to the AHU flange 5 mm away from the inner edge (Figure 15 and Figure 16). Only careful sealing secures the long tightness of the unit. For roof units, the roof flanges require sealant, refer to Figure 17.
For aligning and connecting the delivery sections, the external panels shall be removed, unless heat exchanger or similar prevent this.

Removing the outer panels:
To remove the external panel - start at the corners - use a screwdriver – refer to Figure 19.
After removing the external panel, remove the insulation.

Figure 18

Figure 19

Bring the delivery sections in the exact mounting position, and push them as near as possible together. The screw holes on the flanges have to lie opposite now.

The first step: screw all the screws loosely in: in the basic frame profiles (Figure 20, left)
For units up to size 12/12 in the upper unit corners (reinforcing angles Figure 20 bottom center)
For units from size 15/12 in the stiffening frame (Figure 20 top center)
In the panels (Figure 20 right)
For roof units in the roof flange.
If only one side is accessible (panels and stiffening frame) the sheet metal screws shall be used, otherwise bolts and nuts (all supplied separately):

- Screws M 8 for reinforcement angle (up to size 12/12) and the base frame, screws M 6 for stiffening frame (size 15/12) and panels.
- For the tightness at least every second hole (bolt spacing 305mm) shall be used.
- After placing all the loose screws they shall be tightened - starting with the base frame, refer to Figure 21.

Reinsert the isolation and remount the external panel:
- From the external panels of roof units, or units with external aluminum panels the white protective film from the sealing tape must be removed before mounting. (Figure 22 left)
Figure 22

Start at the bottom to mount the external panels (Figure 22 right).

For roof units also the supplied slide bar must be mounted on the flange.
After mounting the AHU, every butt joint of wet sections must be sealed carefully with the supplied sealant.

Transport lock
A possibly mounted transportation lock in the fan sections (spring isolators) must be removed.

Remove the transport lock of spring isolators mounted on fan-motor base frame (signed with red point) according to Figure 23 below.

Figure 23

1) remove nuts and bolts of pos. 1, 2, 3
2) remove z-shaped metal sheet (pos. 4)
3) fasten nuts of pos. 1 including potential compensation wire

5.2 Doors

Hinged doors
The EU-hinge doors have the following design features:
- Space-saving design
- Operated by a handle lever.
For open door, the handle is in horizontal position; refer to Figure 24.
For closed door, the handle is in vertical position; see Figure 25.

Doors which allow access to the fan section
- Are equipped with a door lock., Figure 26 shows the lock in the position 'locked'
- 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

Above-mentioned doors with lock are an effective safety device according to EN ISO 12499: there is no case where entering during fan operation is required, refer also to Indications for minimizing specific hazards.

The keys are provided attached to the handle, refer to Figure 27.
The locking mechanism of the hinged door is on the inside of the door panel and is shown in Figure 28 (closed position) and Figure 29 (open position). The rolling piston can be pressure from above (if you are in the unit) with your thumb in the position 'open'.
5.3 Filters

Ensure proper insertion of the filter media (the bound filter media side on the unclean air side).

5.3.1 Panel filters side removable

The filters are supplied mounted in a guide (for more than one filter) for side pull out.
- Figure 30: Extraction of the filters with the extraction tool
- Figure 31: Extraction tool

![Figure 30](image1)
![Figure 31](image2)

5.3.2 Panel filters and / or bag filters in filter frame

Filters are supplied loose and have to be fixed by clips

Filter clips are supplied fixed on the filter frame.
Inserting the filter clips (4 pcs per frame)
Filter mounted

![Figure 32](image3)
![Figure 33](image4)
![Figure 34](image5)

Bag filters are installed similarly. Bags cells hang vertically.
5.3.3 Bag filters side removable center locked

Stick on each vertical side of the filter cells above and below a spacer (supplied separately; adhesive on one side); refer to Figure 35, Figure 36 and Figure 37. Between the door and the filter frame no spacer is needed.

Move all the levers of the clamping rails toward the door opening – Figure 38
Slide one filter after the other in the filter frame – Figure 39

Press the last filter of the row against the rear panel. Then press with the lever the filter cells against the sealing - Figure 41

Note: For soft bags the downer bags of the filter cells are to lift up in order to prevent damage with the clamping system - Figure 40!
5.3.4 HEPA filters

If a sealing is not included in the manufacturer delivery, a suitable sealing is delivered (loose) by Trane. This sealing is then to fix on the filter cell, or alternatively on the filter frame. The assembly of the filter is done through the filter fixer supplied loose, as shown in Figure 43 up to Figure 46.
Camfil Airopac filters
In the case of filter frame without sealing:
If you order this filter from Camfil, please ask for the type with sealing. Alternatively, another sealing must be installed on site!

5.4 Hygienic AHU’s
After assembly all grooves and joints at the connection positions must be sealed with the supplied sealant. In case of exchange 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
The following instructions shall be followed exactly!

6.1 Heat exchanger connection
Before connecting the heat exchanger, the piping system must be purged thoroughly.

To prevent damage of the heat exchanger connection, it is necessary to held with a pipe wrench during the screwing - Figure 47.
Absolutely tension-free connection is to ensure. The piping of the heat exchanger should hinder a for maintenance required expansion of the heat exchanger as less as possible.

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 sealant!

The connection of the heat exchanger is to execute as indicated on the label on the AHU (connection diagrams in Figure 48).

The heat exchanger operates according to the cross-counter-flow principle. Only preheat can be supplied for parallel flow operation on request:
1. All standard heating and cooling heat exchangers - counter flow
2. Steam heat exchangers: steam inlet top condensate bottom, counter flow
3. Preheat heat exchanger (freezing risk - on request) - parallel flow

Connection schemes of heating or cooling coil should be carried out as shown in the scheme Figure 49 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 correct operation must be ensured, however, that the vent is on the highest point of the whole water cycle and the drain at the lowest. Otherwise, the valves shall be mounted on another suitable point in the circuit.

Drain valve: **Figure 50**  
Vent valve: **Figure 51**

Steam heat exchanger  
The heater is heated to above 70 °C, in the vicinity plastic parts are installed. To prevent damage on the plastic parts, a thermostat must be used. Installation is analogous to chapter Electric heater page 36

### 6.1.1 Plate heat exchangers for refrigeration circuits

Refrigeration circuits of ETA-POOL-Units may contain a plate heat exchanger as optional. Connect it to pool water or water for domestic use according to blue arrows of **Figure 52**

**Application of plastic water tubes is not allowed because refrigerant - and therefore also plate heat exchanger - may reach temperatures of 110°C or higher!**
6.2 Connection of indirect adiabatic cooling

ETA-PAC-AHU’s are equipped with indirect adiabatic cooling device. Carry out connection to piping system as shown in Figure 53

![Figure 53](image)

6.3 Condensate drain

Each drain must be equipped with a U-trap. U-traps are available as accessories from Trane.

A space-saving design of the necessary U-trap we can do on request. Contact your sales representative for detailed information.

The following conditions are essential for correct operation:

- At each drain a U-trap must be connected.
- Several drains may not be connected to one U-trap.
- The water from the U-trap must run in a funnel.
- Before starting, fill the U-trap with water.
- The heights H1, H2 and H3 can be determined from the maximum negative pressure (p) and maximum pressure (p) in the section of the U-trap or be determined by the information on the technical data sheet as follows:

  \[
  \begin{align*}
  \text{Total pressure} & \quad p_{\text{ges}} & = 1196 \text{ Pa} \\
  \text{Dynamic pressure} & \quad p_{\text{dyn}} & = 83 \text{ Pa} \\
  \text{Total static pressure} & \quad p_{\text{stat}} = p_{\text{ges}} - p_{\text{dyn}} & = 1113 \text{ Pa}
  \end{align*}
  \]

  \[1 \text{ mmWS} = 9,81 \text{ Pa}\]

  \[H_1 > 1113/9,81 = 114 \text{ mm} + 15 \text{ mm (Safety)} = \text{ca. 130 mm}\]

  \[H_2 = 65 \text{ mm}\]

U-trap intake side (in direction of airflow before the fan), see Figure 54

H1 [mm] > p [mm WS]
H2 [mm] > p/2 [mm WS]
U-trap pressure side (in direction of airflow after the fan), see Figure 55

\[ H3 \ [\text{mm}] > p \ [\text{mm WS}] \]
\[ H4 \ [\text{mm}] \geq 0 \]

Figure 55

6.4 Duct connection

The air conditioning work must be executed tension and torsion free. To prevent structure-borne sound transmission is an intermediary flexible connector recommended with at least 140 mm width. It shall be installed unconstrained between the duct and the AHU. Ensure proper performance of the AHU by avoiding of excessive pressure drops in the duct. To minimize the noise, the basic rules of the duct construction and acoustic design shall be observed.

6.5 Pumps

In case of subsequent pump installation is to be noted, that the intake socket is below the water surface. The pump base is to be set so low, that the suction tub comes to the pump with a decline. For noise insulation the foundation shall be executed as the AHU itself (refer to chapter Foundation).

Fresh water supply
The maximum allowable pressure for the fresh water supply is 300 kPa (3.0 bar).

7 Electrical connection

The electrical connection must be executed in compliance with international regulations such as the Low Voltage Directive and the requirements of electromagnetic compatibility of national legislation and the requirements of the local electricity provider.

For systems, which operate in hazardous areas, are special provisions for component / equipment design and used materials. For details refer to chapter Atex units

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
- Alternatively, at the potential compensation that is mounted on the flexible connection by Trane
- Furthermore each electrical component must be connected to the earthing system.
7.2 AC motors

The three-phase motors fulfill the following criteria:
- Protection class: IP 55
- Thermal class: F
- Type: B3

In 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 unit outside was done by Trane standard wiring is for direct start. Wiring for star-delta start is possible on request.

All single-speed motors are suitable for frequency converters, the frequency range of the motor is shown in **Figure 56**

Speed range in which the motor reaches the rated output:

\[
\begin{align*}
N_n \times 0.6 & \text{ bis } N_n \times 1.75 \\
N_{min} &= 0.1 \times N_n \\
\text{Minimum performance by } N_{min} &= 0.1 \times P_n
\end{align*}
\]

Pn.................Nom. capacity  
Nn.................Nom. RPM  
Nmin.............Min. RPM

**Figure 56**

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 CCEB the following on site equipment is required:

1) Motor without 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 leader in the three phase 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 adequately.

In addition to 1) or 2) full motor protection with PTC (thermistor)
As standard (specified in the technical data sheet as PTC) 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 damages, 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 additional. The connection to a PTC relay is a prerequisite for the receipt of the warranty in case of winding damage.

The motor protection consists of a 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 $135 \, ^\circ\text{C}$, a sharp increase of resistance occurs, which switches the PTC relay. For an example of connection diagram refer to Figure 57.

The motor protection (PTC) switches off the motor in case of:

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

Not apply voltages above 5V at the temperature sensor. This leads to its destruction!

Alternative to PTC: Motors with integrated bimetal (thermal contact, Klixon) - 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 warmed, 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 58

ETA - AHU

Are as standard equipped with circuit protection switch and variable speed drives. When the motor is equipped with a PTC, it is connected to the temperature monitoring of the frequency converter.
Correct direction of motor rotation is a result of direction of fan impeller rotation which is signed by an arrow: for plug fan refer to Figure 60, for fan with casing refer to Figure 61. Before connecting the motor check the rotating field of mains connection with a suitable device. Afterwards connect the phases accordingly to motor terminal (or repair switch if supplied and wired by Trane).
Fastening torque for electrical connections on the control panel refer to Table 2:

Table 2

<table>
<thead>
<tr>
<th>Thread Ø</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>min.</td>
<td>0.8</td>
<td>1.8</td>
<td>2.7</td>
</tr>
<tr>
<td>max.</td>
<td>1.2</td>
<td>2.5</td>
<td>4</td>
</tr>
</tbody>
</table>

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 startups at short intervals should be avoided; they may lead to thermal overloading of the motor.

7.3 Repair 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 repair switch.

Requirements according to DIN VDE 0660 and IEC 947-3 on a repair switch in RED-YELLOW execution

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 clearly marked OFF (0) and ON (1) position
3. in OFF position lockable, to secure against unauthorized or unintentional re-start
4. for outdoor installation the repair switch at least must be IP65
5. interrupts the power supply to the AHU (lighting can be excluded)
6. separates the electrical equipment from the main supply
7. is easily accessible
8. mounted within sight of the AHU
9. the assignment to the AHU can be clearly seen
10. emergency stop function: The emergency stop function, which is signaled by the red handle with yellow background, has to be implemented by additional components in control system. Reset means that a manual start command – separate from repair switch - must be activated.
CCEB-control
- Control box is equipped with repair switch in execution RED-YELLOW as specified above
- On responsibility of the client must be ensured that of the above specified Requirements according to DIN VDE 0660 and IEC 947-3 on a repair switch in RED-YELLOW execution are fulfilled
  a) item 7 to 9
  b) item 10, implementation of emergency stop function in control system

CCEB without control
- Specified repair switch must be provided on responsibility of the client
- Is to carry out independent from EUROCLIMA supply of repair switch for fan motor. Fan motor repair 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 repair switch in RED-YELLOW execution are fulfilled

Is integrated in the control cabinet:
  a) The control cabinet is mounted in or on the unit, no on-site measures required
  b) If the control cabinet is supplied loose, then on site must be done:
     - The control cabinet must be mounted within sight of the AHU
     - The assignment to the AHU must be clearly visible

For each AHU an all pole acting repair switch must be provided, which:
  - Interrupts the power supply to the AHU (lighting can be excluded)
  - Is designed lockable
  - Mounted within sight of the AHU
  - The assignment to the AHU can be clearly seen

For outdoor installation the repair switch at least must be IP65.

CCEB
To be provided on site. This switch must also be provided even if already Trane provided repair switches for the fan sections. These switches are only for the respective supply or exhaust air fan.

7.4 Variable frequency-controlled drives (VFD, frequency converters)
If the frequency controller is supplied from other than Trane, please note the following points to ensure proper operation:

- Suitability for fans with variable torque
- The frequency converters supplied by Trane 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 adapt 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 must be equipped with a separate display unit.

In this case, the display is to be kept on the outside of the unit - operating in the fan section is not permitted for safety reasons!

When using residual current devices (RCD), the lead 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 fans (fans with direct-coupled motor-wheel), a frequency converter is necessary to reach the operating point.

7.5 Electric heaters

Fire risk !
With electric heater in operation, the heating elements may arrive to a temperature of several hundred °C. In case of malfunction – heater in operation without adequate airflow – inadmissible temperatures may occur. Plastic parts as for example filters, gaskets, droplet eliminators etc. close to electric heater may become damaged or even catch fire. Subsequent damages up to fire spread to the building are possible.
In order to avoid the above mentioned risks Trane provides as a standard electric heaters with 2 independent safety thermostats.

**AHU’s equipped from Trane with control ETAMATIC**
The recommended execution and function as described in the following is included in the EUROCLIMA delivery

**AHU’s which are not equipped from Trane with control (which have to be equipped on responsibility of the client with controls)**
Supply of Trane contains:
- 2 independent safety thermostats
- installation of the safety thermostats

The safety related correct implementation of control is to be carried out on responsibility of the client

Trane proposes a safety concept as specified below as minimum requirement:

**Description of execution and function of control**
- In order to avoid excessive heating of components by residual heat of electric heater control must ensure that fan motor keeps on running for at least 5 min after cut off of electric heater
  - If in case of mains power failure (for example lightning stroke) this automatic run cannot be ensured AHU may become damaged by the residual heat of electric heater
  - In order to avoid damages an uninterrupted power supply is recommended
  - If AHU is not operated by an uninterrupted power supply after every mains power failure an AHU inspection is requested as indicated in chapter Maintenance page 50
- Electric heater power supply is to be equipped with 2 contactors in serial connection
- The 2 safety thermostats must be connected such to protect the AHU both, by contactors in power supply and by software of control. In case of failure contactors must immediately cut off electric heater from power supply
- The 2 safety thermostats are to be 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 reset of the thermostat**

Thermostat 1 (Figure 64 and Figure 65)
- position of thermostat body: fastened on electric heater at connection side, 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

![Figure 64](image1)
![Figure 65](image2)

Thermostat 2 (Figure 66)
- position of thermostat casing: fastened on outside panel of AHU casing
- triggering temperature: set to 70°C – value must not be changed
- sensor position: downstream of electric heater in upper area of airflow
- function: alarm stop in case of over temperature because of missing airflow
Connection box may reach high temperatures. For 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 the specified safety concept as minimum requirement

![Connection scheme for electric heater](image)

In case of dehumidification wheel downstream of electric heater ensure that control rotates the wheel while electric heater is on. This feature is to ensure on responsibility of client if control is not supplied by Trane.

7.6 Differential pressure restriction for plate heat exchangers

Plate heat exchangers are only in limits pressure resistant. By a malfunction of the system, the pressure in the plate heat exchanger section can rise unacceptably high with the result of high costly damage. Use differential pressure switch!

The following factors cause pressure increasing:
- Dampers are closed or open in delay
- Filters where not changed also if they already 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 canal systems can lead to additional external pressures.
- Only one fan is working (supply- or exhaust air), which can increase the pressure in some cases.

Trane provides as optional differential pressure switches, which shall be used as described below:
- For each fan, which can produce an unacceptably high pressure, a differential pressure switch will be provided.
- The switches are factory set to the maximum allowed differential pressure.
- The differential pressure switch measures the differential pressure on the plate heat exchanger.
- If the measured pressure is above the maximum allowed, the switch will switch off the respective fan motors.
- The switches are to connect as below described.

If no differential pressure switches are included in the delivery of Trane (shown in the technical data sheet), then another appropriate on-site measure device must protect the plate heat exchanger from excessive pressure!

**Differential pressure switch**

If Trane deliver the differential pressure switch, then they are factory mounted and set to the correct pressure difference. The measuring tubes are pre-connected and may not be interchangeable. The maximum allowable differential pressure according to the PHE manufacturer is indicated on the technical data sheet.

In case of unintended adjustment of the differential pressure switch, contact the manufacturer or Trane for information about proper installation and adjustment before starting the unit.

**Electrical connection**

The onsite electrical connection of the fans must be done, that when exceeding the maximum allowable differential pressure, the fan motors will immediately be disconnected from the power supply until the restart by hand. Example for connection diagram: refer to Figure 68.

![Connection Diagram](image)

**Figure 68**

When the differential pressure switch was activated, the cause of the excessive pressure must be found and eliminated before the restart.

### 7.7 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 loose cables, with a sufficient 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 are to be connected on site.

If the AHU will be equipped on site with lights, it is to make sure that in humidifier and wet sections (and air downstream), such as:
- Humidifier sections
- Sections with condensate, such as cooling sections

Lighting with an at least protection of IP65 where used.

Switches or junction boxes mounted on the outside of rooftop units must also have at least protection class IP65.
7.8 Dampers
The close position of the dampers is indicated as shown in Figure 69.

8 Startup procedure
8.1 Preliminary steps
- Clean thoroughly the AHU and all components of dust and other debris
- Remove all loose parts, documentation, etc. from the unit
- Remove the transport lock from the spring isolators under the fan motor base frame
- Ensure that the duct 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

Here are given some points, which could cause problems after transport or not appropriate unit 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 70, tightening torque depends on the type of bush, according to Table 3

Table 3

<table>
<thead>
<tr>
<th>Bash</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>

- Check the tension of the belt and the alignment of the pulleys, refer to chapter Re-tensioning of belt on page 53
- 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 - parameters

- The frequency converter must be configured, if not done by Trane (please refer to technical data sheet): parameterization using Table 4 below respectively the provided manufacturer's operating instructions and data from Trane technical data sheet.

- Observe safety instructions of chapter Indications for minimizing specific hazards page 8 and safety instructions of manufacturer (supplied by Trane) of frequency converter
- Observe safety instructions of fan manufacturer (supplied from Trane) regarding fan minimum starting up time. Otherwise fatigue fracture of impeller may occur.
Table 4: parameters for Danfoss VFD FC102

<table>
<thead>
<tr>
<th>n°</th>
<th>description</th>
<th>value</th>
<th>note</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-..</td>
<td>display</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>motor/load</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] autom. energy optimizationVT</td>
<td></td>
</tr>
<tr>
<td>1-20</td>
<td>rated power</td>
<td>... kW</td>
<td>laut Motor-Typschild</td>
</tr>
<tr>
<td>1-23</td>
<td>rated frequency</td>
<td>... Hz</td>
<td>laut Motor-Typschild</td>
</tr>
<tr>
<td>1-24</td>
<td>rated current</td>
<td>... [A]</td>
<td>laut Motor-Typschild</td>
</tr>
<tr>
<td>1-25</td>
<td>rated speed</td>
<td>... rpm</td>
<td>laut Motor-Typschild</td>
</tr>
<tr>
<td>1-90</td>
<td>thermal protection</td>
<td>[2] switch off of thermistor</td>
<td>connect PTC/Klixon</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>setpoints</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>max[HHz]=Max speed [rpm]/rated speed [rpm]*50[HHz]</td>
</tr>
<tr>
<td>3-15</td>
<td>variable setpoint 1</td>
<td>[1] analog input 53</td>
<td></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</td>
<td>30 s</td>
<td></td>
</tr>
<tr>
<td>3-42</td>
<td>speed decrease up to stop</td>
<td>30 s</td>
<td></td>
</tr>
<tr>
<td>3-..</td>
<td>limits/warnings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-10</td>
<td>motor direction of rotation</td>
<td>[0] only clockwise</td>
<td>according to AHU data sheet</td>
</tr>
<tr>
<td>4-12</td>
<td>min. frequency</td>
<td>15 Hz</td>
<td>max[HHz]=Max speed [rpm]/rated speed [rpm]*50[HHz]</td>
</tr>
<tr>
<td>4-14</td>
<td>max. frequency</td>
<td>... Hz</td>
<td></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>rated current according to motor type plate</td>
</tr>
<tr>
<td>5-..</td>
<td>digit. inputs / outputs</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>5-12</td>
<td>clamp digital input 27</td>
<td>[2] motor freewheel (inv)</td>
<td>bridge 12/27 necessary for operation</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>relais 1 [0]</td>
<td>[5] motor rotates</td>
<td></td>
</tr>
<tr>
<td></td>
<td>relais 2 [1]</td>
<td>[2] ready</td>
<td></td>
</tr>
<tr>
<td>6-..</td>
<td>analog input / output</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 min. voltage</td>
<td>0.00 V</td>
<td></td>
</tr>
<tr>
<td>6-11</td>
<td>clamp 53 max. voltage</td>
<td>10.00 V</td>
<td></td>
</tr>
<tr>
<td>6-14</td>
<td>clamp 53 min. setpoint</td>
<td>15 Hz</td>
<td>according to AHU data sheet</td>
</tr>
<tr>
<td>6-15</td>
<td>clamp 53 max.-setpoint</td>
<td>... Hz</td>
<td>max[HHz]=Max speed [rpm]/rated speed [rpm]*50[HHz]</td>
</tr>
<tr>
<td>6-17</td>
<td>clamp 53 signal error</td>
<td>[0] disabled</td>
<td></td>
</tr>
</tbody>
</table>

**connection control cables:**

- PTC/Klixon: clamp 50 and 54
- start: clamp 12 and 18
- release: clamp 12 and 27

50=-10V, 54= analog input 2
12=+24V, 18= digital input
12=+24V, 27= digital input
8.1.2 Airflow measurement by differential pressure measurement at the fan nozzle

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

The following formula can be determined from the pressure signal of the airflow:

\[ V_h = K \sqrt{\frac{2 \times \Delta p}{\rho}} \]

- \( V_h \) = Airflow [m³/h]
- \( K \) = K-Factor [m²s/h]
- \( \Delta p \) = Dif. pressure [Pa]
- \( \rho \) = Density [kg/m³]

The corresponding K-factor of the fan is shown in the fan-motor data sheet or on the technical data sheet provided by Trane.

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

If in the Euroclima delivery the device is included, this must be configured before use.

1) Air flow measurement type SENSO
The specified K-factor corresponds to the K-factor necessary for SENSO airflow measurement. Following you will find the instructions of the manufacturer Figure 71
SENSO-VP
Flow rate display, monitor and transmitter with alarm signal

- Easy-to-read LCD display
- Display of volume flow up to 99,999 in the following display units: m³/h, l/s, ft³/min
- Display of the alarm value (limit) up to max volume flow
- Red LED flashes when value fails below alarm value (limit)
- Programmable alarm value, K-factor and air density ρ
- Power: 24V AC at 50/60 Hz or 24V DC

Specification
The SENO-VP consists of a round measurement instrument and a rectangular or round front panel.

The measurement instrument is optimised for mounting in air-handling units and switchboards. The two connections for pressure measurement are located at the back of the instrument in recesses for protection against mechanical damage. They are labelled with + (overpressure) and - (underpressure).

A threaded bushing is provided in the centre of the housing. The fixing clamp is attached using the threaded bolt and the wing-nut supplied. The wing-nut is secured against loosening.

On the rear of the housing two cable break-outs are provided. Two M16x1.5 cable bushings are included in the mounting set.

An integrated O-ring provides sealing between the housing and the panel in which it is mounted. In order to ensure correct mounting, an arrow can be found on the back of the device that must point upwards. In the front part of the instrument an LCD display can be found, along with a red LED for alarm indication and three function buttons.

After the unit has been mounted and any programming done, the front panel can then be clipped onto it. These guidelines ensure that this is only possible when correctly oriented. The front panel can be removed by pulling it with both hands or using a screwdriver.

Cable connection: M16 bushing with cable clamp

### Technical data

- Housing: High impact ABS
- Colour front panel: beige
- Colour housing body: anthracite
- Protection: IP 64, IP 64 with supplementary seal
- Operating temperature: -10 to +40 °C
- Storage temperature: -20 to +60 °C
- Relative humidity: max. 75 %, non-condensing
- Dimensions basic unit: 112 x 58 mm (Ø x t)
- Dimensions: Rectangular front panel: 184 x 136 x 20 mm (L x W x H)
- Rounded front panel: 145 mm Ø
- Flexible tube connection: 5 to 8 mm internal diameter
- Working range: 0 - 1000 Pa
- Measurement range: 0-99,999 m³/h, l/s, ft³/min
- Burst pressure: 75 kPa
- Protection class: II (IEC 60529)
- Tolerance: ≤ 1.5 %
- Long-term stability: ± ± 0.5 % V, EN60
- Approbation (EMV): EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-6-4
- Power supply: 24V AC at 50/60 Hz
- or 24V DC, 20 % ±5 %
- Analogue outputs: 0(2)-10 V, 0.1 mA and/or (0)4-20 mA, max. load 600Ω
- Digital outputs: Relay contact, changeover activated when under power contact loading 240V 2A
- 34V 5mA

### Models

<table>
<thead>
<tr>
<th>Model</th>
<th>LO (Pa)</th>
<th>RA (Pa)</th>
<th>OUT D-20</th>
<th>OUT 4-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>VPS002D</td>
<td>40 Pa</td>
<td>variable</td>
<td>12V SRA</td>
<td>12V SRA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1mA SRA</td>
<td>1mA SRA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20mA SRA</td>
<td>20mA SRA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>160mA SRA</td>
<td>160mA SRA</td>
</tr>
</tbody>
</table>

LO: Low (low value suppression)
RA: Range (measuring range)

Datasheet no. 13158
SENSEO-VP
Flow rate display, monitor and transmitter with alarm signal

Activation and operation
All electrical connections must be made before applying the supply of power. To start the installation and programming of the Senso-VP, the 24V supply should be connected. Take care that the power supply connections are not reversed!

The device is immediately ready for operation: Display on the LCD.

The setting of the unit’s parameters is carried out using the three buttons that are accessible when the front panel is removed. Below 50 Pa (model VP500D), low-value suppression LQ (low) is active.

Setting the units displayed (Dimension)
By pressing the bottom button (S1) during normal operation for a short time, the units displayed change between m³/h, l/s, ft³/min.

Programming the Senso-VP
While programming, the current values on the display and the analogue output are frozen. By pressing the lower button (S1) longer, the unit goes into programming mode. The selected parameter is indicated by a flashing display. By repeatedly pressing S1 for a short time, the menu items can be cycled through:
- Limit (alarm value) – max. range (measuring range) – Out (mA)
- K-factor – air density p

When the appropriate menu item flashes, the top left (S2) and top right (S3) buttons can be used to adjust the programmed values:
- Short press → single step.
- Long press → increasing rate of change.

Limit: The lower limit is entered in the chosen unit.
If the value drops below this, the LED flashes and the relay drops off (ditto if supply voltage fails).

Range max. is, at the moment, displayed dimensionlessly and represents the value in the measurement unit chosen for which the max. analogue signal (20mA or 10V) is outputted.

The analogue output is programmed to provide 0-20 mA, corresponding to 0-10 V or 4-20 mA, corresponding to 2-10 V.

The K-factor (manufacturer’s specification; Measurement unit) and the air density multiplied by the factor 100 (default value 112 = 1,12 kg/m³) are entered.

Store (OK)
If no buttons are pressed within 5 seconds, the value currently displayed is automatically stored and programming mode is left.

Zero-point correction
Remove device’s supply voltage. Then make the measuring inputs pressure-free (cut off both tubes). Press and hold button (S1).

Restore device’s supply voltage (→ display flashes). Release button S1 (→ pressure displayed; 0 Pa).

Briefly press and immediately release button S1 (→ value is stored).

Display of differential pressure for testing purposes
By pressing both of the top buttons at the same time, the differential pressure measured is displayed in Pa as long as the buttons are pressed.

Extended calibration possibilities on request.

Scope of delivery:
The standard version comprises the measurement instrument, the front plate and fitting instructions.

Accessories:
SENSEO-2F mounting set,
SENSEO-O-ring for IP 64,
SENSEO-CS air-conditioning set,
SENSEO-H mounting cover for 50 or 50 mm height.

SENSEO-VP assembly

Electrical connections

If the relay drops off (limit exceeded or power failure), COM and NC are connected to each other.

Function
The differential pressure to be measured is fed via the connection nipples to the piezo differential pressure sensor, electronically evaluated, recalculated into volumetric flow using the K-factor and density p values that have been programmed and then displayed on the LCD display.

The following basic formula is the basis for the calculation:

\[ \dot{V}_H = K \times \frac{2 \times \Delta p}{p} \]

Where:
- \( \dot{V}_H \) = volume flow [m³/h]
- \( K \) = K-factor [m³/h]
- \( \Delta p \) = differential pressure [Pa]
- \( p \) = air density [kg/m³]

Note: Many manufacturers do not employ the basic formula but modified formulas. Always obtain the formula on which the value is based from the manufacturer.

Fitting
A 1/6 mm Ø hole is drilled in the sandwich plate or the control cabinet door and the measurement instrument is soldered into the aperture from the front side. The correct alignment of the instrument is indicated by an upwards-pointing arrow on the rear of instrument. Using a screwdriver, the threaded bolt is firmly screwed into the threaded bushing; the mounting bracket is placed over it and secured with the wing-nut. When connecting the pressure tubing, great care should be taken that the correct polarity is adhered to (+: pressure, -: under-pressure). Finally, the front panel can be snapped on.

The operating instructions can be found on the back of the front plate.

Figure 71

2) Using the pressure signal in other devices
Devices from other manufacturers may require a conversion of the K value. Therefore ask always the formula with 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 exchanger 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 avoided 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 on drain out and vent valve (on the condensate drain outlet) steam is coming out
- Close drain and vent valve and open steam valve fully.
- Check regularly vent valve during operation.

Attention!
For a temporary shutdown of the system, because of frost and corrosion, is to avoid that condensate is remaining in the pipes.

8.1.4 Electric heater
Observe specifications of chapter Electric heater page 36 - 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!

8.1.5 Filters
Differential pressure measuring device - U-tube manometer and inclined manometer- are optional and must be filled with the supplied test liquid (bottle) of density 1 kg/l.
Is a differential pressure switch is mounted (option) or is it installed on site, it is to set to the final pressure drop.
Information regarding final pressure drop can be found at the technical data sheet.

8.1.6 Humidifier / Air washer
Drain pan must be cleaned thoroughly. Pollution from construction dust can later cause failure of the pump. In this case, there is no warranty.
Check pumps strainer, washer nozzles and tubes for proper fit. Check pump strainer and clean it if necessary. 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.
For honey comb humidifier the float value must be set up to a water level of 80-100mm.
Ensure in any case, bubble-free suck in. Check the pump rotation direction (arrow on the pump). Measure the current consumption. Compare the values with the data on the nameplate.

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.

The water pressure for the water supply should be 3.0 bar. Maximum allowable pressure is 6.0 bar. For air washers the target pressure of the nozzles must be set at the built in discharge pipe regulating valve.

- Check the right set with a manometer.
- The bleed off quantity is to be setup at the bleed off valve.
- Recommended setting (thumb): Bleed off rate = evaporation rate

On request, we will advise you in determining the correct bleed off quantity. Check the proper installation of honeycomb and droplet eliminator. The arrow must point in direction of airflow (Figure 72). Check the tightness of the flange connection of the air washer / humidifier to the adjoining components. If necessary reseal. Combs made from cellulose material can have initially an odor that is normal and will soon disappear.

Figure 72

Water quality for air washer and evaporative humidifiers
Please check the supply water quality for air washer and honey comb humidifier. Critical to the need for water treatment is particularly the carbonate hardness of fresh water. Depending on water hardness and operational importance of the device, a suitable water treatment method is to select.
To ensure sufficient reliability, the recommended water qualities are shown in Table 5 below:

Table 5

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>clear, colorless, no sediment</td>
</tr>
<tr>
<td>pH value</td>
<td>7 to 8.5</td>
</tr>
<tr>
<td>Conductivity</td>
<td>max. 30 mS/m</td>
</tr>
<tr>
<td>Total hardness</td>
<td>max. 1.2 mol/m³</td>
</tr>
<tr>
<td>Carbonate hardness</td>
<td>max. 0.7 mol/m³</td>
</tr>
<tr>
<td>with carbonate hardness stabilization</td>
<td>max. 3.5 mol/m³</td>
</tr>
<tr>
<td>Total salt content</td>
<td>max. 250 g/m³</td>
</tr>
<tr>
<td>Chloride content</td>
<td>0 g/m³</td>
</tr>
<tr>
<td>Sulfate</td>
<td>0 g/m³</td>
</tr>
<tr>
<td>Manganese</td>
<td>max. 0.01 g/m³</td>
</tr>
<tr>
<td>Aggressive carbonic acid</td>
<td>0 g/m³</td>
</tr>
<tr>
<td>KMnO4-consumption</td>
<td>max. 20 g/m³</td>
</tr>
</tbody>
</table>

8.2 Refrigeration circuit

8.2.1 Generally

- Refrigeration equipment is subject to the EG Pressure Equipment Directive (97/23/EG) and requires special handling and special care.
- Start up the refrigeration circuit only if it was properly installed.
• Start up the refrigeration circuit only when it was evacuated and filled properly - Never start a compressor under vacuum. It is essential that the glide of refrigerant blends as R407C is carefully considered when adjusting superheat controls.

8.2.2 Refrigerant
Refrigerants used by Trane 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.

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.

8.2.3 Compressor lubricant
Compressor oil, 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 unit 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 unit 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.

Two cases can occur:

1. The airflow is too low. The reason is that the external pressure drop is higher than indicated on the technical data sheet.
   **Remedy:**
   By replacing or adjusting the pulleys the airflow can be increased.
   **Attention!**
   Increase the fan speed only to the extent that the motor rated current is not exceeded. If this is not enough only the motor replace helps.

2. The airflow is too high. The reason is, that the external pressure drop is less then indicated in the technical data sheet.
   **Result:**
   The electrical absorbed power rises sharply
   **Attention!**
   Possible motor damage due to overload.
   **Remedy:**
   Either change or adjust pulleys to reduce fan speed or reduce airflow by closing a damper partially.
8.3.1 Adjusting variable pulleys

Figure 73: Setting the smallest working diameter: H max see Table 6
Figure 74: Setting the biggest working diameter

Table 6

<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><strong>SPZ</strong></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></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>
<tr>
<td></td>
<td>RST 156</td>
<td>126</td>
<td>12</td>
<td>150</td>
</tr>
<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><strong>SPA</strong></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>
Changing the working diameter of a variable pulley
- Decrease the belt tension
- Open the over the disk circumference distributed screws (position see Figure 76)
- Twist the outer ring (the outer rings for pulleys with 2 slots) to the desired diameter, observe the limits as per Figure 72 and Figure 73
- Fix the Allen screws
- Tighten the Belts (refer to chapter Retensioning of belt page 53)

After a change of the transmission ratio, must be controlled in each case, the current consumption of the motor. 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 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.

9 Maintenance
Trane devices are built mostly maintenance free and easy to maintain. The maintenance intervals are indicative for normal operating conditions. Widely differing applications may require different intervals, ask Trane for details.

![Important Note](warning.png)

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 Safety instructions are to be observed!

Please understand that we cannot take care of damage caused by improper handling of solvents and cleaning agents, and no liability for mechanical damage. Solvents and cleaning agents may not contain alcohol for use on coated surfaces.

In order to avoid corrosion in case of components of stainless steel like drain pans or bottom take care that parts 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 Trane sales office.
9.1 Fan / motor group

9.1.1 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 / visual inspection
- Check vibration isolators for proper mounting / 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 function
- 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 sounds. The theoretical lifetime, depending on the operating conditions, is at least 20,000 hours. The fan bearings are lubricated for life, only the large fan sizes with pillow block bearings annually must be lubricated with adverse operating conditions according to the following Table 7 with lithium soap grease. After three lubricate the bearings must be removed, cleaned and greased again.

Table 7

<table>
<thead>
<tr>
<th>Ambient Conditions</th>
<th>Temperature range °C</th>
<th>Lubrication interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean</td>
<td>T &lt;50</td>
<td>6 - 12 months</td>
</tr>
<tr>
<td></td>
<td>50 &lt; T &lt; 70</td>
<td>2 - 4 months</td>
</tr>
<tr>
<td></td>
<td>70 &lt; T &lt; 100</td>
<td>2 - 6 weeks</td>
</tr>
<tr>
<td></td>
<td>€ 100</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></td>
<td>1 week</td>
</tr>
</tbody>
</table>

The following is an example of a fan bearing grease nipple (Comefri NTHZ)

Figure 3

Table 8: Recommended grease types

<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>

Plug fan

The fan is directly flanged to the motor due to the absence of the belt drive, it is a service friendly component. To reach the operating point, a frequency converter is required.

Deposits on the wheel can cause damage (risk of fatigue fracture) - impeller can burst - Danger!

- Visually inspect: Check the wheel for any particular weld cracking
9.1.2 Motor
- Check the motor for cleanliness and clean if necessary.
- Check motor bearings by rotating the shaft by hand and check with a metal rod for noise. In case of irregular or rough sound, the corresponding bearing must be replaced.
- Measure current consumption which must not exceed the rated current indicated on the nameplate.

Motor bearings
Small and medium sized motors are equipped with closed bearing running for several years without 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 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 9:

Table 9

<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>&lt;= 180</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>&lt;= 250</td>
<td>6</td>
<td>12</td>
<td>12</td>
<td>12</td>
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<tr>
<td>280</td>
<td>3</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

For different, unfavorable operating conditions, the intervals are to be reduced according to motor manufacturer’s instructions.

9.1.3 V-belt drive
The belt drive is a reliable, low-maintenance component provided that unfavorable working conditions as shown in Figure 78 up to Figure 81 which may reduce durability and result in reduced efficiency. The unfavorable conditions include high temperatures and inadequate filtered air and thus formation of deposits. Check 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 78

Figure 78

Slippage / pulley too small / overloading / damaged disc / eccentricity, wobble - Figure 79
9.1.4 Re-tensioning of belts

Moving the motor away from the fan does the tensioning of the belt. Depending on the size of the motor is this:
- On a rocker swivel
- On slide rails mounted.

Loosening the lock nut and then turning the adjustment screws make the adjustment.

It is important to maintain the alignment of the discs accordingly - Figure 82 and Table 10
This should be checked after each tensioning with a straight edge.
Table 10

<table>
<thead>
<tr>
<th>Pulley diameter d1, d2 in mm</th>
<th>Max. distance x1, x2 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>
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</table>

Figure 82
For quick results at the pulley alignment for factory mounted pulleys we recommend to set the same thread overhang of the threaded rods on the left and right side - *Figure 83*

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

**Belt tension**
The correct tension of the belt is obtained if you have the same data as calculated (separately for each drive). The necessary information to tension new and used belt can be found on the tensioning data sheet, which is on the inside of the fan door (*Figure 84*). Following two methods for determining the tensioning are described:

1) **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.

2) **Frequency Measurement**

Special measuring instruments that are based on frequency measurements are available on the market. Tension the belt so, that during the measurement you measure the same frequency as indicated on the fan data sheet.
9.1.5 Replacing of belts

- Loosen the belt tension so far that the old belt can be removed.
- Cleaned before putting the new belt pulleys and check for damage and wear.
- Never push the new belt with a tool on the pulley, to avoid damage which shorten the lifetime.
- 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 be damaged see Figure 85.

Figure 85

- Tension the belts, turn the drive a few turns with no load and re-measure the belt tension.
- Check axle and wheel alignment, see chapter Re-tensioning of belt.
- Repeat this steps correct alignment and belt tension.
9.2 Air filters

Filters are supplied loose with exception of side removable pre-filter. The filters should be installed on site.

9.2.1 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). Reaching the pressure difference indicated in the technical data sheet, cleaning or replacement is required.

Cleaning:
Remove, tap and vacuum or pressure clean (max. 5 bar) the filters. Wash the filter in max. 35°C warm water with mild commercial detergent, then rinse thoroughly.
Let greasy filters about 1h in suds. Do not wring cleaned filter, let filters drain before mounting. The synthetic fibers dry quickly and can be installed and put back into service also if they are still wet.
Clean also the filter section before remounting the filters, check filter tightness and reseal if necessary.
Filters can be cleaned 2-3 times then a replacement of the filters is necessary.
Internal removable
Side removable

Seals for filter and soft bag filter
Seals are self-adhesive and are supplied loose. Sealing: only the front side, only 1 sealing strip between the filters / between filter and door / between wall and filter

9.2.2 Bag filters

Contamination level of the filter can be controlled by the differential pressure drop (check every 14 days to 1 month). Reaching the pressure difference indicated in the technical data sheet cleaning or replacement is required.
Bag filters of class EU3, EU4 are repeatedly reclaimable. Clean the bags from the dust airside with a vacuum cleaner. This cleaning can be repeated several times. If this cleaning is not sufficient, also wet cleaning can be executed. Remove the bag filter, keeping the opening up, see Figure 86

Figure 86

Rinse the bag with upward opening with a not too strong jet of water. The mud must pass flushed through the filter material to the outside. Possibly, add to the water a little bit detergent. Let the clean filter bags drain well, they can be remounted wet and immediately put back into service. Clean also the filter section before remounting the filters, check filter tightness and reseal if necessary. Filters can be cleaned 2-3 times then a replacement of the filters is necessary. Filter elements in the clamping frame must be fitted with four springs per filter. Check air tightness! Bag filter with class EU5 and above cannot be regenerated and must be renewed after the first lifetime.
9.2.3  HEPA filters
Contamination level of the filter can be controlled by the differential pressure drop (check every 14 days to 1 month), replace filter if necessary. Check filter sealing and fastening. The filters clamps have to be tightened evenly.

9.2.4  Auto roll filters
Detailed maintenance instructions are in the auto roll filter section! These filters work automatically and can be monitored by the controlling device. A warning indicates the filter strip is finished. The filter roll must be replaced. Every six months the oil level is to check. Lubricate roller chain and gears. Use oil for the gears and chain wheels, according to the manufacturer instructions.

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

9.3.1  Medium Water / Steam
Heat exchangers special maintenance is not required, only occasional cleaning is recommended. Depending on the hours of operation and filter maintenance approximately every three months, the heat exchanger fins should be check for dust contamination, debris and cleaned if necessary. The piping is to check for leaks.

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

Figure 87

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. Check frost protection thermostat for correct setting.

Drain pan
Drain pan and drain should be checked for debris and cleaned, if necessary - Figure 87

Droplet eliminator
Check droplet eliminator about 1 a year for contamination. Remove fins and clean if necessary. Contamination can cause damage by water drops and reduce the performance of the device. Please make sure that the fins are installed properly and are not bent.

Steam Coil
Check automatic vapor supply stop and automatic fan run for some minutes, when after unit shut down.
9.3.2 Refrigerant

Refrigerant (direct expansion) same things to check as above, plus:
Check the evaporator for icing, dispensing head and the pipes must be check with leak spray for leaks.

9.3.3 Electric Heater

When working on the electric heater, refer to instructions in chapter Safety instructions beginning.
Check heaters for dirt and corrosion, clean heating elements if necessary. Check built-in safety devices and electrical parts for proper functioning.

9.4 Humidifier, Air washers

9.4.1 Pumps

The maintenance of pumps and motors is done according to the manufacturer's instructions.
In general:
- Regular cleaning of all components largely determines the hygiene of the entire system
- Never let operate the pump without liquid
- Protect the pump from any solids.
- 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.
- The need for a sterilizing system depends on the operating conditions and is to check case by case.

9.4.2 Air washers

- Check water supply for properly function and check the water level, adjust if necessary
- Depending on water pollution, hardness and processing the air washer are to rid of deposits and impurities: 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.
- Replace corroded or damaged droplet eliminator fins.
- Check sieves for dirt deposits and clean if necessary.
- Disassemble and clean the nozzles.
- Check water tank overflow, and U-trap for debris and clean if necessary
- Damage nozzles are to be replaced. Never clean the nozzle holes with hard objects.
- Clean drain valve with, high-pressure water.
- Check the bleed of valve settings and proper function.
- Check pump piping for leaks
- Check hoses for cracks, replace if necessary
- Check that hose clamps are tight.

9.4.3 Steam humidifiers

Maintained according to manufacturer's instructions:
The following information's are general rules:
- Check water sieves for contamination and clean if necessary
- Check operation of solenoid valves, and clean if necessary
- Check steam distribution for deposits
- Check steam supply for leaks
- Check function of the condensate drain.
- Check electrical contacts on the pump for corrosion.
- Measure the current consumption
- Clean entire piping system, control and safety devices. Check proper function, measuring the humidifier performance.
9.4.4 Honey comb humidifiers
Please refer to the indications for air washers. Heavily calcified honeycomb packets must be renewed. In mild calcification the packed can be cleaned by adding decalcify to the circulating water (shut down the unit before adding decalcify). After that clean the section and tubes properly with fresh water.

9.4.5 Spray tube humidifiers
Please refer to the indications for air washers.
- Remove tubes and nozzle for cleaning
- Clean drain pan and drain

9.5 Dampers
EUROCLIMA dampers type J are nearly maintenance free. Check for dirt, damage and corrosion, clean if necessary with compressed air or steam jet. Check the function, spray the wheels with silicone spray if necessary.

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

9.6 Sound attenuators
The Silencers are basically maintenance free. In the context of larger maintenance they can be checked for dust and cleaned with a vacuum cleaner.

9.7 Weather louver
Check for dirt, damage and corrosion, free from leaves, paper, etc.

9.8 Energy recovery systems

9.8.1 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 max. allowed. The only maintenance required is cleaning:
Clean the condensate drain, control and fill the U-trap. The plate pack is normally self-cleaning.
- Removed fibers and dust at the exchanger inlet with a brush
- Clean oils and greases with hot water, household cleaners or degreasing steam.
- check for proper operation of differential pressure switch – for function refer to chapter Differential pressure restriction for plate heat exchangers
If there is a bypass damper, please refer to chapter Dampers

9.8.2 Heat wheels
Check the drive unit according to manufacturer's instructions. 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 check and adjust if necessary.

9.8.3 Heat pipes
Heat pipe components have no drive or moving parts, maintenance is limited to cleaning:
Clean the drain pan and U-trap.
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 exists, please refer to 6.6.
9.8.4 Accublocks

Electrical connection:
The Accublock is supplied including controller supplied loose (configured with default values), including operating instructions. On site must be provided:

1) Power supply 3x400V (efficiency according to technical data sheet)
2) Control signal 0-10V

![Figure 65](image)

![Figure 88](image)

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

The only maintenance required is periodic cleaning of the memory blocks. The cleaning intervals can define by visual inspection.

The memory blocks are to take off as follows for cleaning:

- Switch the safety switch to OFF, it must be ensured that the Accublock - control is off
- Dismount the unit wall on the access side
- Dismount the cover sheet for the damper linkage.
- Dismount the damper linkage
- Unscrew the metal cover
- On site an adapted devise must be mounted on the Accublock frame, which allows the extraction of the memory blocks. The devise should contain a guide and an end stop, similar to the internal management. Be careful! The memory blocks run very easily.
- The second memory block is reachable when the wall between the memory blocks is pulled out. Therefore are two handle holes on the upper half.
- The memory blocks should be cleaned with water with less than 20 bar and with a distance of about 20cm from the surface of the memory block. If chemical cleaning additives were used they should be suitable for aluminum (alkali-free).

9.9 Refrigeration circuit

To ensure the environmental requirements, the operational reliability and a long lifetime of refrigeration circuit periodic leakage and maintenance checks are required.
9.9.1 Leakage checks

- to be performed according to EU-regulations indicated in Records for refrigeration circuit application in air-conditioning units supplied by Trane. Execution by certified refrigeration technician at intervals that depend on the refrigerant filling quantity.
- to be documented in Records for refrigeration circuit application in air-conditioning units.

The type of refrigerant and the refrigerant charge 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 (datas from EN378 part 1):

- R407C: GWP = 1650
- R134A: GWP = 1300

9.9.2 Maintenance

- to be performed only by qualified personal and at least once a year
- to be documented in supplied Records for refrigeration circuit application in air-conditioning units

Circuit:
Check pressures and temperatures of the system; pay attention to unusual operating noises and to possible vibrations.

Compressor:
Check oil sight glass in the crankcase (if present); in the on mode must be visible oil in the sight glass; otherwise must be checked if there has been loss of oil (even outside of the unit is possible); and optionally fill in oil directly by an oil pump directly into the compressor suction side. Only use oil that is approved by compressor manufacturer.
Out of compressor operation 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.
Follow maintenance and inspection requirements of compressor manufacturer. These instructions are supplied from Trane or can be ordered from Trane.

Filter drier:
Each refrigeration circuit is equipped with a filter drier. If refrigeration circuit has to be repaired 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 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 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 to 5 to 10K. Check that the temperature sensor is correctly fitted as well as the pressure compensation pipe.
With an electronic expansion valve the corresponding values must be followed by control unit. Instructions from valve manufacturer are supplied by Trane.

High pressure safety switch:
The high pressure switch stops the compressor when the allowed equipment pressure is exceeded. Check if the switch releases correctly.

Low pressure safety switch:
The low pressure switch stops the compressor when the equipment pressure decreases the allowed low pressure. Check if the switch releases correctly.
Handling:
If the unit goes into high or low pressure the problem must be acknowledged at the control panel for the compressors to start again.

9.9.3 Inspection
May be carried out by the operator in trimestral intervals

All equipment:
Have a look for loosen links, fasteners etc., tighten if necessary. Pay attention to unusual noise. Have a look for oil leakage on components and joints.

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 vacuum cleaner.

Compressor:
Check oil sight glass in the crankcase (if mounted). Pay attention to unusual noise. recommendations of the compressor manufacturer should be observed. These instructions will be included with delivery or can be ordered from Trane.

Coolant contents:
Check the inspection glass in the liquid line, to see whether the inspection glass is completely full. Under full load, if bubbles appear in the inspection window, the contents are not in order and must be rectified by a specialist. The appearance of bubbles under partial load 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, clean or rinse out condensate outlet from time to time.

9.10 Hygienic units

The maintenance plan for Trane AHU’s you will find in the general part of instruction manual. Trane recommends a maintenance based on VDMA 24186 part 1 and VDI6022 part 1. In chapter 5 of VDI 6022 part 1, you can find detailed requests on operation and maintenance.

Trane recommends as cleaning agent Allrain or Multirain, as disinfectant Sanosil or Sanirain of Hygan.

9.11 Maintenance plan

The maintenance intervals specified in the table below 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, 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>
<thead>
<tr>
<th>Component</th>
<th>Action</th>
<th>Section</th>
<th>Monthly</th>
<th>½ year</th>
<th>Year</th>
<th>Chapter</th>
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<td>flexible connection</td>
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<td>Ch</td>
<td>vibration isolators</td>
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<td>according to Table 7 page 51</td>
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<tr>
<td>refrigeration circuit</td>
<td>Ch</td>
<td>leakage check</td>
<td>&gt;300 kg</td>
<td>&gt;30kg</td>
<td>&gt;3kg</td>
<td>Leakage checks, page 62</td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>maintenance</td>
<td></td>
<td></td>
<td>X</td>
<td>Maintenance, page 62</td>
</tr>
<tr>
<td></td>
<td>Ch</td>
<td>inspection</td>
<td></td>
<td></td>
<td>X</td>
<td>Inspection, page 63</td>
</tr>
</tbody>
</table>
10 Information on airborne noise emitted by the air conditioning units - on request

Sound data can be printed on request on the technical data sheet, samples see below 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]</td>
<td>68.0</td>
<td>81.0</td>
<td>78.4</td>
<td>62.0</td>
<td>56.2</td>
<td>50.7</td>
<td>41.1</td>
<td>32.6</td>
<td>71.9</td>
</tr>
<tr>
<td>2&gt; Sound power level air inlet [dB]</td>
<td>+/− 4 dB</td>
<td>53.2</td>
<td>90.0</td>
<td>95.0</td>
<td>87.0</td>
<td>77.0</td>
<td>74.0</td>
<td>72.0</td>
<td>66.0</td>
</tr>
<tr>
<td>3&gt; Sound power level air outlet [dB]</td>
<td>+/− 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>75.0</td>
</tr>
<tr>
<td>4&gt; Sound press. for 1 [m] distance from AHU</td>
<td>66.7</td>
<td>61.7</td>
<td>59.1</td>
<td>42.7</td>
<td>36.8</td>
<td>31.4</td>
<td>21.8</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>85.8</td>
<td>83.3</td>
<td>90.0</td>
<td>81.5</td>
<td>71.7</td>
<td>69.8</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>93.0</td>
<td>83.5</td>
<td>80.7</td>
<td>78.6</td>
<td>74.1</td>
<td>70.1</td>
<td>85.1</td>
</tr>
</tbody>
</table>

Calculated sound pressure levels are indicative only. It corresponds to: free field hemispheric sound radiation from the unit casing (4), the inlet (5) and the outlet (6) opening. Other sound sources, acoustic character of the room, air flow noise, duct connections and vibrations can influence the sound pressure in dependence. In practice, therefore measured values on site may be different from the calculated ones.

Figure 89

11 Disposal

The operator is responsible for disposing of the shipment (packing material), operation (filters, tools, spare parts etc.), and for the disposal of the air handling unit itself. A standard AHU consists of 95% recyclable metallic materials. For isolating the equipment mineral wool is used which is mechanically fastened to the walls. Filter made of synthetic fibers can be offered. The used materials are listed in the technical data sheets supplied with the AHU. The disposal of the material must be done by equipment, qualified technicians according to the international, national and local regulations.

Note: Regular maintenance is essential for a long service life of AHU and ventilation equipment.

12 Atex units

The ignition hazard assessment was according to EN 13463-1:2001 and EN 1127-1:1997 performed.
Applied protection: EN 13463-5 Protection by constructional safety “c”

12.1 General

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 12 described.

Group I: Underground facilities

Group II: surface installations, category 1, 2 and 3

Letters: G gases, vapors, mists
D Dust

Table 12
<table>
<thead>
<tr>
<th>Unit category</th>
<th>Selection for type of explosive Atmosphere</th>
<th>Avoidance sources of ignition</th>
<th>Degree of security</th>
<th>Use in Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 G</td>
<td>Gas / Gas-mixture or Steam/ Gas-mixture or fog</td>
<td>Even in rare malfunctions</td>
<td>very high</td>
<td>0</td>
</tr>
<tr>
<td>2 G</td>
<td>Gas / Gas-mixture or Steam/ Gas-mixture or fog</td>
<td>Even with the usual malfunctions</td>
<td>high</td>
<td>1</td>
</tr>
<tr>
<td>3 G</td>
<td>Gas / Gas-mixture or Steam/ Gas-mixture or fog</td>
<td>In normal operation</td>
<td>normal</td>
<td>2</td>
</tr>
<tr>
<td>1 D</td>
<td>Dust / Gas-mixture</td>
<td>Even in rare malfunctions</td>
<td>very high</td>
<td>20</td>
</tr>
<tr>
<td>2 D</td>
<td>Dust / Gas-mixture</td>
<td>Even with the usual malfunctions</td>
<td>high</td>
<td>21</td>
</tr>
<tr>
<td>3 D</td>
<td>Dust / Gas-mixture</td>
<td>In normal operation</td>
<td>normal</td>
<td>22</td>
</tr>
</tbody>
</table>

Classification according to surface temperature for devices of group II G:

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

For devices of group II D, the maximum surface temperature is specified.

The maximum allowable surface temperature must always be lower than the ignition temperature of the explosive atmosphere.
12.2 Information regarding the unit, protective systems and components

Example of designation:

- **Group**
- **Category** (2 inside / 3 outside)
- **G** Gas, D for Dust
- **Designation of type of protection**
- **Temperature Class**

Evidence of compliance with EC - Directive 94/9/EC (ATEX 95a)

The manufacturer declares conformity to ATEX, in addition to equipment in category 2, the technical documentation in accordance with EC Directive 94/9/EC of TÜV South Germany deposited.

**Type of use:**

- **II 3 G c T3** (inside)

The AHU are designed for processing and transport of explosive atmospheres of Zone 2 but not for installation in Zone 2. Equipment in this category provide in normal operation, the required level of security.

- **II 2 G c T3** (inside)

The AHU 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 in this category must provide themselves with frequent disturbances or equipment faults, which normally have to be considered, the required level of security.

- **II 2/3 G c T3** (inside / outside)

The AHU are used for processing and transport of explosive atmospheres of Zone 1 and for installation in Zone 2. The device-specific explosion protection, within this category must provide themselves with frequent disturbances or equipment faults, which normally have to be considered, the required level of security.
Air leakage rate:

The air leakage rate of the air conditioner is determined at a vacuum of 400 Pa. The device corresponds to the tightness class L1 to EN 1886. Tightness Class L1 corresponds to a maximum air leakage rate of 0.15 l/(s*m²).

This must be considered, therefore installation of equipment in areas with natural convection.

During maintenance work must be ensured, that no explosive atmosphere is present.

Ensured before starting the system that all doors are closed and properly sealed so that there are no leaks and the device cannot be opened unintentionally.

The following conditions must prevail:

On the intake side and in the vicinity of the device, the temperature shall not exceed -20 °C to +60 °C.

An atmosphere with pressures from 0.8 bar to 1.1 bar shall be present in the environment of the AHU.

12.3 Information for commissioning, maintenance and repair

12.3.1 Foundation and installation
Refer to chapter Foundation / installation on page 14

The AHU must be connected to an external ground wire system.

12.3.2 Mounting connections
Motor:
Electrical connection, refer to chapter AC motors on page 32: standard repair switches must be mounted outside the hazardous area.
Connecting potential compensation: according to the provided instructions of the motor manufacturer.

All conductive connections (WT piping, U-trap, channels, ...) must be connected to a potential compensation.

It must be ensured that parts that are necessary to achieve the degree of protection, cannot be removed accidentally or unintentionally.
All doors are equipped with a closure device. The doors must be locked and the key removed.

During maintenance ensure that no tools or other objects remain in the unit or duct system, to avoid malfunctions and sparks. (Risk of explosion!)

12.3.3 Fan section
Refer to chapter Fan / motor group
Belt: It's only allowed to use electrically conductive, flame retardant and self-extinguishing belts (ISO 9563 or ISO 1813).

Use original spare parts.

In addition to these data, the guidelines included in the operating instructions of the fan and motor manufacturer are to follow.
12.3.4 Filters

It's only allowed to use electrostatic deductive filter.

Use original spare parts.
For filter types that are equipped with potential equalization cable, each filter cell must be connected to the potential settlement with the AHU in the fixed-mounted metal filter frame using self-tapping screws or bolts.

To prevent the formation of an explosive atmosphere by stirring up of dust deposits, the equipment have protective systems and components designed to avoid deposits of combustible dusts as far as possible. Therefore, for all components corresponding service openings are provided.

Periodically the AHU shall be cleaned (depending on the amount of dust) from dust.

12.3.5 Heat exchangers / steam humidifiers

The in the data sheet indicated heat exchange medium temperature and the steam humidifier surface temperature shall not be exceeded. Otherwise, the specified temperature class is no longer valid - danger of explosion! - and the declaration loses its validity.

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 device loses its declaration.

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