Installation
Operation
Maintenance

CCE-Compact
Air Handling Unit

March 2021 AH-SVX007B-GB

TRANE TECHNOLOGIES

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

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

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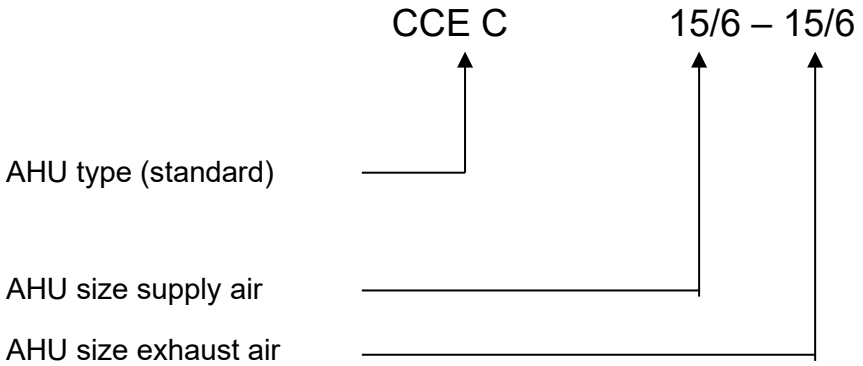
- Original Instructions -

1 Introduction

This is the instruction and operation manual for an air handling unit, hereinafter designated as 'AHU'.

1.1 Model code



Legend used for AHU type

CCE VISION	casing type with thermally decoupled version T2-TB1
CCE C	casing type with thermally decoupled version T2-TB2
CCE B	casing type version T3-TB2
CCE COMPACT	compact AHU series with thermally decoupled version T2-TB2
ETA XXX	key ETA: including control
ETA POOL	compact AHU for pool dehumidification with refrigeration circuit (option)
ETA PAC	indirect adiabatic cooling
ETA MATIC	control for AHUs

Design key AHU execution

S	AHU for indoor installation
DG	AHU for outdoor installation
I	AHU Industrial – heavy version of the panels
HG	AHU hygienic execution

Legend for the AHU size

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

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

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

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

1.2 Intended use / foreseeable misuse

1.2.1 Intended use

The AHU is used, depending on the chosen purpose for
- transportation and conditioning of air in and out of buildings, in which humans stay
- creation of a desired room air quality in the occupied area of humans
- creation of an acceptable comfort or desired working conditions
- depending on the AHU type, the air conditioning is done primarily by
    - Air change
    - Control of air temperature and air humidity
    - Filtration of normal polluted air
    - Filtration at specific requirements (clean room and so on)

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

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

Components provided by the customer
If it is planned and agreed, that TRANE installs components in the AHU, which are provided by the customer, TRANE only accepts liability, if there are significant mistakes in construction.
The warranty for proper functionality of the provided components as well as the component concerned safety requirements is excluded.
For AHUs with components provided by the customer no CE-conformity is generated due to this reason.

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

1.2.2 Foreseeable misuse

Other than above use, is considered as improper and must be excluded totally:
- The commissioning of equipment, prior to performing the steps indicated in the assembly instructions and operating with the fan section door open, is a serious security risk.
- Opening the AHU, without securing the main switch in the off position, represents a massive security risk.
- The operation of an AHU equipped with an electric heater while the fan-motor is cut off, or if the fan is working at a limited airflow, for example, caused by closed dampers or similar and with the electric heater in operation produces an imminent fire risk.
- The operation in an explosive atmosphere is prohibited.
- Handling of air with corrosive / aggressive components.

- Pressure-sided doors can detach suddenly while opening. So, there is a risk of injury for the user. See chapter **5.2 Doors.**

1.3 Modular design

Because of the modular AHU design, the instruction manual covers all the possible sections and components which can be delivered. The ordered range is smaller and can be seen on the technical data sheet - see **chapter 1.4 (Documentation**).

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

1.4 Documentation

The AHU will be delivered with the following documentation:

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

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

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

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

K-value for airflow measurement	There is a cardboard box for loosely delivered parts inside of the AHU.

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

You will also find stickers with warning labels and other instructions on and inside the AHU.
In this manual and on labels used symbols:

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

Indication to avoid damage

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

2 Safety instructions / Guidelines to conformity to laws and directives

2.1 Indications for minimizing specific hazards

2.1.1 General indications

An improperly performed maintenance can pose a security risk!

Risk of thin sheets, when working on AHU

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

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

Firefighting in case of fire
In general, the local fire protection regulations must be observed.

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

Exposure to harmful substances in case of fire

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

Exposure to rotating parts / hot surfaces / electrocution
When working on and/or in the AHU note the following risks:

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

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

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

Therefore it must be ensured that prior to working on and/or in the AHU, that…

- all current-carrying parts, such as cable plug connections, fan motors, valves, motors and electric heaters are disconnected from the power supply by using the main switch (emergency stop) and that the switch is locked in position 'off' in order to effectively prevent a re-activation during the work. The housing of the AHU interior lighting (can have separate supply) is not current-carrying.
- all moving parts, especially the fan wheel, motor and heat wheel have come to a standstill; wait at least 5 minutes after switching off before opening the doors.
- 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 is interrupted and all the heat registers, heat exchangers, etc. are cooled to ambient temperature.

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

Start of the AHU

Ensure after working and before the start that…

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

Storage of potential energy in gases and fluids

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

Preventing the risk of explosion and fire spread

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

Prevention of exposure caused by antifreeze agents

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

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

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

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

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

2.2 CE-conformity / installation instructions for safe operation

2.2.1 CE-conformity / incorporation declaration according to Machinery Directive 2006/42/EC

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

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

The AHU is always only a part of the building system and requires supplements on-site, that means in responsibility of the customer. Therefore, for a **safe operation**, the general in **chapter 2.1 (Indications for minimizing specific hazards)** and in particular in the following chapters described on-site work must be carried out exactly before the initial start-up. The AHU must be mounted and operated professionally, according to the specifications in this operation manual. The safe operation of the AHU in the overall building system is thus the responsibility of the customer.

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

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

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

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

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

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

2.2.3 Installation instructions for the proper installation in the building system

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

Assembly of delivery sections
The delivery sections of the AHU must be assembled and linked together, according to the drawing supplied on the inner face of fan section door. See the **chapter 4 (Foundation / erection)**.

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

Main switch
See **chapter 7.2 (EC motors**).

Installation of filters
See **chapter 5.4 (Airfilters)**.

Temperature limitation
Ensure that a control system is fitted and that the AHU is only operated with a supply air temperature below the allowable maximum (see **chapter 1.2.1 Intended use**, when not stated otherwise in the technical data). For this purpose, the continuous monitoring of the supply air must be ensured on site.

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

Measures to minimize the risk of water damage or damage caused by similar media
See **chapter 4.2.2 (Actions to prevent potential risks).**

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

Electric heater
Installation (if not supplied by TRANE) and connection of thermostats for safety shutdown, see **chapter 7.4 (Electric heaters)**.

Siphons
Connecting according to **chapter 6.2 (Drain for condensate and excess water)**.

Flexible connection
Installations (if not supplied by TRANE) refer to **chapter 6.3 (Duct connection – airside connection to AHU)**.

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

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

Freeze protection
The customer must ensure sufficient freeze protection measures. See indications in **chapters 4.2.1 (Potential risks that may arise at the erection site), 4.2.2 (Actions to prevent potential risks)**, 6.4 **(Freeze protection measures)** and **7.5 (Frost protection for plate heat exchanger)**.

Venting, draining of heat exchangers
See chapter **8.1.2** (**Heat exchanger**).

2.3 Conformity to laws and directives

2.3.1 General

The AHU will be built and delivered according to the agreed specifications and exactly to your requirements. It is important to note that the AHU is a part of a system and that the AHU is only after assembling and connection to the system ready for operation. It is normal, that the AHU is ready for operation only after installation-work.
Depending on the particular application and country-specific requirements and laws it is possible, that the AHU does not meet the valid requirements at the ordered state at delivery.
Therefore, you – the customer and installer of the AHU – are obligated – before commissioning of the AHU to check the conformity of the entire system to the valid laws and directive.
If there are any doubts about the conformity of the AHU with the local (on site) valid laws and directives, the AHU is only allowed to be put into operation, if the conformity of the AHU in the system is unequivocally guaranteed.

2.3.2 Conformity to VDI 6022

The AHU of the series CCE Compact in basic design complies with the hygiene requirements of VDI 6022.

Basin in the outside-air intake section
The AHU CCE Compact is not equipped with a basin in the outside-air intake section as standard. In order to fulfill the requirements of VDI 6022 a tub must be installed in the area of the fresh air intake section, depending on the location of the AHU. Additionally, the entrance of water, fog, snow etc. has to be prevented by a measure on site. If necessary, an additional intake plenum with drain-pan has to be provided.
On request an appropriate plenum can be offered. For this purpose, contact your TRANE-partner.

Maintenance-friendly accessibility of all components

All components of the air handling system have to be accessible on inflow and outflow side. This means that ducts with access doors have to be provided on site in order to provide accessibility.

Intake grids at openings of outdoor AHUs
According to VDI 6022 all intake openings have to be equipped with an intake grid (mesh size 20 x 20 mm).
Such intake grids are optional and can be ordered on request. However, the mounting of intake grids at all intake openings has to be ensured on site.

Door adjustment at outdoor AHUs
Hinged doors at outside AHUs have to be secured by an appropriate fixture against shutting. Such equipment is optional and can be ordered on request. Anyway, the system operator is responsible for ensuring such appropriate measures.

Manometer for filter monitoring
According VDI 6022 at a volume flow > 1000 m³/h manometer have to be installed for filter monitoring. These could be ordered at TRANE as an option. However, the filter monitoring has to be ensured on site.

2.4 ErP conformity according to directive (EU) 1253/2014

The ErP directive (energy related products) determines minimum requirements to the efficiency of air handling units. Important points, for which the system operator is responsible, are:

Multi staged control
All AHU`s, except those with double application, have to be equipped with multi staged drive or speed control for fans. See **chapter 7 (electrical connection)**.

Filter change indicator
If one or more filter stages belong to the AHU equipment, then they have to be equipped with an optical display or an acoustic warning in the controlling. They will be triggered if the pressure drop at the filter exceeds the maximum permissible value. See **chapter 9.3 (air filters).**

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

2.5 Staff selection and qualification

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

All work must be carried out by professionals who have sufficient technical training, experience and sufficient knowledge of…
- Locally applicable safety and occupational health rules
- Locally valid accident prevention regulations
- Locally applicable standards and approved rules of practice.

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

Execution of the assembly, installation, electrical connection, commissioning and disposal:
- by qualified electricians and AHU technicians.

Execution of maintenance / monitoring of the operation:
- by technical staff or trained personnel and qualified electricians and AHU technicians.

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

3 Reception control / unloading / transportation to installation site

3.1 Reception control

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

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

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

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

Devices shall not be climbed. If unavoidable: weight must be compensated by use of boards.

Figure 1: Do not climb on the AHU!

3.2 Lifting by forklift / lift truck

In accordance with the TRANE drawing the AHU will be delivered as monobloc or more delivery section(s). The AHU parts or the monobloc are delivered on pallets and can be unloaded and moved by forklift or lift truck. Forces must always act on the base frame, see **Figure 2**.

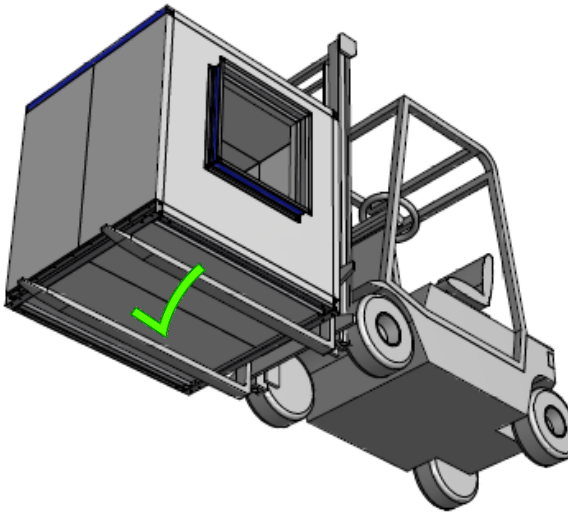


Figure 2: Transport correct

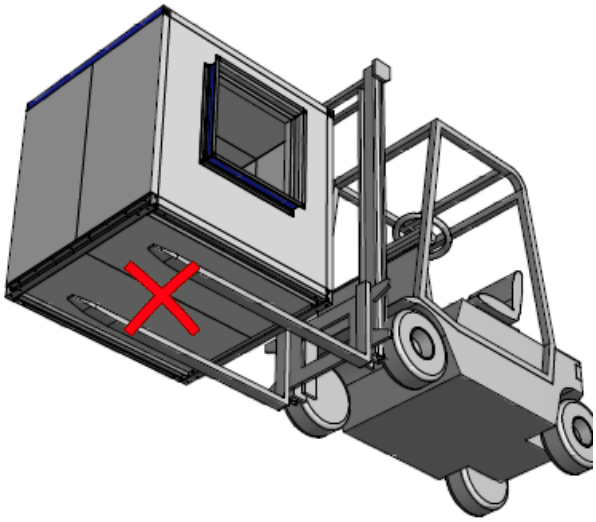


Figure 3: Transport incorrect

Center of gravity must be centrally located between the forks (see **Figure 4**). For large parts use several lift trucks.

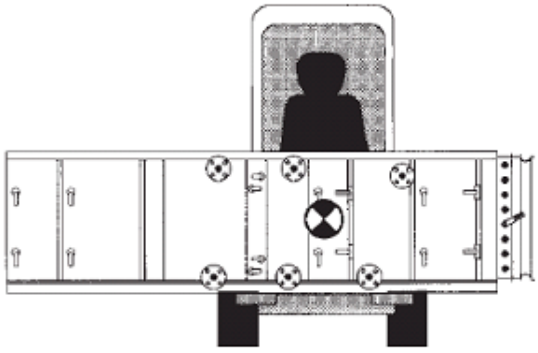


Figure 4: Center of gravity centrally between the forks

For the overlifting directly by crane from the truck applies the following **chapter 3.4 (Lifting of CCE Compact AHUs)**.

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

- Make sure that nobody is under the raised load.
- The AHU sections or monoblocs must be lifted with appropriate equipment e.g. belt with hook.

- The ropes, hooks and crane lugs used must be suitable for the load, see **chapter 3.4.1 (Weight specifications of CCE Compact AHUs and additional parts)**.The influence of the temperature on the load capacity must be taken into account.
- The recommended minimum load capacity per load carrying equipment is 50% of the total weight of the delivery section or monobloc.
- Only use lifting hooks with locking device. The hooks must be securely fastened before handling.
- The length of the supporting means must allow a favourable course. The load carrying equipment is not permitted to exceed an angle of maximum 15 ° to the vertical and must be spread apart to avoid damage to the casing, refer to **Figure 5.**
- The course of the load carrying equipment must be chosen so that overhanging attachments, roofs and the like will not be stressed or damaged.
- Load carrying equipment shall not run over sharp edges and is not allowed to be knotted.
- The load carrying equipment must be secured against slipping off.
- Before lifting, check the screw connections of the crane lugs and the correct assembly as described in **chapter 3.4.2 (Mounting of crane lugs).**
- Lift the AHU very slowly and completely horizontally. When lifting, a maximum lifting speed of 10 m/min is permissible.
- After the section is lifted slowly from the floor for a few centimeters, stop the operation. Now check the correct course of the load carrying equipment and that the lifting and fastening elements are all secure and safe.
- Before further lifting, check by visual inspection that no conspicuous deformations can be detected on the suspension means.
- Avoid jerky lifting.
- Never lift AHU sections or monoblocs on heat exchanger connections or other attachments.

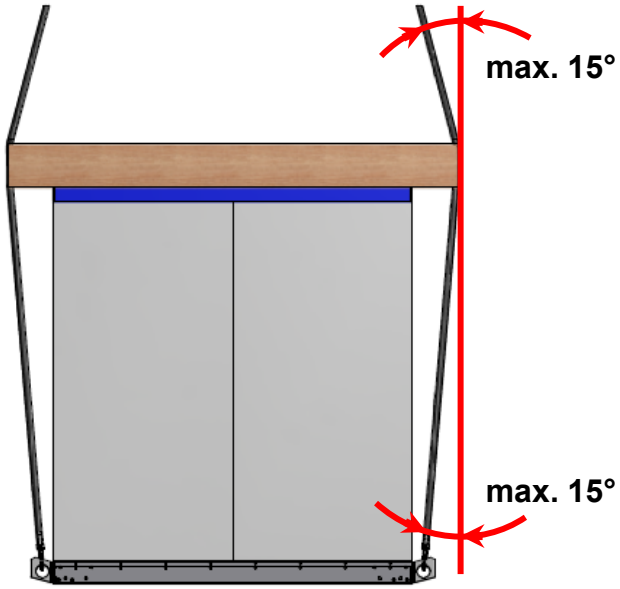


Figure 5: Permitted angle for load carrying equipment guidance

3.4 Lifting of CCE Compact AHUs

AHUs of the series CCE Compact type (size) 45, 55 and 65 are usually delivered as monobloc. As monobloc are called AHUs that can be lifted as a single section. In the CCE Compact AHU-series this applies to the variants with plate heat exchanger and with heat wheel of the type (size) 45, 55 and 65, see **Figure 6**.

However, it is a CCE Compact of the type (size) 80 delivery is in two (heat wheel) or in three (plate heat exchanger) AHU sections see **Figure 7.** For those AHU sections and any additional AHU option, the same specifications apply for lifting the AHU as for a monobloc, which are described in this chapter.

Every option / additional part (chiller or E-heating coil) must be lifted in each case separately.

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

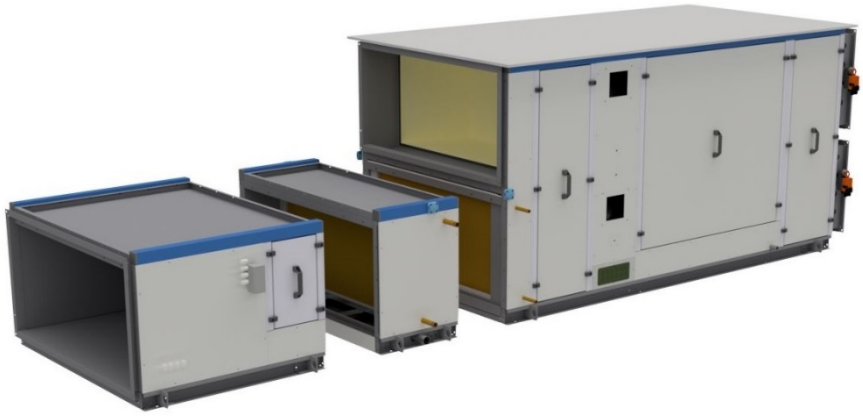


Figure 6: CCE Compact monobloc and additional parts (chiller and E-heating coil)

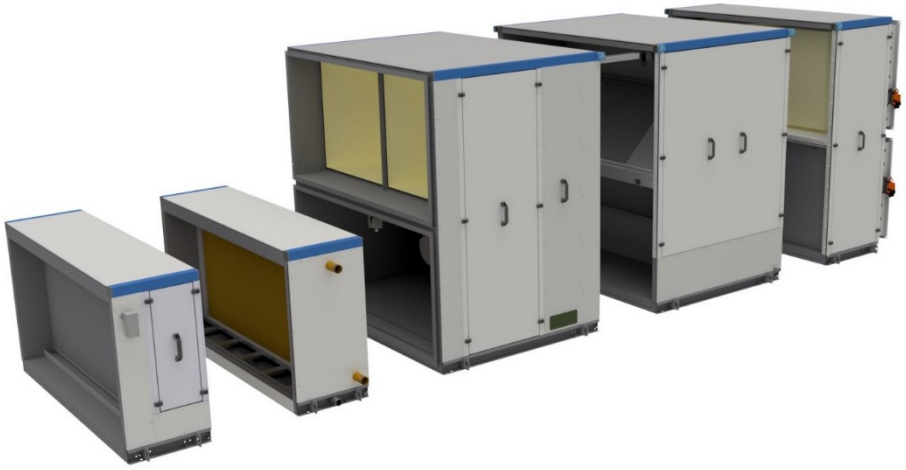


Figure 7: CCE Compact 80 AHU sections and additional parts (chiller and E-heating coil)

3.4.1 Weight specifications of CCE Compact AHUs and additional parts

CCE Compact AHUs of type (size) 45, 55 and 65 and additional parts have depending on type (size) and variant the weights as listed in **Table 1**, and AHUs of the series CCE Compact type (size) 80 as listed in **Table 2**. The delivered crane lugs may be used for lifting CCE Compact AHUs which have these maximum weights. It is required, that the weight is equally distributed on all 4 correctly mounted crane lugs. If there are more than one AHU part, they must be lifted separately.

	type 45 weight in kg	**type 55 weight in kg**	**type 65 weight in kg**
Variant with plate heat exchanger	440	560	740
Variant with heat wheel	410	530	700
optional chiller (additional part)	80	90	120
optional E-heating coil (additional part)	115	140	155

Table 1: Weight specifications CCE Compact AHUs type (size) 45, 55 and 65 and additional parts

	type 80 weight in kg
Variant with plate heat exchanger: section 1	350
Variant with plate heat exchanger: section 2	270
Variant with plate heat exchanger: section 3	250
Variant with heat wheel: section 1	470
Variant with heat wheel: section 2	350
optional chiller (additional part)	140
optional E-heating coil (additional part)	185

Table 2: Weight specifications CCE Compact AHU type (size) 80 and additional parts

3.4.2 Mounting of crane lugs

4 crane lugs are supplied loose in two versions – mirror inverted. These lugs must be mounted at the specific positions at the base frame of the AHU.

Execution of the lifting lugs (see **Figure 8**):

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

Attention to correct mounting of the crane lug according **Figure 10**.

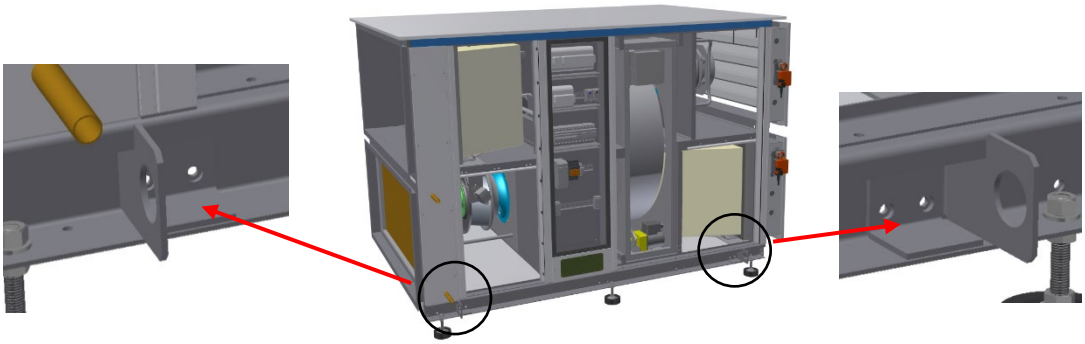


Figure 8: Right-side and left-side crane lifting lug

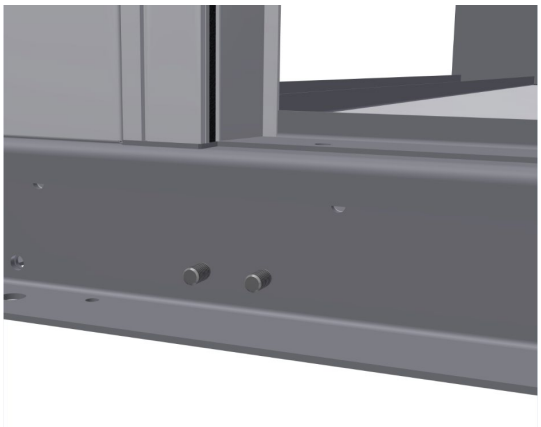


Figure 9: Crane lug dismounted

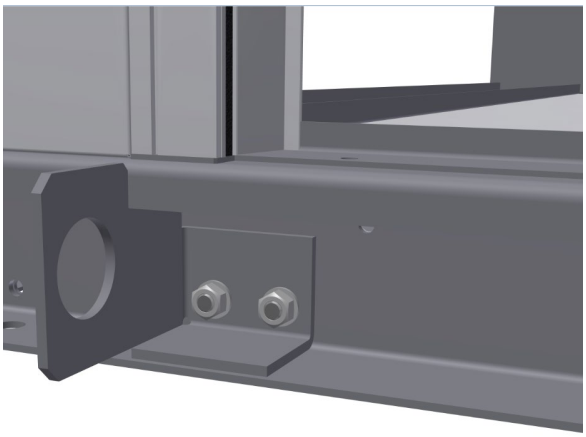


Figure 10: Crane lug mounted

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

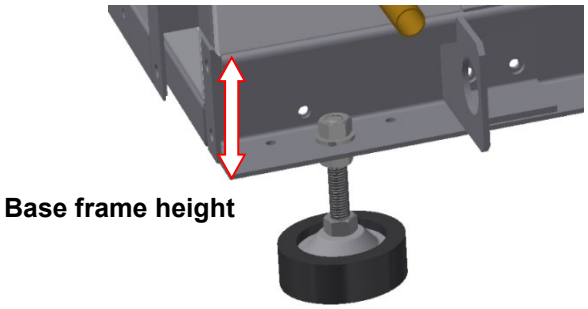


Figure 11: Base frame height

Base frame height H (mm)	Bolt type	Nm	Strength class
80	M8x20	10	min. 8.8

Table 3: Tightening torque for bolts

3.4.3 Lifting of CCE Compact AHU by crane lugs

- The load effect has to take place uniformly across all four crane lugs.
- The definition of the load carrying equipment is the responsibility of the executing company.
- The correct guidance of the load carrying equipment according to **Figure 12** must be observed.
- After the pre-positioning of the delivery section at the desired position, remove the lifting lugs and use them for the next delivery section.

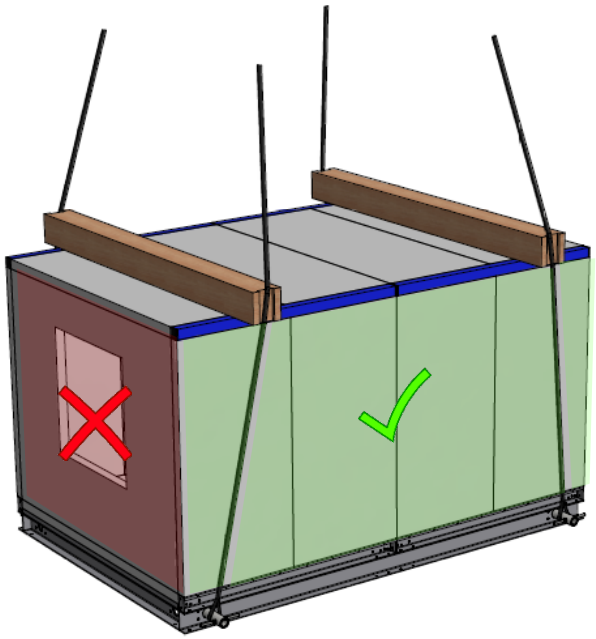


Figure 12: Guiding of load carrying equipment (schematic illustration)

3.5 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. The insertion into a dry area after unloading is therefore essential for the preservation of the AHU.

Standstill maintenance

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

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

Removal of nylon packaging

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

If
you want to please to yourself, the planner, the owner and other observers of the AHU,
then
we strongly recommend covering and protect the AHU against dirt and damage during the installation and commissioning process, see **Figure 13**.

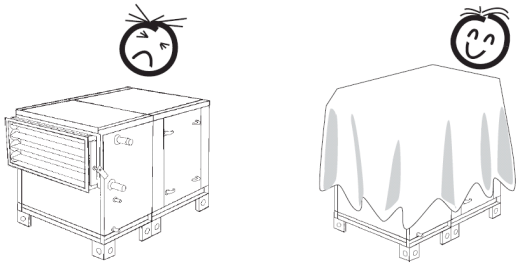


Figure 13: Protection against dirt

4 Foundation / erection

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

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

4.1 Foundation

Recommended are solid foundations of reinforced concrete, as shown in **Figure 14** left, or strip foundations, as shown in **Figure 14** right. For strip foundations, concrete or steel beams shall be used, see **Figure 14** bottom-right. Steel beams constructions must have an appropriate stiffness in relation to the AHU size. The foundation must be flat and leveled, it may not have fall in any direction or uneven surfaces.

AHUs must strain via baseframe in longitudinal direction and cross direction optionally in form of strips or point like the foundation. The distance of the strip or point contact surfaces **must not exceed 1,500 mm** in length and width of the AHU.

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

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

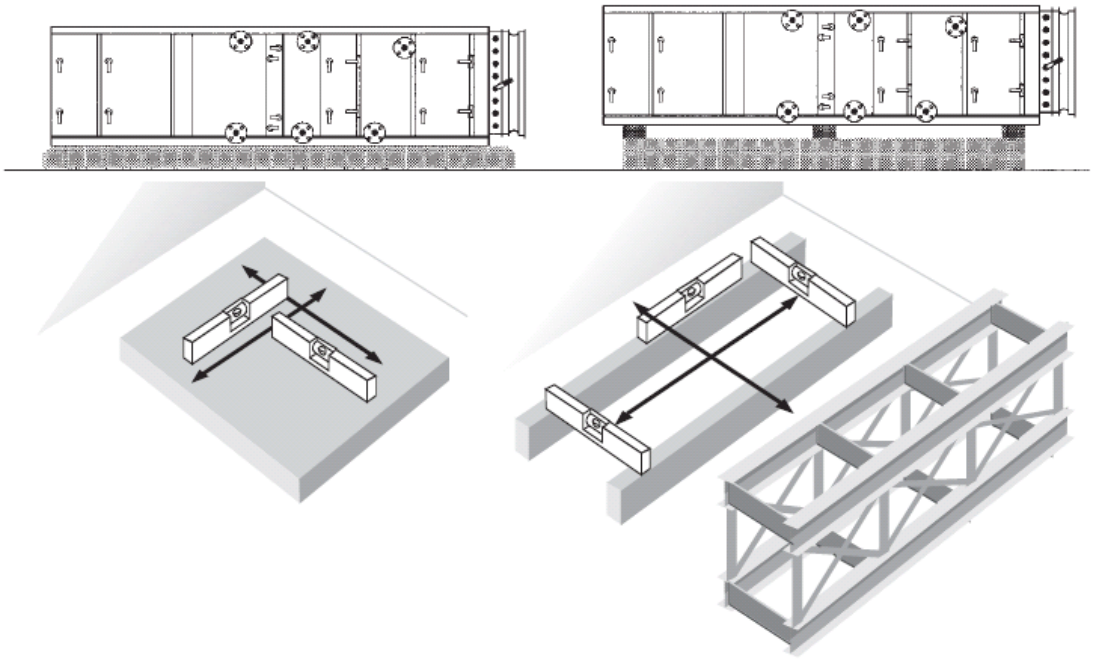


Figure 14: Solid foundation and strip foundation

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

4.2 Erection

4.2.1 Potential risks that may arise at the erection site

- For heating or cooling water or water-glycol circuits these can be connected to the AHU.
- The pipes or hoses and their fittings can become leaky or loose, so that inside or outside of the AHU water or the medium exits.
- Cooling processes can cause dehumidification and the associated formation of condensation in the AHU. The AHU is then equipped with condensate collecting trays and outlets. Nevertheless, condensate can exit from the AHU in case of errors on the AHU, under inadmissible or extreme operating conditions. Errors on the AHU, inadmissible or extreme operating conditions can also cause the formation of condensate on the outer surfaces of the AHU, which may then drip down.
- Internal and external cleaning - also wet cleaning - can be performed on the AHU. When performing this work, an exit/dripping down of the cleaning fluid is possible.
- All parts which are in contact with water inside and outside of the AHU may freeze under certain environmental conditions. Particularly, the following components have an increased risk of freezing:
    - Condensate pans of heat recovery systems and heat exchangers inclusive pan nozzles, siphons and drains
    - Freezing condensate directly on the heat recovery system and heat exchanger
    - Freezing operation fluid of heat exchangers with/without glycol

- All areas and parts of the AHU which are exposed to the weather.

4.2.2 Actions to prevent potential risks

These risks can be prevented by the following actions:

- It does not matter, whether or not the AHU is floor standing, heightened (e.g. on a scaffold) or suspended from the ceiling, the easy assembling and maintenance of the AHU has always to be guaranteed on site
- Depending on the erection, suitable protective actions must be taken to ensure that persons, buildings and equipment are not jeopardized by falling parts (e.g. tools, screws, etc.) and possible exit of water or other fluids.
- The ground around the erection site should be watertight and have with a downward gradient to a sufficiently sized outlet.
- Where this is not met, the erection of the AHU in a sufficiently sized collecting tray with an outlet may be an appropriate solution.
- A humidity sensor with alarm transmitter can represent an additional action to protect critical operating conditions.
- For AHUs suspended from the ceiling, it is recommended in any case to provide a sufficiently dimensioned collecting tray with outlet under the AHU.
- To avoid freezing of components, the customer must ensure, that the AHU is protected against weather, which could lead to such problems. Additionally, the customer must take further measures to provide freeze protection. Some possibilities for that purpose are:
    - Complete drainage of the heat exchanger if it is not used
    - Usage of water/glycol mixtures with adequate glycol concentration as fluid for the heat exchanger. (Attention: Performance loss must be considered)
    - Control-technological frost protection

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

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

4.2.3 General indications for the erection

If floor AHUs shall be mounted on the ceiling, then the device must be fixed with the base frame on an encompassing suspension see **Figure 15** right. The handling of the structure-borne noise insulation is analogously as for floor AHUs.

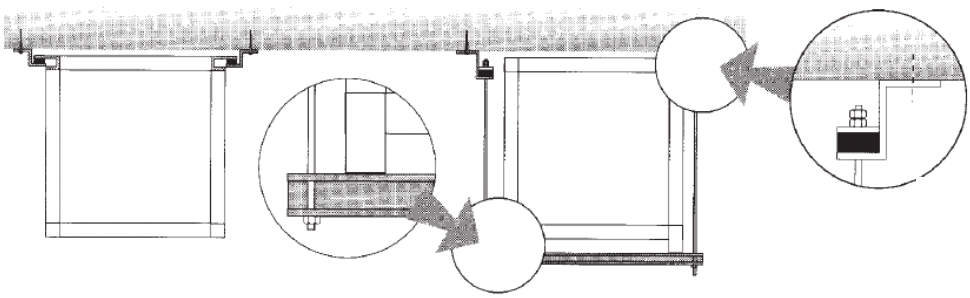


Figure 15: Suspension of ceiling AHUs

5 Assembly

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

Figure 16: Do not climb on the AHU!

5.1 Assembly of casing

5.1.1 Actions before the assembly of casing

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

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

Applying sealing material
The supplied self-adhesive sealing strip (**Figure 17**) must be applied at all section connections before assembling, see **Figure 18.**

Following section connection points must be sealed:
- The flange areas between sections.
- Between duct and casing connection openings.
- Between connection flange and dampers, flexible connection, weather protection grid, sand trap louvre, intake hood …

Figure 17: Sealing strip

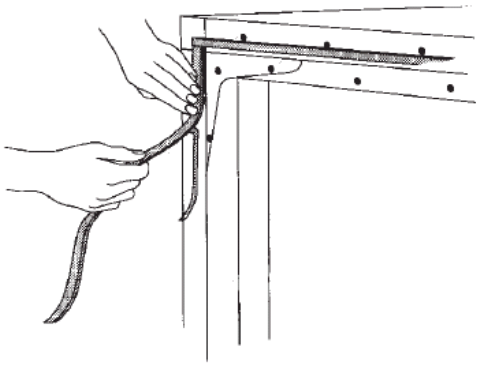


Figure 18: Applying the sealing strip

Section connection points, screw connections between inside and outside, connection openings and bushings, and all other openings which penetrate the casing must additionally be sealed with SIKAFLEX (e.g: heat exchanger connections, mounting screws, duct connections, measuring openings, etc.), as shown on **Figure 19** and **Figure 20.**

For roof AHUs as well as at device separations directly before or after a wet area (e.g. cooler), special actions must be done for sealing. For that purpose, the supplied sealing agent Sikaflex (**Figure 19**) must be used. Further information will follow in **chapter 5.1.4 (Special features for roof AHUs and device separations at wet areas)**.

Figure 19: Sealing agent (Sikaflex)

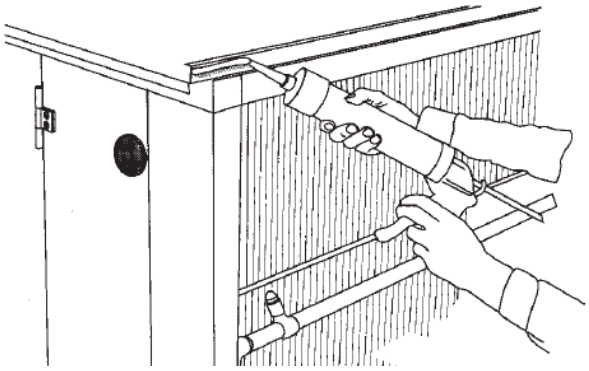


Figure 20: Applying the sealing agent

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

The AHU sections can be pulled together with belts which attach on the base frame, as shown on **Figure 21** and **Figure 22**.

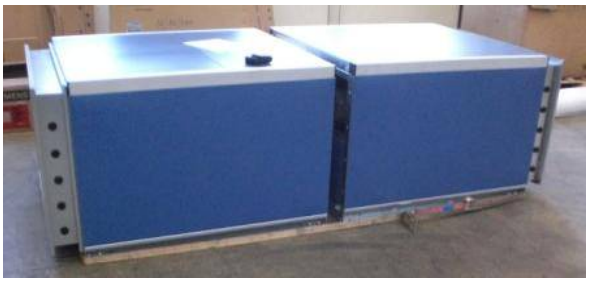


Figure 21: Pulling AHU sections together

Figure 22: Pulling AHU sections together (detail)

5.1.2 Standard connections and connection components

The connection via base frame must be always made at all AHUs, see **Figure 23** and **Figure 24**.

Figure 23: Hexagon bolt with locknut M8x20 / M10x30 / M12x40

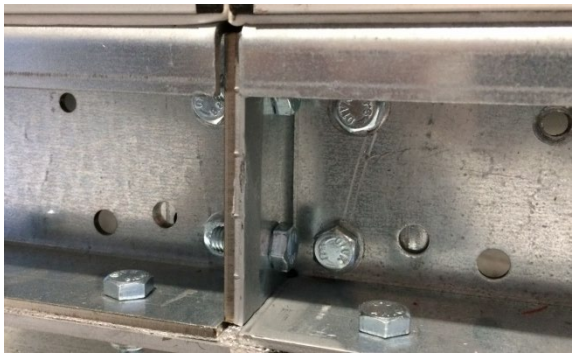


Figure 24: Bolt connection of base frames

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

CCE COMPACT:

1. Easy Connection, see **Figure 25** and **Figure 26**
2. Connection angle, see **Figure 27** up to **Figure 29**

Figure 25: Easy Connection

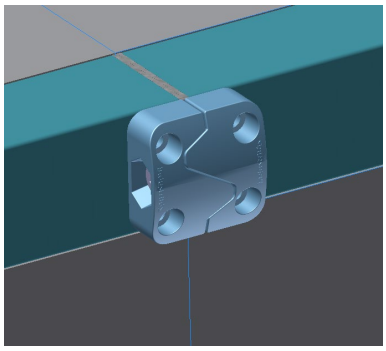


Figure 26: Connection via Easy Connection

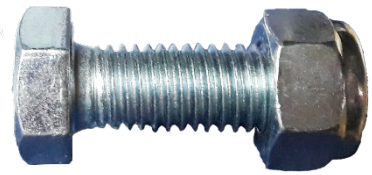


Figure 27: Hexagon bolt with locknut M8x20

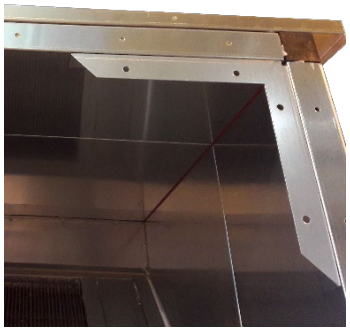


Figure 28: Connection angle

Figure 29: Connection via connection angle

5.1.3 Establishing the screw connection of AHU parts

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

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

- In the base frame profiles (**Figure 30**).
- In the connection angles located in the upper corners of the AHU (**Figure 31**).
- For roof AHUs in the roof flange.

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

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

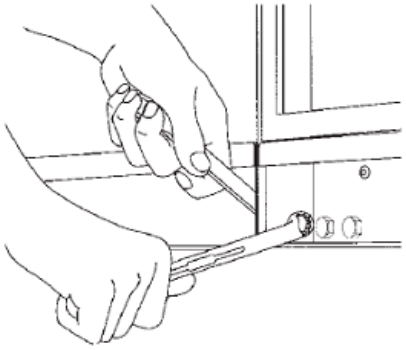


Figure 30: Bolt connection base frame

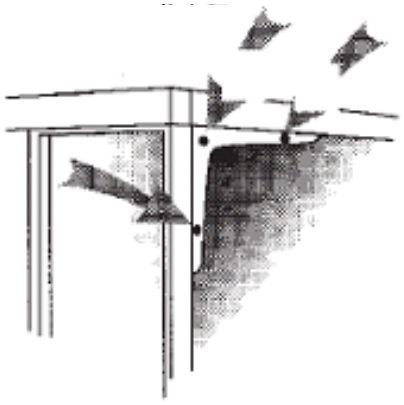


Figure 31: Bolt connection angles

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

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

1. The sealing agent (Sikaflex) has to be applied instead of the sealing strip across the whole flange of the AHU, 5 mm from the inner edge (see **Figure 33**). Immediately thereafter, the relevant delivery sections have to be joined together and then bolted.
2. If the AHU separation is **accessible at the inside via a door** (see **Figure 34**), then the joints (**Figure 35**) have to be closed over the entire outline with the supplied sealing agent (Sikaflex) after bolting together the delivery sections.

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

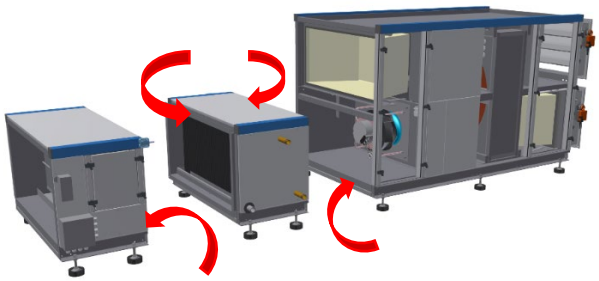


Figure 32: Sealing surfaces

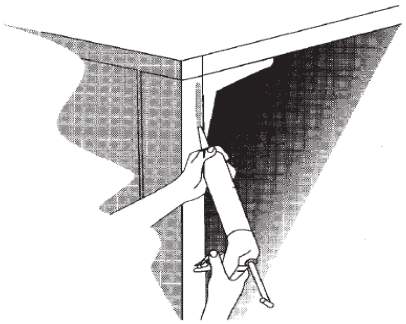


Figure 33: Sealing the frontal joints

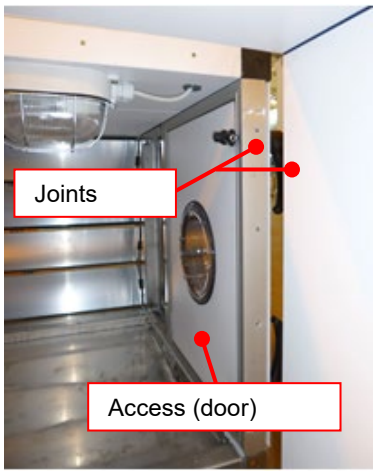


Figure 34: AHU separation accessible via door

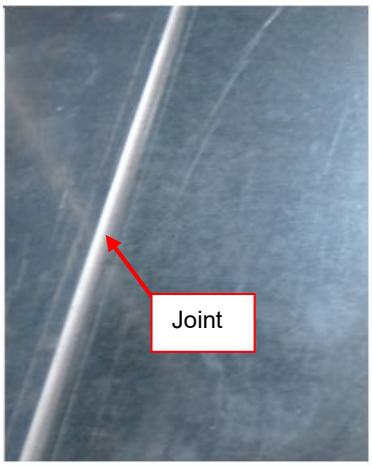


Figure 35: Sealing the section connection (joint) with the sealing agent

For roof AHUs, also the roof flange is to seal, refer to **Figure 36**.

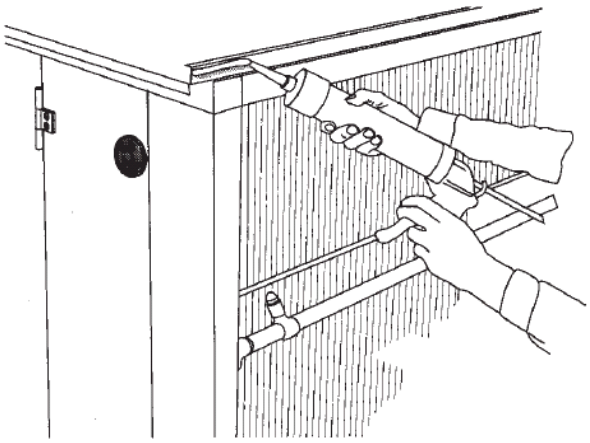


Figure 36: Sealing the roof flange

5.1.5 Securing the position of AHUs

Floor AHUs must be fixed on the foundation to secure the position. A direct coupling, see **Figure 37** left, should be avoided because of structure-borne sound transmission. If you use structure-borne sound insulated underlayment, the fixing by lugs is particularly suitable to avoid the displacement of the AHU in all directions (**Figure 37** right).

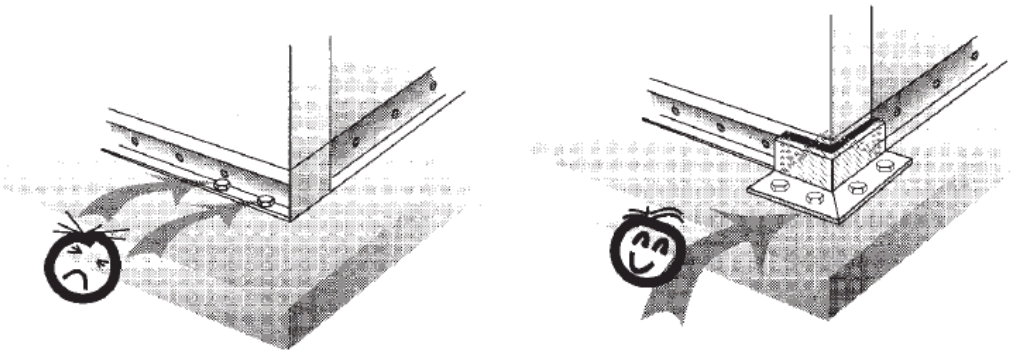


Figure 37: Securing the position on the foundation

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

5.2 Doors

Doors with hinged lock

Door panels with hinged lock can be opened optionally to the right or to the left. Additionally, this lock mechanism enables the easy removal of the door panel from the door frame.
In order to swivel the door to the left, proceed as follows:

1. Open the hinged locks to the right (**Figure 39**)
2. Pull on the flaps in order to swivel the door panel and to get access to the components inside (**Figure 40**)

Figure 38: door panel with hinged locks

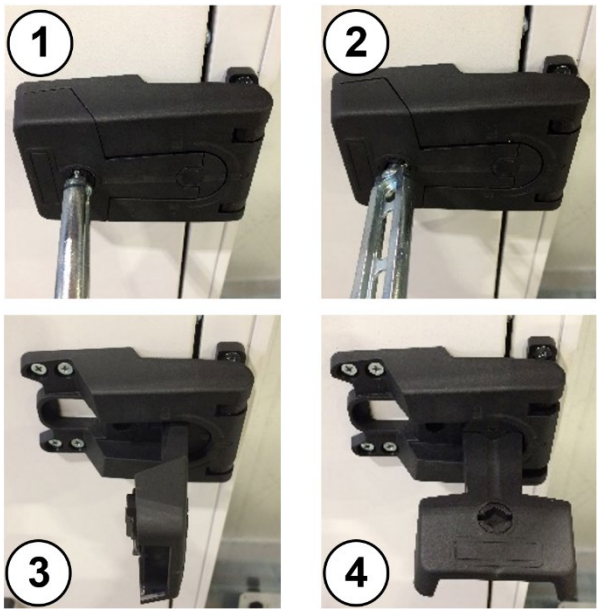


Figure 39: opening of the hinged locks

Figure 40: swiveled door panel

Removable door panel ZIB (CCE)

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

Figure 41: fixing screw with clamping piece (ZIB)

Figure 42: fixing mechanism at door frame (ZIB)

Figure 43: fixed door panel (ZIB)

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

Attention: Pressure-sided doors represent an increased risk of injury. While opening. They can firstly adhere due to the pressure-difference, and then suddenly detach and fall against the user. The user could also be skidded backwards.
Therefore, particularly when opening pressure-sided doors, it must be done very carefully. Open the door panel carefully and detach it slowly from the sealing. At the sudden detaching of the panel, the user must be able to carry the weight of the door. At doors with a surface of > 0,5 m² two persons are necessary.

5.3 Dampers

The closing position of the dampers can be identified in two different ways, see **Figure 44** and **Figure 45**.

Figure 44: Closed position, characterized by a sheet metal position indicator

Figure 45: Closed position, characterized by a marking on the gear wheel

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

5.4 Airfilters

- Filters, with the exception of laterally removable prefilters, are supplied loose and must be installed on site.
- Ensure proper insertion of the filters (the bound filter media side on the unclean air side).
- During the installation it must be noted, that the filter bags will not be clamped or damaged. Each filter bag must freely adjust itself in the airstream.
- If the filters are not included in the scope of delivery of TRANE, it must be considered that the used filters fulfills the requirements of VDI 6022.

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

5.4.1 Laterally removable bag filters with clamping mechanism

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

1. First, move all levers of the clamping rails toward the door opening (**Figure 46**).
2. Slide one filter after the other in the filter frame (**Figure 47**).
3. Press the last filter of the row against the rear panel. Then press with the lever the filter cells against the sealing (**Figure 48**).

Figure 46: Loosen the clamps

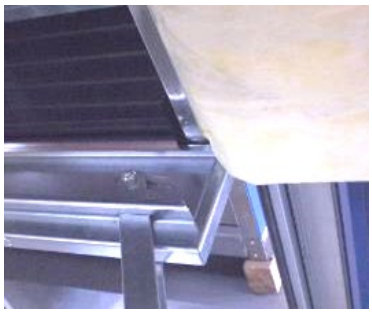


Figure 47: Slide in the filters

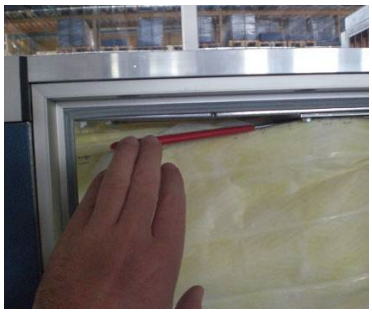


Figure 48: Clamping the filters

Attention: For soft bags the lower bags of the filter cells need to lift up in order to prevent damage with the clamping system (**Figure 49**)!

Figure 49: Lifting the filter bags

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

Figure 50: filter frame for different filter sizes

Figure 51: consider the order according the filter frame raster

Figure 52: filter section with inserted filters

Attention: Filters must be pushed completely to the back, so that all filters fit closely to the filter frame and an air bypass is avoided. Important: Examine if the first filter fits closely to the sealing. (**Figure 54**)

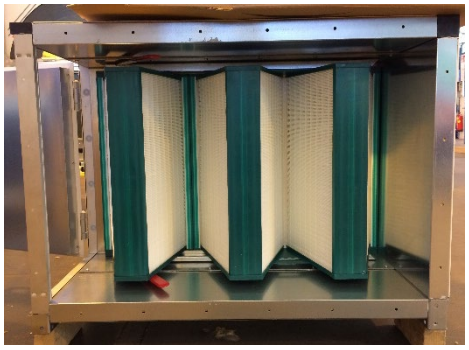


Figure 53: pushing and clamping of the filters to the rear wall

Figure 54: check, if filter lie on the sealing

6 Installation

6.1 Heat exchanger connection

6.1.1 General notes

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

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

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

Connection pipes with thread:
To prevent damage of the heat exchanger connection, it is necessary to hold against with a pipe wrench during the screwing (**Figure 55**).

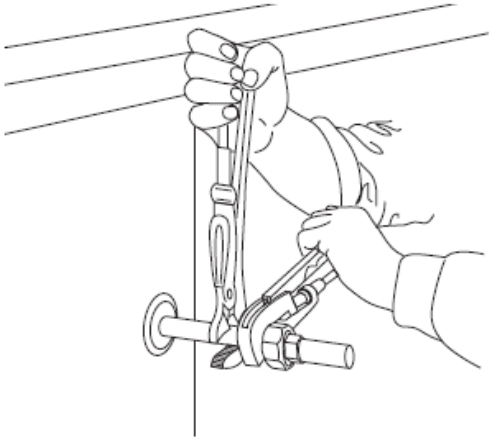


Figure 55: Holding against with a pipe wrench

Recommended sealing material for threaded sleeves:
- Water / glycol heat exchangers, use Teflon tape.

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

Connection pipes without thread:
If the connection pipes are executed without threads, then a mechanical, force-fitting connection (STRAUB coupling) is recommended (**Figure 58**). This coupling could be included optionally in the scope of delivery from TRANE, if not, then it must be provided on site. In order to avoid a damage of the copper pipe of the heat exchanger due to mechanical force, a ring is used to reinforce the copper pipe (**Figure 56** and **Figure 57**).

Figure 56: copper pipe with reinforcing ring

Figure 57: copper pipe with inserted reinforcing ring

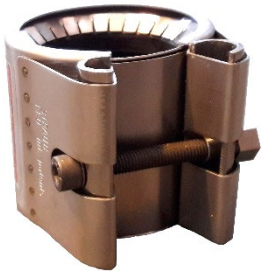


Figure 58: STRAUB coupling

Figure 59: mounted STRAUB coupling

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

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

The connection of the heat exchanger is to execute as indicated on the label on the AHU (connection diagrams in **Figure 60**).

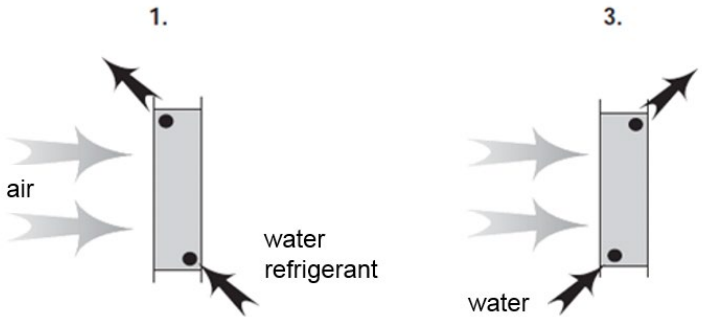


Figure 60: Heat exchanger connection

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

1. All standard heating and cooling heat exchangers - counter flow
2. Preheat exchanger if there is a freezing risk and can be requested - parallel flow

Hydraulic connection schemes of heating or cooling coil should be carried out as shown in the scheme **Figure 61** 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.

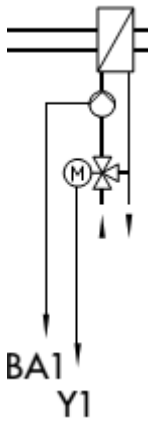


Figure 61: Hydraulic connection scheme

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

Figure 62: Drain valve

Figure 63: Vent valve

6.2 Drain for condensate and excess water

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

6.2.1 Standard siphons

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

The following conditions are essential for correct operation:

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

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

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

1 mmWS = 9,81 Pa

H1 > 1113/9,81 = 114 mm + 15 mm (Safety) = about 130 mm
H2 = 65 mm

Siphon on suction side (in direction of airflow before the fan), see Figure 64.
H1 (mm) > p (mm WS)
H2 (mm) > p/2 (mm WS)

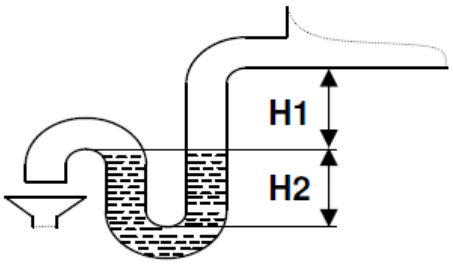


Figure 64: Siphon on suction side

Siphon on pressure side (in direction of airflow after the fan), see Figure 65.
H3 (mm) > p (mm WS)
H4 (mm) ≥ 0

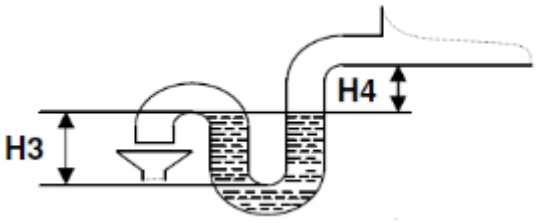


Figure 65: Siphon on pressure side

6.2.2 Ball siphons

If ball siphons with the below shown design are supplied by TRANE, then the following instructions should be observed during installation:

Depending on the suction side or pressure side mounting position, the siphon body has to be installed so that the direction of the arrow (see **Figure 66**) corresponds to the flow direction.

- Pa = suction side
+ Pa = pressure side

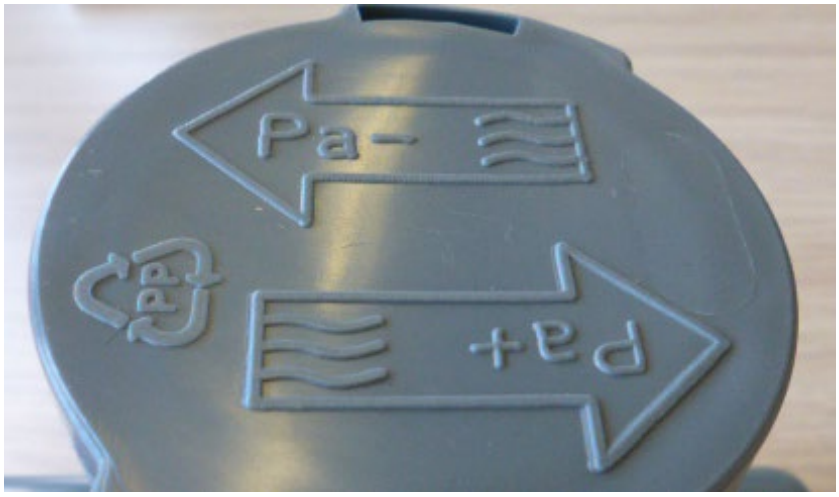


Figure 66: Observe the mounting position - flow direction according to the arrow

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

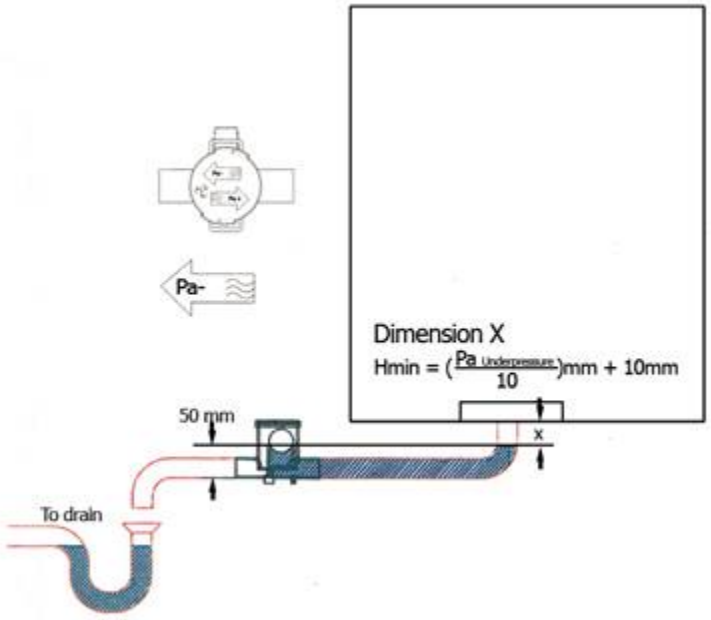


Figure 67: Suction side execution

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

The black plug must be removed for the pressure side installation (see **Figure 69**).

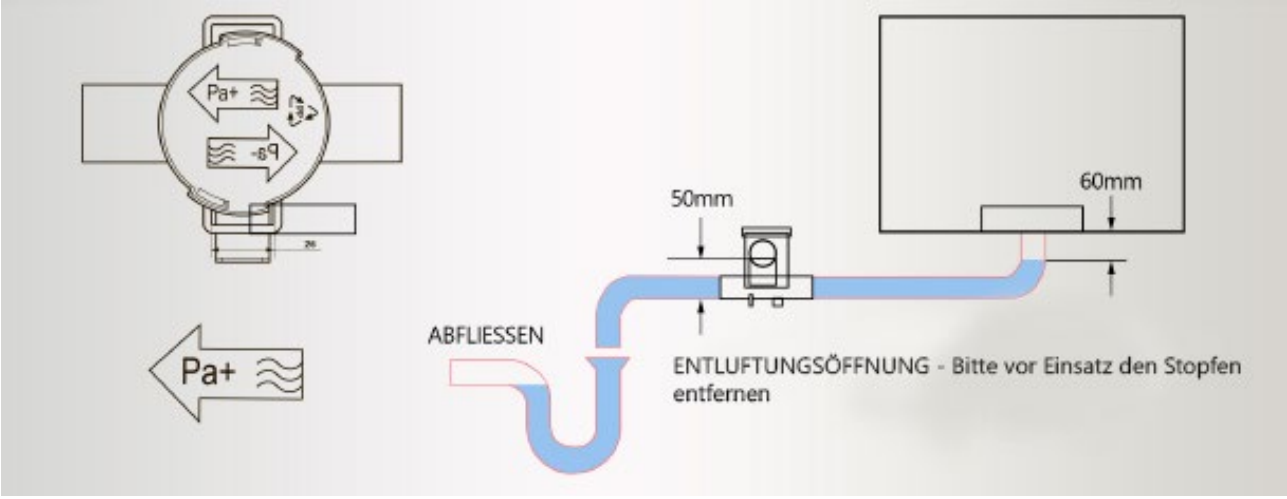


Figure 68: Pressure side execution

Figure 69: Pressure side installation: remove the black closing plug

6.3 Duct connection – airside connection to AHU

Depending on the customer's requirements, TRANE devices are equipped with various accessories and options for attaching air duct elements like dampers, flexible connections, frames, panel flanges, etc.
If no such accessories are supplied, then the airside mounting of components of the duct system is made directly to the housing of the AHU. Depending on the device opening, this can be done directly on the panel flange or directly on the external panel of the device.
When connecting, make sure that the requirements listed below are followed:

Requirements

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

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

Number of screws

The duct components are screwed as follows,
- each at a distance of 120 mm from the corner
- additional number of screws see **Table 4** and **Figure 70**.

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

Table 4: Information on the screw distances

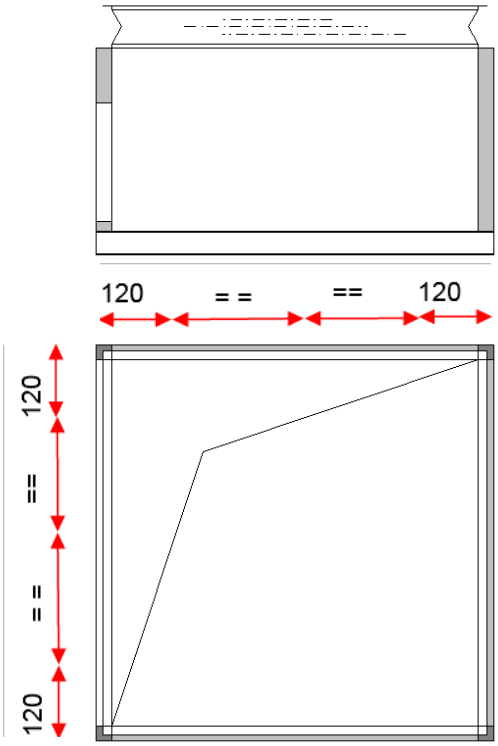


Figure 70: Information on the screw distance

6.3.1 Insulation of fresh air damper

Before connecting the duct section, the flange of the fresh air damper must be insulated in the course of the fresh air duct insulation on site. This action is urgently required to prevent the formation of condensation by heat transfer.
If fresh air dampers are not integrated in the AHU casing, then also the damper frame must be insulated.

6.4 Freeze protection measures

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

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

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

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.
- All electrical connections must be inspected annually and deficiencies (for example, loose cable strands, loose screw and clamp connection, etc.) must be eliminated immediately.

7.1 Connecting to an external protective conductor system

The AHU must be connected to an external protective conductor system. The AHU shall be either:
- connected at the base frames or
- alternatively, at the potential compensation, that is mounted on the flexible connection by TRANE.

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

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

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

Lightning protection for roof AHUs

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

Correct direction of motor rotation is a result of direction of fan impeller rotation which is marked by an arrow: for EC fan refer to **Figure 71**.
Before connecting the motor check the rotating field of mains connection with a suitable device. Afterwards, connect the phases accordingly to main switch.

Figure 71: Rotation marking of EC fans

Fastening torque for electrical connections on the control panel refer to **Table 5**:

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

Table 5: Torques for the motor terminal board

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

7.2 EC motors

EC motors are variable through an integrated frequency converter. For operation, the supply voltage, a digital enable signal and an analog control signal are required for the speed control.
When using residual current circuit breakers (RCDs), the supply line must be protected by means of a pulsed current (type A) or an all-current sensitive (type B) residual current circuit breaker.

- The maximum admissible motor speed depends on the maximum admissible fan speed. The maximum admissible fan speed is specified on the order-related technical data sheets. For safety reasons the maximum admissible fan speed must not be exceeded!
- In order to prevent high vibration loads and damage, critical speeds or operating frequencies must be avoided, see **chapter 8.2.1 (Resonance at fans).**

TRANE recommends therefore the continuously monitoring of the operating conditions.

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

7.3 Main switch (emergency stop switch)

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

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

1. Is used as a repair, maintenance or safety switch, because the actuation of the switch does not reset the control commands from control system.
2. Has a clearly marked OFF (0) and ON (I) position.
3. In OFF position lockable, to secure against unauthorized or unintentional restart.
4. For outdoor installation the main switch must be at least IP65.
5. Interrupts the power supply to the AHU (lighting can be excluded, refer to **chapter 7.6 (Lighting)**).
6. Separates the electrical equipment from the main supply.
7. Is easily accessible
8. Mounted within sight of the AHU.

9. The allocation to the AHU can be clearly seen.
10. **Emergency stop function**: The main switch (red switch with yellow background) **must be connected to the control system with appropriate components** in order to ensure the emergency stop function works effectively. Reset means that a manual start command – separate from main switch – must be activated.

Figure 72: Main switch

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

7.4 Electric heaters

An electric heater is designed to heat the airflow, which is stated on the technical data sheet, from the specified air inlet temperature to the air outlet temperature. TRANE provides electric heaters with one or more stages according to customer requirements.
The control of the electric heater provided by the customer can be carried out in several ways:

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

Fire risk!
With the electric heater in operation, the heating elements may arrive to a temperature of several hundred °C.
In case of malfunction, for example, heater in operation without adequate airflow, inadmissible temperatures may occur. Furthermore, plastic parts for example, filters, gaskets, droplet eliminators etc. close to electric heater may become damaged or even catch fire. This could lead to the spread of fire and significant damages to the wider building.

In order to avoid the above mentioned risks, TRANE provides, as standard, electric heaters with 2 independent safety thermostats.

7.4.1 AHUs equipped from TRANE with control

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

The execution and function, as specified below, is supplied by TRANE.

Control-side limitation of the air temperature beyond the electric heater
The control of the electric heater always regulates the temperature of the air passing through the heater so that it never exceeds the permitted air temperature in the AHU (40 °C, if not differently specified in the technical data). This item must be especially observed, when the AHU is only operated with a partial air flow (e.g. in times of reduced use of the building).

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

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

Avoid overheating of AHU components by residual heat of electric heater
In order to avoid excessive heating of components by residual heat of electric heater control ensures that fan motor keeps on running for at least 5 min after cutting off of electric heater! By using an enabling contact (see **Figure 76**) the control engineering also ensures that the electric heater can only start its operation when the fan is running.

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

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

Safety concept
Electric heater power supply is equipped with 2 contactors in serial connection!
The 2 safety thermostats protect the AHU in two independent ways:
Firstly: By hardware via contactors in the power supply.
Secondly: By software via controlling. In case of failure contactors immediately cut off the electric heater from power supply.
- The 2 safety thermostats are connected in serial connection.
- The 2 safety thermostats are equipped with manual reset.
- After triggering, the reason for stopping must be detected and eliminated before the reset of the thermostat!

Thermostat 1 (Figure 73 and Figure 74)
- Position of thermostat body: fastened on the electric heater at the connection side, is accessible by removing the electric heater access panel.
- Triggering temperature: pre-set – value must not be changed.

- Sensor position: between heating bars.
- Function: alarm stop in case of over temperature because of low airflow issues

Cover cap on reset button

Reset button

Figure 73: Thermostat with cover cap on the reset button

Figure 74: Thermostat with uncovered reset button

Thermostat 2 (Figure 75)

- Position of the thermostat casing: fastened on the outside panel of AHU casing
- Triggering temperature: set to 70 °C – value must not be changed
- Sensor position: downstream of the electric heater in upper area of airflow
- Function: alarm stop in case of over temperature because of missing airflow

Figure 75: Thermostat 2

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

Connection scheme for electric heater according to TRANE:

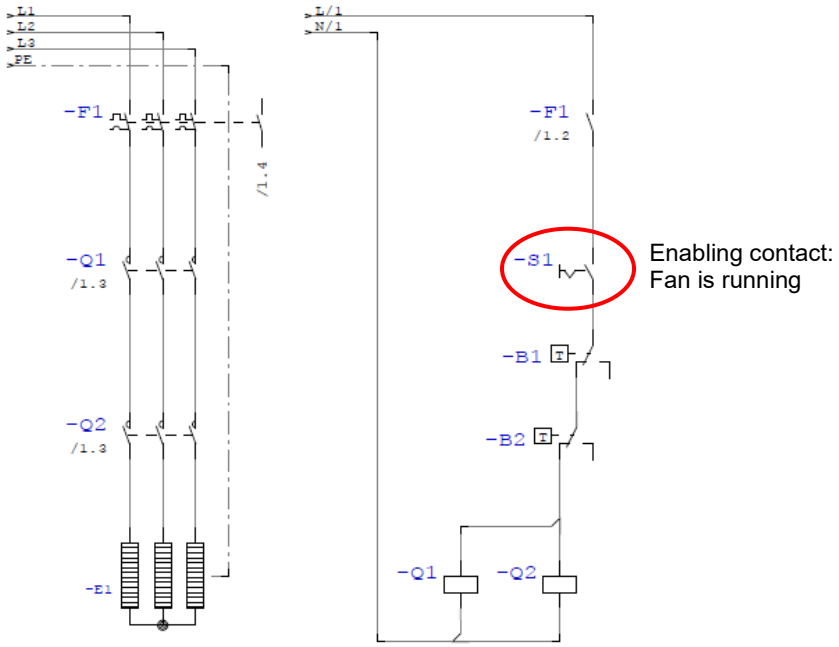


Figure 76: Connection scheme for electric heater

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

7.5 Frost protection for plate heat exchanger

At low temperatures and high air speeds, the condensate in the plate heat exchanger can freeze and cause its icing.
For devices supplied by TRANE with control, this is prevented by pressure monitoring of the plate heat exchanger and the temporary adjustment of the supply air volume flow.

7.6 Lighting

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

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

The lamps are mounted and supplied with one side connected and one side with loose cables, sufficient in length to be routed to the nearest junction box or the next switch.
The AHU will be delivered in parts, and for this reason the lights have to be connected on site and the client is responsible for the completion of this work.

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

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

8 Commissioning

8.1 Preliminary steps

- Clean thoroughly the AHU and all components of dust, swarf and other debris.
- Remove all loose parts like tools, etc. and any documentation from the AHU. Such parts can be sucked in by the fan and lead to its destruction.
- check all bolt connections and electrical connections and retighten if necessary
- Ensure that the duct pressure corresponds to the pressure for the nominal air flow and the pressure specified in the technical data sheet.
- Ensure that all planned filters are mounted. Not mounted filters can overload the fan motor.
- All cables must be checked for damage to the insulation and replaced if necessary.

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

- Rotate the impeller of the fan by hand, to check whether it rotates freely.
- Check 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 Airflow measurement by differential pressure measurement at the fan

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

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

<table>
<tr><th>Formula A</th><th>Formula B</th></tr>
<tr><td>In this formula, the respective air density at the fan is taken into account.
The air density must be determined as a function of air temperature, air humidity, sea level and atmospheric pressure.</td><td>In this formula, a variable air density is not taken into account.
Instead, a "fixed" air density of 1.20 kg/m^3 is assumed.</td></tr>
<tr><td colspan="2">With the following formulas, the airflow rate can be determined from the pressure signal:</td></tr>
<tr><td>- Airflow rate calculation
$\dot{V} = K_A \cdot \sqrt{\frac{2 \cdot \Delta p_w}{\rho_V}}$
$\dot{V}$ Nominal airflow rate m³/h
K_A K_A –factor for formula A m²*s/h
Δp_w Measured diff. pressure Pa
ρ_V Air density at the fan kg/m³</td><td>- Airflow rate calculation
$\dot{V} = k_B \cdot \sqrt{\Delta p_W}$
$\dot{V}$ Nominal airflow rate m³/h
k_B k_B –factor for formula B m³/(h*Pa^{0,5})</i>
Δp_w Measured diff. pressure Pa</td></tr>
<tr><td colspan="2">If several fans in a fan section are operated in parallel with the same speed, then the total airflow rate is accordingly a multiple of the calculated individual airflow rate.</td></tr>
<tr><td colspan="2">With the following formulas, the setpoint Δp_w can be determined for a certain airflow rate (e.g. for dimensioning a pressure sensor, for constant airflow rate control):</td></tr>
<tr><td>- Target differential pressure calculation
$\Delta p_{w.set} = \frac{\dot{V}^2 \cdot \rho_V}{K_A^2 \cdot 2}$
$\Delta p_{w.set}$ Target differential pressure Pa
$\dot{V}$ Target airflow rate m³/h
K_A K_A –factor for formula A (s.a.) m²*s/h
ρ_V Air density at the fan (Nominal value) kg/m³</td><td>- Target differential pressure calculation
$\Delta p_{w.set} = \frac{\dot{V}^2}{k_B^2}$
$\Delta p_{w.set}$ Target differential pressure Pa
$\dot{V}$ Target airflow rate m³/h
k_B k_B –factor for formula B (s.a.) m³/(h*Pa^{0,5})</td></tr>
</table>

Table 6: Formulas for airflow rate measurement

The corresponding K-factors of the fan are shown in the fan-motor data sheet or on the technical data sheet for the AHU. The data on the data sheet always refers to one fan.
The air density at the measuring point is to set up manually, depending on sea level, temperature and humidity. In most cases, 1.2 kg/m³ is a suitable value.

For AHUs supplied by TRANE with control, the airflow rate sensors are already preset.

8.1.2 Heat exchanger

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

Water heat exchangers
Normal heating, cooling coils filled with water and additives for freeze and corrosion protection:
- Open vent valve.
- Water valve is initially only to open slightly, so that the coil will be slowly filled with water. To avoid heat stress.
- When the heat exchanger is filled, close the vent valve.
- Water valve is to open fully, start the fan.
- Subsequently, the entire piping system must be vented properly.

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

8.1.3 Electric heater

Observe specifications of **chapter 7.4 (Electric heaters)** -safety thermostats.

8.1.4 Air filters

- Before the commissioning, all filters should be checked for tightness, as otherwise they could be sucked in and could lead to damage.
- The mounted differential pressure switches are pre-set according to the final pressure loss on the technical data sheet.
- These ensure the output of a warning message when the final pressure loss is reached. The resulting maintenance actions are described in **chapter 9.3** (**Air filters**).

8.2 Test run

After having done the preparatory work the AHU can be started for the test run.
- For testing the device and measuring the motor data and the volumetric flow rate, the device must be fully connected to the operational duct system.
- The AHU doors must be closed, because by eliminating the system-side pressure drop measurement errors will be the result.

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

In addition, the actual power consumption of all phases shall be measured and compared with the nameplate. If the actual power consumption is too high, there is maybe a faulty connection. The system must be shut down immediately.
Measure the volume flow and the pressure difference. Often the measured airflow does not match with the design data of the device.

Possible causes for low airflow:
- The external pressure drop is higher than indicated on the technical data sheet.
- e.g. closed fire or VAV dampers in the duct

If the airflow is incorrect and if you require support on this matter, please contact TRANE.

8.2.1 Vibration verification

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

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

Resonance at fans
The operation of fans at the resonant frequency (and multiples of it) must be avoided, in order to prevent high vibration loads. The resonant frequency must be determined at the AHU on site. **Figure 77** shows a typical vibration curve.

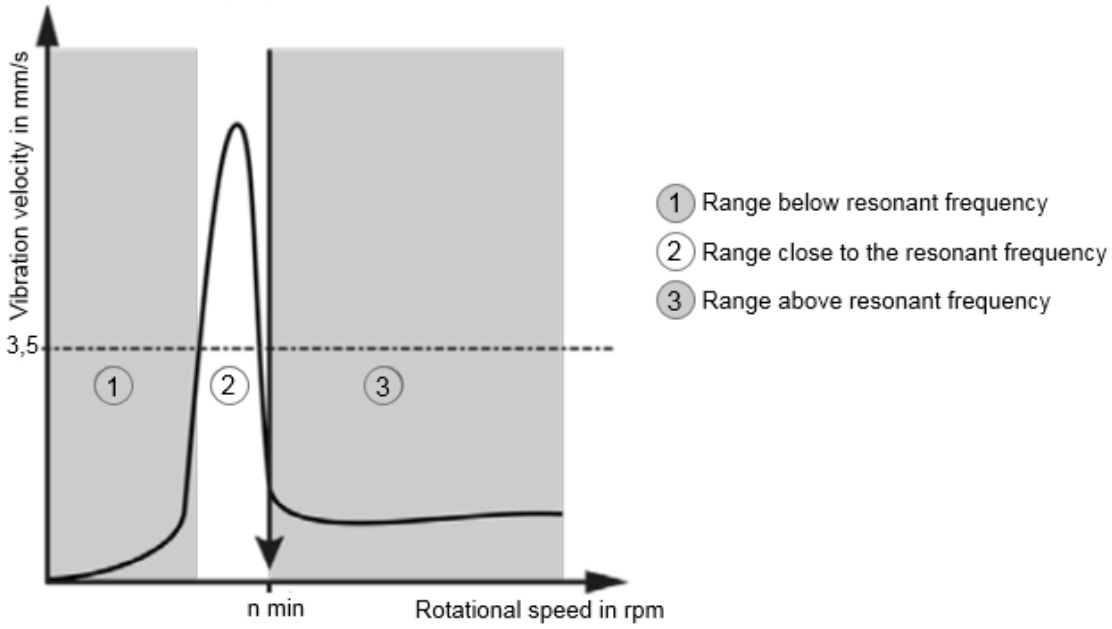


Figure 77: Typical vibration curve

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

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

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

Permanent operation of fans at inadmissible high vibrations can lead to severe damage at the AHU and subsequently to damages to property or personnel.

9 Maintenance

TRANE AHUs are built mostly maintenance free and easy to maintain when required. The maintenance intervals (see **Table 7**) are indicative for normal operating conditions. Widely differing applications may require different intervals, ask TRANE for details. The execution of the described checks and maintenance needs are necessary to ensure a permanent safety operation and functionality of the AHU.

The entire AHU and all components must be checked regularly for pollution, corrosion, damage and fixing and, if necessary, they must be cleaned or repaired.
Depending on the material used and the environmental conditions, it can lead to a superficial corrosion on components. For example, motor, fan shafts, pulleys, bushings, sheet metal cutting edges etc. The resulting corrosion layer protects the underlying material from further corroding and does not represent a deficiency of the component or the device. The removal of surface corrosion and treatment of the corresponding sites are generally not required. Depending on the material used, a superficial oxidation can be removed as part of regular maintenance and the appropriate site treated with suitable protective measures.

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

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

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

To order spare parts please contact your TRANE sales partner.

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

9.1 Electrical connection, control cabinet

All electrical connections must be inspected annually and deficiencies (e.g. loose cable strands, loose screw and clamp connection etc.) must be identified and eliminated immediately.

The following maintenance work is recommended for the control cabinet of AHUs with integrated control:
- annual change of the filter
- annually check the function of the fan for the control cabinet ventilation (if present)

- annually check the function of the heater (installed in outdoor AHUs)
- annually check of screw connections and electrical connections and if necessary retighten
- cleaning of possible dust deposits

9.2 Fan / motor group

9.2.1 Vibrations

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

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

The fan-motor-unit must be monitored regularly for mechanical vibrations according to the manufacturer's specifications, and the results must be recorded. The maximum vibration speed according to the manufacturer's specifications must be strictly observed. If the admissible vibration values are exceeded, it is absolutely necessary to identify the cause and take immediately appropriate measures.

9.2.2 Fan

- Check for dirt, debris, damage and corrosion, clean if necessary.
- Coat surface damage of the housing and impeller with zinc dust paint.
- Flexible connections are to be checked for damage through visual inspection.
- Check the protection grid (Fan in and/or outlet) if available for correct installation / damaged (visual inspection).
- Test the wheel by rotating it by hand for abnormal noises.
- Danger: Deposits on the wheel can cause damage (risk of fatigue fracture) and the impeller can break!
- Visual inspection: Check the wheel for any particular weld cracking.
- After dismantling and reinstalling an impeller, the fan must be checked for mechanical vibrations. It may be necessary to rebalance.

9.2.3 Motor

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

9.3 Air filters

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

To ensure the performance and the energy-efficient operation of the AHU, the air filters must be replaced regularly. Use only filter types and filter sizes, which are suitable and intended for assembly. Please view the technical data for getting this information (**Figure 78**).

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

Figure 78: extract (filter section) of technical data

All filters should be checked for tightness, because otherwise they could be sucked in and could lead to damage.

If AHUs are equipped with TRANE control, then a corresponding warning message is displayed on the HMI (see **Figure 79**) when the differential pressure limitation is reached.

Figure 79: Warning message filter

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

9.3.1 Panel filters

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

9.3.2 Bag filters

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

9.4 Heat exchangers

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

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

9.4.1 Medium water

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

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

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

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

Antifreeze protection
Check antifreeze activity before each winter season. Also check the frost protection thermostat for the correct setting.

Drain pan
Drain pan and drain should be checked for debris and cleaned, if necessary – **Figure 80**.

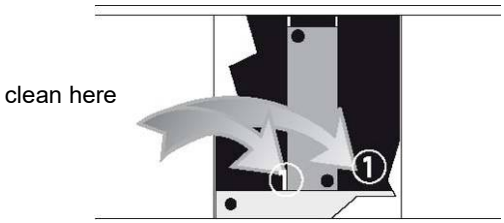


Figure 80: Cleaning of air coolers

Droplet eliminator
Check the droplet eliminator about once per year for contamination. Remove fins and clean if necessary. Please make sure that the fins are installed properly and are not bent.

Pollutants can cause poor performance of the AHU as well as damage due to drop flight.

9.4.2 Electric Heater

- When working on the electric heater, refer to the instructions in **chapter 2 (Safety instructions)**.
- Check electric heaters for dirt and corrosion, clean heating elements if necessary.
- Check built-in safety devices and electrical parts for proper functioning.

9.5 Dampers

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

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

9.6 Weather louver

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

9.7 Energy recovery systems

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

9.7.1 Plate heat exchangers

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

The only maintenance required is cleaning:
- Clean the condensate drain, control and fill the U-trap. The plate pack is normally self-cleaning.
  - Remove fibers and dust at the exchanger inlet with a brush.
  - Clean oils and fats with hot water, household cleaners or degreasing steam.
- If there is a bypass damper, please refer to **chapter 9.5 (Dampers)**.

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

9.7.2 Heat wheels

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

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

9.8 Maintenance plan

The maintenance intervals specified in **Table 7** are based on empirical values for normal operating conditions. They are designed for continuous operation (24 hours / day) in moderate temperate climates and low dust areas, such as in offices or shopping malls. Widely differing operating conditions, particularly with respect to air temperature, humidity and dust can significantly shorten the intervals.

Ch = Check, Cl = Clean, M = Maintenance

Component	Action	Section	monthly	¼ year	½ year	year	Reference chapter
Housing	Ch / Cl	Housing inside and outside			X		
							9.2.1 Vibrations
Fan / motor	Ch	Corrosion check			X		
	Ch	Flexible connection			X		
	Ch	Protection grid			X		
	Ch / Cl / M	Motor, general			X		9.2.3 Motor
	Ch	Check current consumption		X			
Filter	Ch / Cl / M	Panel filters	X				9.3.1 Panel filters
	Ch / Cl / M	Bag filters		X			9.3.2 Bag filters

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

The fan-motor-unit must be monitored regularly for mechanical vibrations according to the manufacturer's specifications, and the results must be recorded. The maximum vibration speed according to the manufacturer's specifications must be strictly observed. If the admissible vibration values are exceeded, it is absolutely necessary to identify the cause and take immediately appropriate measures.

Fan

Heat exchanger	Ch / Cl	Fins			X	9.4 Heat exchangers
	Ch	Frost protection			X	
	Ch / Cl	Drain pan			X	
	Ch / Cl	Droplet eliminator			X	
Electric heater	Ch / Cl	E-heater		X		9.4.2 Electric Heater
		Check e-heater section for thermal damages after mains supply failure!				
Dampers	Ch / Cl	Dampers			X	9.5 Dampers
Weather louver	Ch / Cl	Weather louver, grid and hood			X	
Energy recovery	Ch / Cl	Plate heat exchanger		X		9.7.1 Plate heat exchangers
	Ch / Cl	Heat wheel	X			9.7.2 Heat wheels
Control cabinet	M	Filter			X	9.1 Electrical connection, control cabinet
	Ch	Fan			X	
	Ch	Heater			X	
	Ch	Bolts, electrical connections			X	

Table 7: Maintenance plan

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

Sound data can be printed on request on the technical data sheet, sample see **Figure 81**. The sound power is specified as A-weighted sound power level:

- **Line 1:** Sound power over the casing
- **Line 2:** Sound power inlet
- **Line 3:** Sound power outlet

The sound through the openings (sound power level in line 2 and 3) is the basis for the calculation of the on-site sound emissions from the environment.

AHU sound levels	63	125	250	500	1000	2000	4000	8000	Tot db (A)
1> Sound power level casing [db] +/- 4 dB	88,0	81,0	78,4	62,0	56,2	50,7	41,1	32,6	**71,9**
2> Sound power level air inlet [db] +/- 4 dB	93,2	90,0	96,0	87,0	77,0	74,0	72,0	66,0	**89,7**
3> Sound power level air outlet [db] +/- 4 dB	97,0	98,0	99,0	89,0	86,0	82,0	79,0	75,0	**93,8**
4> Sound press. for 1 [m] distance from AHU	68,7	61,7	59,1	42,7	36,9	31,4	21,8	20,0	**52,6**
5> Sound press. for 1 [m] distance from air inlet	85,8	83,3	90,0	81,5	71,7	68,8	67,1	61,1	**83,9**
6> Sound press. for 1 [m] distance from air outlet	89,6	91,3	93,0	83,5	80,7	76,8	74,1	70,1	**88,1**

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

Figure 81: Sound data information

11 Disassembly and disposal

11.1 Disassembly

At disassembly, the safety instructions of **chapter 2** (**Safety instructions**) must be considered. It also apply the instructions in **chapter 3** (**Reception control / unloading / transportation to installation site**). The housing can be disassembled relatively easy:

Disassembly of the housing:
- Disassembly of the external panels and removal of the insulation.
- Loosening of the screw connections.
- Loosening of the rivet connections by drilling the rivets.

Disassembly of the built-in parts:
- Secure slender components against tipping over.
- Use of appropriate scaffolds and load carrying equipment.
- The AHU components must be raised with suitable load carrying equipment (e.g. belt with hook or shekel with chain) and have to be secured until the components are safely fixed in the AHU – see **Figure 82**.
- Handling: securing with belt – see **Figure 83**.

Figure 82: Lifting with chain hoist

Figure 83: Securing with belt

11.2 Disposal

The operator is responsible for the disposal of the shipment (packing material), operation (filters, tools, spare parts etc.), and for the disposal of the AHU itself.

The disposal of the material must be done by qualified technicians according to the international, national and local regulations.

A standard AHU consists of 95 % recyclable metallic materials.

Components (examples)	**Material**	**CER / EWC European Waste Code**
Casing panels, built-in components, base frames, heat exchangers	VZ and VZB sheet metal	170405
	Stainless steel	170405
	Aluminum	170402
	Copper tube	170401
Copper cable	Copper cable	170411
Casing insulation	Mineral wool	170604
Air filter	Plastic, metal	150106
	Filters which have caught toxic and/or pathogenic pollutants must be disposed of as chemical waste. National rules and regulations apply.	
Droplet separator slats	Plastic	150102
Insulation profile CCE C		
Sealing tape		
Piping		
EC – motor	Guidelines for the disassembly and instructions for the disposal can be found in the appropriate previous chapters of this instruction manual or on the homepage of the manufacturer. Detailed information of the manufacturer can be found on the component.	
Electronic components		

Table 8: Information for disposal

User manual

COMPACT V0.03
April 2018

Hotline
+39 335 1334212

12 Display

12.1 Push buttons, rotary button

Figure 84: Display

The operation takes place via the elements described below:

- **Info-button** return to the main / start page or application info page
  - off AHU off
  - green AHU on
  - green flashing AHU is starting (preheating) or stopping
  - orange only one fan is running
- **Alarm-button** show alarms (see **chapter 21**)
  - off no alarm
  - red flashing not acknowledged alarm is active
  - red alarms are active
- **ESC-button** return to the previous menu page
  cancel a value change
  - push long display service page (contrast, color, backlight, brightness)
- **Ok-button** multifunctional push and rotary button
  - rotate select a menu / line, select / change value
  - push ok, go to a submenu, confirm a changed value
  - push long go to the password page, log in / log out
    possible at any time in any menu

12.2 Display

The display is divided into several areas:

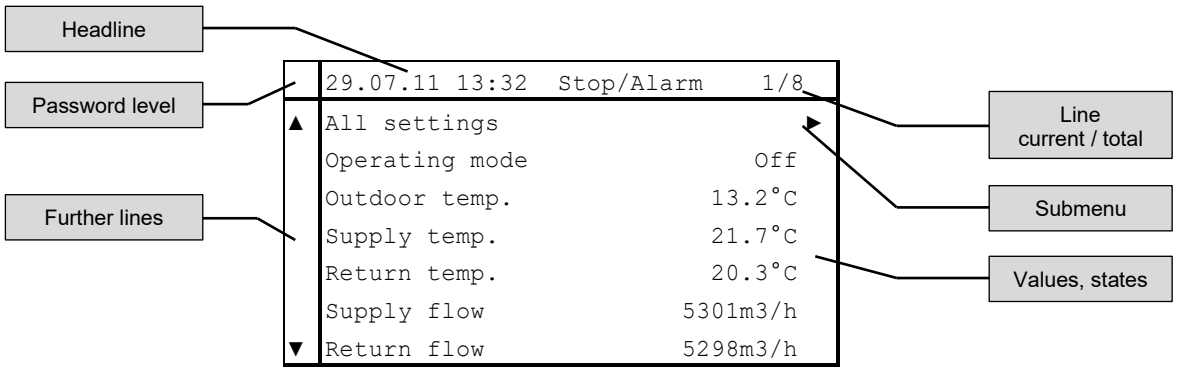

Figure 85: Start page

- **Headline** — on the main / start page: date, time and AHU state
  in a submenu: the current selected submenu
- **Further lines** — arrows indicate additional lines above/below
- **Current line / total lines** — current selected line / total number of lines
- **Submenu** — submenu, press *Ok* to go into the submenu
- **Values, states** — display the current values, states and the setpoints / settings

The language can be selected via *All settings* → *Language*.
Depending on the configuration of the AHU, more or less lines are displayed.

12.3 Password

For every entry a password is needed (except language selection); the current access level is displayed in the left top corner:

- **No key** — level 253 — no change of settings possible, only a few parts of the menus are visible (language selection is always possible)
- **1 key** — level 6 — user level, change of setpoints / settings
  level 5 — extra user level, special settings

Password for user level

1000

(for level 5 the password is: user password +1 → 1001)

After 10 minutes the display makes an automatic logout and returns to the main / start page.

12.4 Operation, value entry

For the operation of the display, the rotary button and the *ESC*-button are primarily used. The rotary button is used to select the desired line. Depending on the type of line a value / state is displayed, a setpoint is entered, a setting is made or a submenu is selected.

12.4.1.1 Line with submenu

An arrow right next to the line indicates a submenu; the line can be selected with the rotary button and the submenu can be entered with *Ok*.

12.4.1.2 Value, setpoint

Select the line of the setpoint to be changed and confirm with *Ok*; a new page displays the setpoint with the limits and the location of the setpoint within the limits with an arrow on the bar.
Keep turning the rotary button until the desired value is set to change a value; after prolonged turning the active position will automatically switch to the next higher (once 10 numbers have been run through); if the rotary button is not turned for some seconds, the active position will switch back to the next lower. For better orientation this is illustrated by an arrow above the number. Thus, large numerical ranges are adjusted quickly.

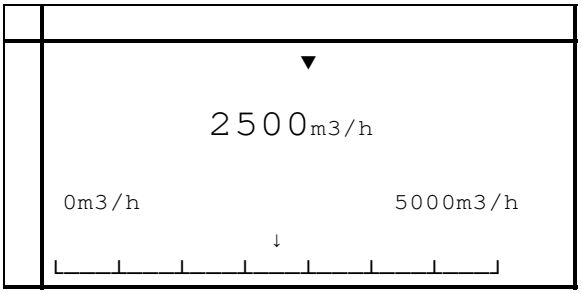

Figure 86: Set value, setpoint

12.4.1.3 Selection, setting, function

Select the line of the setting / selection / function to be changed with the rotary button and confirm with Ok; A new page displays a list of possible settings with a √ next to the current setting. Select a new setting with the rotary button and confirm with *Ok*.

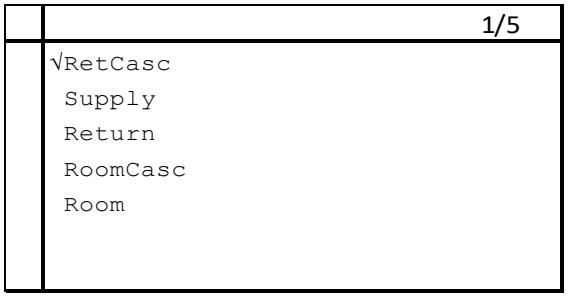

Figure 87: Selection (e.g. supply air control)

12.4.1.4 ESC-button

The *ESC*-button has different functions:

- During the change of a setpoint or setting, this will be cancelled and the old value is retained
- Within a menu to return to the next higher menu
- By pressing and holding the button, the system page of the display is called up; there the color, contrast and brightness of the backlighting can be changed

12.4.1.5 Adjustability

If a line is selected, the text appears on the left white on a black background. Is also the value white on black background, then the value is adjustable, otherwise not. An adjustment is not possible without registration.

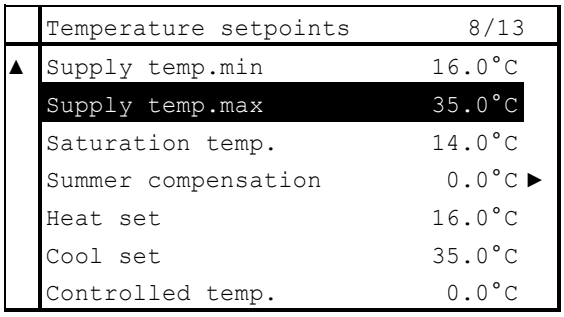

Figure 88: Value adjustable

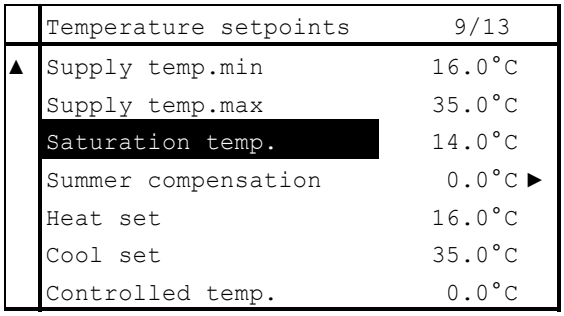

Figure 89: Value not adjustable

13 Main / start page

The main / start page with the most important values and settings of the AHU is displayed after powering on the controller:

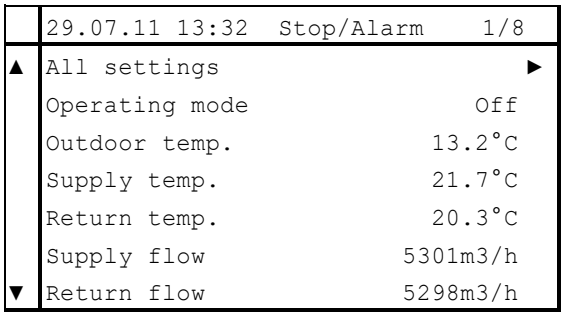

Figure 90: Main / start page

- Date, time and AHU state / operating mode source
- Submenu for all settings
- Operating mode (switch on / off the AHU)
- Temperatures (outdoor, supply air, return air, ...)
- Humidity (supply air, return air)

- Air flow rate, duct pressure and fan speed
- Power of the recovery
- Valve positions and pumps for heating and cooling batteries
- Humidifier

The state display shows the current operating mode / operating mode source of the AHU:

- - no request
- Start start phase, initialization
- Config configuration changed; AHU blocked
- Stop / alarm AHU blocked (Alarm emergency stop)
- Display command from operating display
- BMS command from BMS
- Room unit command from room unit
- Scheduler command from scheduler

The different possibilities of the request (switching AHU on / off or operating mode) have different priorities; so the AHU is switched off when the command from the display is *Off*, even if the scheduler or the BMS request is economy or comfort. The priority corresponds to the above list; “Config” has the highest and “Scheduler” the lowest priority. Appears in the display -, then there is no request active (display, BMS and room unit have the state *Auto*, the scheduler is not active).

13.1 All settings

By the line *All settings*, the submenu *All settings* can be entered; by several submenus the display pages for setpoints, operation mode, alarm state, password handling and language setting can be entered.

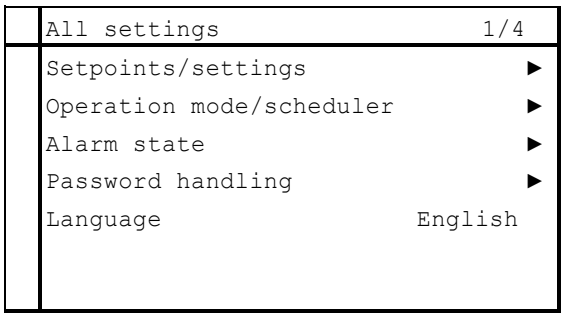

Figure 91: All settings

- **Setpoints / settings** setpoints for temperature, humidity, air quality, …
- **Operation mode / scheduler** operation mode, scheduler, date / time setting
- **Alarm states** alarm states
- **Password handling** enter passwords, change passwords
- **Language** language selection (English, Italian, German)

14 Setpoints / settings

The setting of the setpoints is performed separately for the airflow rate, temperature, humidity, air quality and night setback.

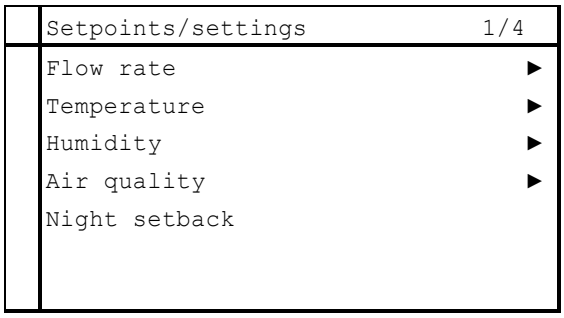

Figure 92: Setpoints/settings

14.1 Fan setpoints

The air flow rate, duct pressure, fan stage or fan speed is set via this page of the display; depending on the operating mode, more or less or no settings can be changed.

14.1.1 Operating mode of the fan control

The fan control has 3 possible operating modes; the operating mode is set during the commissioning and cannot be changed.

14.1.1.1 Airflow rate control

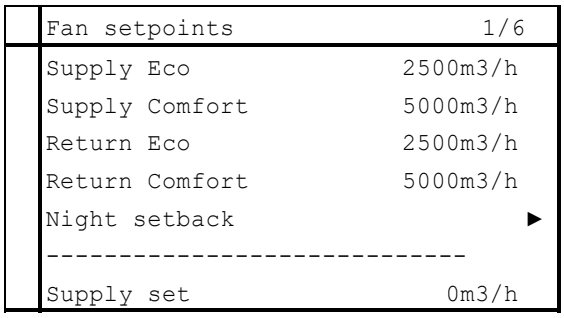

Figure 93: Airflow rate control

At the airflow rate control, one setpoint for economy, comfort mode and night setback will be set separately for supply and return air. Thus, it can be adjusted as desired overpressure (supply airflow > return airflow) or a negative pressure (supply airflow < return airflow). The setting is made in m³ / h. The last 2 lines show the current setpoints for the fan control.

If an air quality control by means of the airflow rate is active, the maximum airflow rate for poor air quality can also be set. The resulting airflow rate is then the maximum of the setpoint for economy / comfort mode and air quality control. Thus, the selected airflow rate is always adhered and increases due to poor air quality. The setting is made in the menu *Air quality,* which can be entered directly.

If the dehumidification by means of the airflow rate is active, the maximum airflow rate for high humidity can also be set. The resulting airflow rate is then the maximum of the setpoint for economy / comfort mode and the dehumidification control. Thus, the selected flow rate is always adhered and increases due to high room humidity. The setting is made in the menu *Humidity*, which can be entered directly.

In the night setback mode, the rooms can be cooled with the cool outdoor air outside normal working hours; all heating batteries, cooling batteries, recovery systems, humidity and air quality control are disabled. The setting is made in the menu *Night setback*, which can be entered directly.

If a room unit or remote switch is connected, the airflow can be changed via this with a corresponding configuration (offset).

Setpoint	Description	Default
Supply Eco	Supply airflow rate for economy mode	Half nominal airflow rate
Supply Comfort	Supply airflow rate for comfort mode	Nominal airflow rate
Return Eco	Return airflow rate for economy mode	Half nominal airflow rate
Return Comfort	Return airflow rate for comfort mode	Nominal airflow rate
Supply set	Current supply airflow rate setpoint	… m³/h
Return set	Current return airflow rate setpoint	… m³/h

Table 9: Airflow rate setpoints

The setpoints for night setback, air quality and humidity control can be found in the chapters night setback (**14.5 Night setback**), air quality control (**14.4.1.3 Fan speed**) and humidity control (**14.4.1.1 CO2 sensor**).

14.1.1.2 Pressure control

When the fans are controlled by the duct pressure, the required pressure setpoint is set at commissioning separately for supply and return air and is equal for economy and comfort mode. This is visible, but can be changed only by service personnel. The current air flow rate is always visible on the main page.
An air quality control or dehumidification is not possible, because the amount of air cannot be changed and depends only on the external duct pressure.

If air quality control is provided by means of duct pressure, the maximum duct pressure can also be set at poor air quality. The resulting duct pressure is then the maximum of the setpoint for economy / comfort mode and air quality control. Thus, the selected duct pressure is always maintained and increased due to poor air quality. The setting is made in the menu "air quality", which can be entered directly.

If the dehumidification is activated by means of duct pressure, the maximum duct pressure can also be set at high humidity. The resulting duct pressure is then the maximum of the setpoint for economy / comfort mode and dehumidification control. Thus, the selected duct pressure is always maintained and increased due to high room humidity. The setting is made in the menu "humidity", which can be entered directly.

Setpoint	Description	Default
Supply duct press.	Supply air duct pressure setpoint	See data sheet
Return duct press.	Return air duct pressure setpoint	See data sheet

Table 10: Duct pressure setpoints

14.1.1.3 Speed control

Similar to the airflow rate control the speed for economy, comfort and night setback mode can be set. The fans are operated at the set speed, regardless of airflow rate or duct pressure.

In addition, the speed is increased by air quality control or dehumidification when the air quality is poor or the humidity is high. Also, an adjustment of the speed for poor air quality and high humidity is possible. The setting of the speed for night setback, air quality and dehumidification occurs in separate menus, which can be entered directly.

Setpoint	Description	Default
Supply Eco	Supply fan speed for economy mode	40%
Supply Comfort	Supply fan speed for comfort mode	80%
Return Eco	Return fan speed for economy mode	40%
Return Comfort	Return fan speed for comfort mode	80%
Supply set	Current supply fan speed setpoint	...%
Return set	Current return fan speed setpoint	...%

Table 11: Speed settings

The setpoints for night setback, air quality and humidity control can be found in the chapters night setback (**14.5 Night setback**), air quality control (**14.4.1.3 Fan speed**) and humidity control (**14.4.1.1 CO2 sensor**).

14.2 Temperature setpoints

The control mode for the temperature control and the corresponding setpoints are set via the temperature setpoints. Depending on the execution of the AHU, additional calculated setpoints for the saturation temperature are displayed over which the dehumidification is controlled.

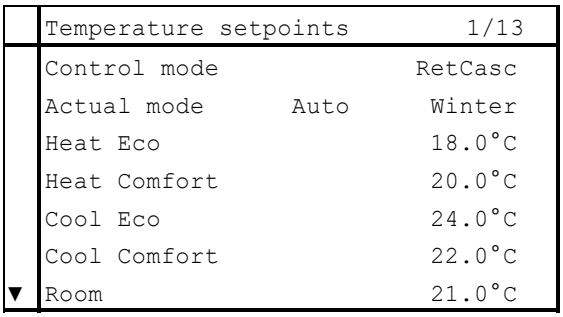

Figure 94: Temperature setpoints

14.2.1 Operating mode of the temperature control

There are up to 5 operating modes for the temperature control, which can be set by the user. If no room unit is present, then only 3 operating modes can be selected. If the AHU is a pure supply air unit, then the return air control cannot be set. In order to make the right setting is the understanding of the individual operating modes very important. Service engineers or planners can give you more information.

14.2.1.1 Return air cascade (RetCasc)

The return air temperature is used as a control variable. The supply air setpoints for the heating batteries and cooling batteries are calculated by the deviation between the current return air temperature and the setpoints. The activation of the valves and the recovery is performed based on the deviation between the current supply air temperature and the calculated supply air setpoints. The calculated supply air setpoints cannot exceed the minimum / maximum supply air limit.

A dead zone can be defined between the setpoints for heating and cooling, by which a deactivation of the heating batteries and cooling batteries can be achieved (energy saving). They are deactivated as long as the return air temperature is in the dead zone. The adjustment of setpoints is performed separately for economy and comfort mode.

This control strategy combines the return air temperature control with a supply air temperature control. It is used when the return air temperature should be kept constant and can be used for infinitely variable heating / cooling batteries (water batteries).

Setpoint	Description	Default
Heat Eco	Heating setpoint for economy mode	18 °C
Heat Comfort	Heating setpoint for comfort mode	20 °C
Cool Eco	Cooling setpoint for economy mode	24 °C
Cool Comfort	Cooling setpoint for comfort mode	22 °C

Table 12: Setpoints for cascade temperature control

14.2.1.2 Supply air

The supply air temperature is used as control variable. The recovery, heating and cooling batteries are activated depending on the deviation between the current supply air temperature and the setpoints.

A dead zone can be defined between the setpoints for heating and cooling, by which a deactivation of the heating batteries and cooling batteries can be achieved (energy saving). They are deactivated as long as the supply air temperature is in the dead zone. The adjustment of setpoints is performed separately for economy and comfort mode.

This control strategy is mainly used in downstream heating or cooling units, which are not controlled by the AHU.

Setpoint	Description	Default
Heat Eco	Heating setpoint for economy mode	22 °C
Heat Comfort	Heating setpoint for comfort mode	24 °C
Cool Eco	Cooling setpoint for economy mode	20 °C
Cool Comfort	Cooling setpoint for comfort mode	18 °C

Table 13: Setpoints for supply air temperature control

14.2.1.3 Return air

The return air temperature is used as control variable. The recovery, heating and cooling batteries are activated depending on the deviation between the current return air temperature and the setpoints. This control is directly performed causing the supply air temperature is subjected to greater

fluctuations. The limiting function of the supply air tries to limit the battery power to comply with the specified minimum and maximum values.

A dead zone can be defined between the setpoints for heating and cooling, by which a deactivation of the heating batteries and cooling batteries can be achieved (energy saving). They are deactivated as long as the return air temperature is in the dead zone. The adjustment of setpoints is performed separately for economy and comfort mode.

This control strategy is mainly used for stage controlled cooling / heating, e.g. in a cooling by means of a direct evaporator (compressor) and is better suited than the cascade or supply air temperature control, because the air temperature is subjected to greater fluctuations by the compressor and no constant supply air temperature is possible.

Setpoint	Description	Default
Heat Eco	Heating setpoint for economy mode	18 °C
Heat Comfort	Heating setpoint for comfort mode	20 °C
Cool Eco	Cooling setpoint for economy mode	24 °C
Cool Comfort	Cooling setpoint for comfort mode	22 °C

Table 14: Setpoints for return air temperature control

14.2.1.4 Room cascade (RoomCasc)

This control strategy works the same as the return air cascade, only that the room temperature of a room unit or room sensor is used as control variable. The adjustable offset at the room unit affects the heating / cooling setpoints.

This control strategy is only available if a room unit or a room sensor is present and is used when the return air temperature is heavily distorted and is an inappropriate control variable or the room temperature should be used directly. The setpoint settings match the settings of the return air cascade (**14.2.1.1**).

If a room unit and a room sensor are installed, then the room sensor is used and the sensor of the room unit has no function.

14.2.1.5 Room

This control strategy works the same as the return air control, only that the room temperature of a room unit or room sensor is used as control variable. The adjustable offset at the room unit affects the heating / cooling setpoints.

This control strategy is only available if a room unit is present and is used when the return air temperature is heavily distorted and is an inappropriate control variable or the room temperature should be used directly. The setpoint settings match the settings of the return air (**14.2.1.3**).

If a room unit and a room sensor are installed, then the room sensor is used and the sensor of the room unit has no function.

14.2.2 AHU with 3 batteries (saturation temperature)

If the device has a preheating battery, a cooling battery and a postheating battery, then a saturation temperature sensor can be mounted after the cooling battery. By this sensor, the first two batteries

can be controlled, whereby the setpoint for this measurement point is lowered at a dehumidification requirement. The lowest setpoint can be set in the access level 5. This function is only possible when:

- 2 heating batteries and 1 cooling battery are present
- a saturation temperature sensor is present
- return air cascade, supply air or room cascade is set as control strategy

Setpoint	Description	Default
Saturation temp.	Minimum saturation temperature	14 °C

Table 15: Saturation temperature setpoint

14.2.3 Supply air limitation

The supply air temperature is always limited:

- the supply air setpoint cannot exceed the limits, if the cascade control is active
- no setpoint is allowed to exceed the limits, if the supply air control is active
- the supply air temperature is limited by separately adjustable controller, if the return air control and room control are active

Setpoint	Description	Default
Min supply air temp.	Minimum limit for the supply air setpoint	16 °C
Max supply air temp.	Maximum limit for the supply air setpoint	35 °C

Table 16: Supply air temperature limits

14.2.4 Summer / winter compensation

Via the summer compensation, cooling setpoints can be raised at high outside temperatures to keep the difference between outdoor and indoor temperature low or to save cooling energy; heating setpoints are not affected.

Via the winter compensation, heating setpoints can be raised or lowered at low outdoor temperatures; cooling setpoints are not affected.

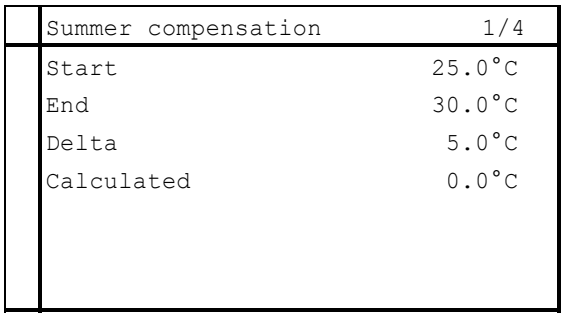

Figure 95: Summer compensation

Setpoint	Description	Default
Summer compensation		
Start	Outdoor temperature start point for shift	25 °C
End	Outdoor temperature end point for shift	30 °C
Delta	Shift value of the cooling setpoints at the end point	0 °C
Calculated	Shift due to the current outdoor temperature	… °C
Winter compensation		
Start	Outdoor temperature start point for shift	0 °C
End	Outdoor temperature end point for shift	-10 °C
Delta	Shift value of the cooling setpoints at the end point	0 °C
Calculated	Shift due to the current outdoor temperature	… °C

Table 17: Summer / winter compensation settings

14.2.5 Setpoint and control variable

At the end of the page, the currently used setpoints and the current control variable are displayed, which vary depending on the control strategy.

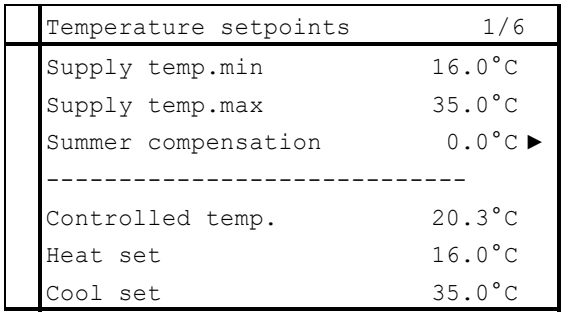

Figure 96: Current setpoints

Setpoint	Description	Default
Controlled temp.	Current control variable (return air, supply air or room temp.)	… °C
Heat set	Current setpoint for recovery, heating batteries	… °C
Cool set	Current setpoint for cooling batteries	… °C

Table 18: Heat / cool setpoint and controlled temperature

14.2.6 Recirculation damper

The recirculation damper is not modulating, but is opened or closed depending on the heating requirement and the set base time (60min). The recirculation damper operates as the last heating sequence for temperature regulation (unless dehumidification by means of recirculation damper has

been configured). For example: recirculation damper requirement = 50%, i.e. with a base time of 60 minutes, the ventilator operates 30 minutes in fresh air mode and 30 minutes in recirculated air mode (in this mode, the return fan is at a standstill). In case of an additional air quality control by the recirculation damper, the air quality has a higher priority.

14.3 Humidity setpoints

Depending on the execution of the AHU can be dehumidified, humidified or dehumidified and humidified; the display differs depending on the execution.

	Humidity setpoints	1/7
	Control mode	Return
	Humidification Eco	30%
	Humidification Com…	40%
	Dehumidificat.Eco	70%
	Dehumidificat.Comf…	60%
	Max supply	80%
	Humidifier	0.0%

Figure 97: Humidification / dehumidification setpoints

14.3.1 Control mode for humidification and dehumidification

Depending on the execution of the AHU, the operating mode of the control can be chosen between return air, supply air and room.

14.3.2 Return air control

Normally, the humidification and dehumidification is controlled via the return air humidity. Thus, the desired room humidity is kept within specified limits; the room humidity should be between 40% and 60%.

14.3.3 Supply air control

In pure supply air devices and if no return air sensor or room humidity sensor is present, then it is controlled via the supply air humidity; this is then kept within specified limits. Since not the room humidity is measured, the response of the room must be considered when entering the setpoints. Depending on the application, higher humidification setpoints in winter and lower dehumidification setpoints in summer may be necessary.

14.3.4 Dehumidification with cooling battery

For dehumidification, the supply air is cooled and again heated up by the heating battery, thus resulting in a dry supply air. In the best case the AHU is equipped with 3 batteries (see also chapter **14.2.2**), whereby the dehumidification lowers the saturation temperature, which is an independent control circuit for temperature control and the postheating battery again raises the supply air temperature.
The water cooling battery, compressor cooling battery or both are used.

14.3.5 Dehumidification with recirculation damper

For the dehumidification by means of the recirculation damper, the absolute humidity of the supply air and of the exhaust air is compared. In case of a higher supply air humidity (corresponds to the fresh air humidity in the fresh air mode), it is switched to recirculated mode as a function of the dehumidification requirement (see **chapter 14.2.6** for more information), in order to not increase the absolute humidity content. In case of an additional air quality control by the recirculation damper, the air quality has a higher priority.

Setpoint	Description	Default
Min fresh air	Minimum opening positon for the fresh air damper	20%
Max fresh air	Maximum opening position for the fresh air damper	100%

Table 19: Fresh air dehumidification with recirculation damper

14.3.6 Dehumidification with damper / cooling, cooling / damper

In this case the dehumidification is done by increasing the amount of recirculation air and then activating the cooling battery or exactly the opposite.

14.3.7 Setpoints

The setpoints for humidification and dehumidification are entered separately for economy and comfort mode. If no humidifier is selected, then no humidification setpoints can be entered. If dehumidification is not possible, then no dehumidification setpoints can be entered. At the same time, a maximum supply air limit for the return air humidity control can be configured. The current humidification and dehumidification request is displayed.

Setpoint	Description	Default
Humidification Eco	Humidification setpoint for economy mode	30 %
Humidification Comfort	Humidification setpoint for comfort mode	40 %
Dehumidification Comfort	Dehumidification setpoint for comfort mode	60 %
Dehumidification Eco	Dehumidification setpoint for economy mode	70 %
Max supply	Maximum supply air humidity (limit)	80 %
Humidifier	Current power request for humidifier	0.0 %
Dehumidification	Current dehumidification request	0.0 %

Table 20: Humidification / dehumidification setpoints

14.4 Air quality setpoints

The air quality is measured by an air quality sensor in the return air and is controlled by the amount of air or the recirculation damper. Sensor type and control mode are configured at commissioning and cannot be changed.

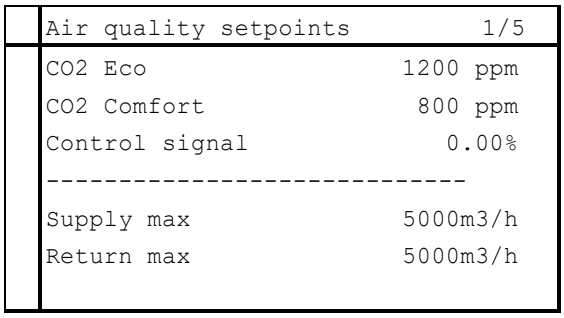

Figure 98: Air quality

14.4.1 Sensor type, control procedures

One type of sensor and one control procedure come into use, depending on the execution of the AHU.

14.4.1.1 CO2 sensor

This sensor measures the CO_2 concentration [ppm] in the return air; the higher the concentration, the worse the air quality. As a guide for the setting of the CO_2 concentration, the following table can be used.

Air quality	CO_2 concentration
Outdoor air (good quality)	~ 400 ppm
Room with good air quality	< 800 ppm
Room with medium air quality	800 … 1000 ppm
Room with moderate air quality	1000 … 1400 ppm
Room with low air quality	> 1400 ppm

Table 21: Room air quality

14.4.1.2 Recirculation damper

For the control of the air quality by means of a recirculation damper, it is possible to determine whether the air quality has priority (default setting: Yes). Depending on the requirements, the fresh air mode is active for a prolonged period (see **chapter 14.2.6** for the method of operation).

Setpoint	Description	Default
Min fresh air	Minimum opening position for the fresh air damper	20%
Max fresh air	Maximum opening position for the fresh air damper	100%

Table 22: Fresh air for air quality control

14.4.1.3 Fan speed

In case of good air quality, the AHU is operated with the airflow rate, speed or duct pressure specified by the operating modes economy and comfort; this setting should be as low as possible. If the

air quality decreases, then the airflow rate, speed or duct pressure increases to an adjustable maximum value. This operating mode can only be used for airflow rate, speed or duct pressure control. The air flow rate, speed or operating stage specified by the economy or comfort mode is always kept and is increased by the air quality control.

Setpoint	Description	Default
CO2 Eco	CO_2 setpoint for economy mode	1500 ppm
CO2 Comfort	CO_2 setpoint for comfort mode	500 ppm
Control signal	Requested fresh air amount or airflow rate	0 %
Supply max	Maximum supply airflow rate for poor air quality Maximum supply fan speed for poor air quality	Nominal value 100%
Return max	Maximum return airflow rate for poor air quality Maximum return fan speed for poor air quality	Nominal value 100%
Supply set	Current supply airflow rate / fan speed request	… m³/h, … %
Return set	Current return airflow rate / fan speed request	… m³/h, … %

Table 23: Air quality setpoints

14.5 Night setback

The operating mode *Night setback* is a special operating mode, which can be selected via the scheduler, the display or the BMS.

In the night setback mode, the rooms shall be cooled with cool outdoor air to save cooling energy the next day. The AHU is operated with the separately adjusted airflow rate, speed or duct pressure. The recovery system, all heating and cooling batteries, humidification and dehumidification are inactive.

Night setback starts according to the operating mode switch (e.g. scheduler at 0:00) when the outdoor temperature is above 12 °C, the room temperature is 3 °C above the setpoint (22 °C) and the outdoor temperature is at least 5 °C below the room temperature. Night setback will run as long as the outdoor temperature is above 12 °C, the room temperature is at least 1 °C above the setpoint (22 °C) and the outdoor temperature is at least 1 °C below room temperature. A minimum operating period of 30 min guarantees, that it will not immediately be switched off after starting.

Several settings are set during commissioning. The room temperature setpoint and the minimum operating period, air flow rate, speed or operation stage can be set in the *Night setback* menu.

If no room sensor and outdoor temperature sensor are present, then the return air temperature and fresh air temperature are used. For this purpose, these are cyclically tested for 5 min every hour; if the conditions are met, then the night setback mode continues operating.

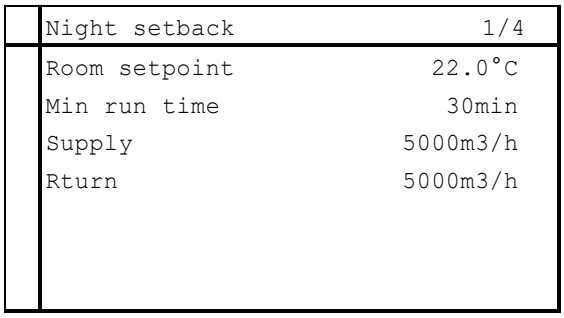

Figure 99: Night setback

Setpoint	Description	Default
Room setpoint	Room temperature setpoint for night setback	22 °C
Min run time	Minimum operating time, even if the conditions are no longer met	30 minutes
Supply	Supply airflow rate, supply fan speed	Nominal value, 60%
Return	Return airflow rate, return fan speed	Nominal value, 60%

Table 24: Night setback setpoints

15 Operating mode / scheduler

The on / off switching and the operating mode economy or comfort are determined by a variety of sources, which have different priorities. A source with a higher priority overrides all lower prioritized sources.

- **HMI** Request from HMI (Off, NightStb, Eco, Comfort, Auto)
  with *Auto* the operating mode is determined by the BMS
- **BMS** Request from BMS (Off, NightStb, Eco, Comfort, Auto)
  with *Auto* the operating mode is determined by the room unit
- **Room unit** Request from room unit (Off, Eco, Comfort, Auto)
  with *Auto* the operating mode is determined by the scheduler
- **Scheduler** Request from scheduler (Off, NightStb, Eco, Comfort)
  with no entry (display -) the AHU is off

Note: the AHU can be started and stopped at the electric cabinet (operating display mounted on the electric cabinet) by setting the operating mode of the HMI.

Depending on the execution of the AHU, individual control devices / lines are not displayed; room unit and building management system are optional. Only the operating mode of the HMI and, with the expanded customer password, the building management system setting is adjustable (for test purposes and in case of failure).

The current mode is displayed next to each control device. The *Operating mode* line shows the resulting operating mode, which results from the various control devices and the scheduler. The *Scheduler* line shows the resulting operating mode switch of the scheduler, which results from the scheduler setting.

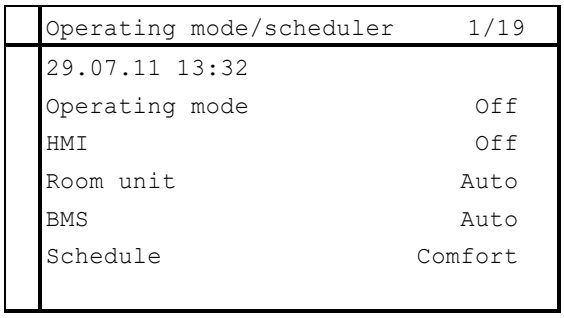

Figure 100 : Operating mode / scheduler

15.1 Operating modes

The AHU can be operated with different operating modes, whereby different setpoints for the fan, temperature and humidity control are active.

- **Off** AHU is switched off
- **NightCool** The AHU is in the night setback mode;
  the unit will run only if the requirements are met
- **Eco** The AHU is in the economy mode
- **Comfort** The AHU is in the comfort mode
- **Auto** The AHU is in the automatic mode

15.2 Scheduler

15.2.1 Weekdays

The scheduler is a week scheduler, in which up to 6 switching points separately for each day of the week can be entered. A program for exception days can be entered additionally, e.g. for events.

Each weekday can have 6 switching points, i.e. the operating mode can be changed up to 6 times a day (see examples). To avoid entering each weekday separately, settings can be copied with the copy function from Monday to the days Tuesday to Friday, from Monday to Tuesday to Sunday or from Saturday to Sunday.

Set the scheduler by selecting the corresponding weekday and confirming it with *Ok*; the display shows the setting of the weekday. The current operating mode, whether the day is active and 12 lines for the 6 switching points are displayed. The input always starts with switching point 1, for which the time and the desired operating mode can be entered. Unnecessary switching points are deleted by entering ":" for the time and "-" for the operation mode.

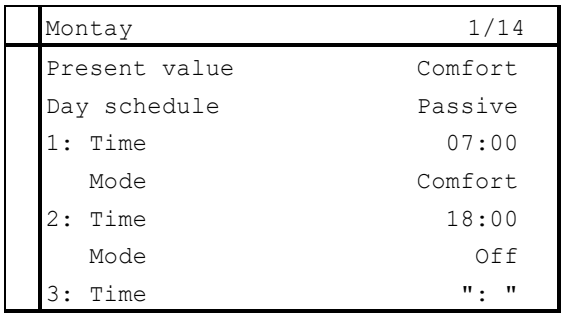

Figure 101: Scheduler - weekday

Attention:

- If only an entry for switching on and none for switching off is entered, then the AHU runs till midnight and then with the settings of the next day.
- It must be entered at least one switching point per day; if all switching points are deleted, then the default setting is entered automatically (7:00 Comfort, 18:00 Off)
- If the AHU should remain off for a day, then at least one switching point for off has to be entered; it is better not to change the times and to set only the modes to *Off*.

Setting for Mo..Fr	Description	Default
1: Time	1st entry– time	07:00
Mode	1st entry – operating mode	Comfort
2: Time	2nd entry – time	18:00
Mode	2nd entry – operating mode	Off
3: Time	3rd entry – time	": "
Mode	3rd entry – operating mode	-
4: Time	4th entry – time	": "
Mode	4th entry – operating mode	-
5: Time	5th entry – time	": "
Mode	5th entry – opterating mode	-
6: Time	6th entry – time	": "
Mode	6th entry – operating mode	-

Table 25: Scheduler settings (day)

Saturday and Sunday has the default setting off (7:00 operating mode „Off“, 18:00 „Off“).

15.2.2 Exception day(s)

The scheduler also includes an exception calendar, which allows you to use a special program for events, without reprogramming the scheduler for individual days. This program can be entered in advance. The setting when the exception is valid, is made in the lines *Period:Start* and *Period:End*. The following settings are possible:

- **only one day**
  enter a date in the line *Period:Start*, enter nothing in the line *Period:End*

- **always the same weekday**
  select a weekday in the line *Period:Start*, enter nothing in the line *Period:End*
- **always the same weekday for a month**
  select a weekday and a month in the line *Period:Start*; if this exception is valid for only one month, then enter nothing in the line *Period:End*; if this exception is valid for two or more month, then enter the same weekday and the last month in the line *Period:End*
- **all odd / even months**
  select 135 in the months field for all odd months or 246 for all even months
- **last day of the month**
  select *le* in the days field

Several combinations are possible, whereby all the settings are always AND linked, i.e. the exception program is executed when all settings are fulfilled.

Example: If the AHU of a gym should run in March and April every Thursday evening from 20:00 to 22:00, then the setting has to be performed as followed:

Setting	Description	Default
In the line Exception		
1: Time	1st entry – time	20:00
Mode	1st entry – operating mode	Comfort
2: Time	2nd entry – time	22:00
Mode	2nd entry – operating mode	Off
In the lines Period:Start and Period:End		
Period:Start	Start date for the exception program	Th, ".Mar.""
Period:End	End date for the exception program	Th, ".Apr.""

Table 26: Scheduler setting (exception program)

15.2.3 Calendar fix off (AHU fix off)

In addition to the exception program of the scheduler, a calendar is available to switch off the AHU for some time. Overall, 10 days, periods (start and end date), weekdays etc. can be programmed. With this function it is possible to program holiday times in advance.

In the screen of the operating modes, the calendar is located in the last line and shows the current state; if the state is active, then the AHU is switched off by this calendar.

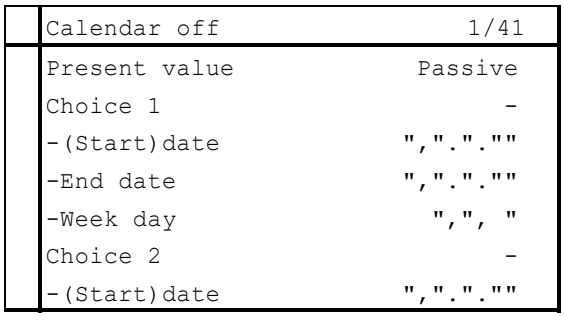

Figure 102: Calendar fix off

For each of these 10 programs adjust the settings in the line *Choice ...*, *(Start)date*, *End date* and *Weekday*; the settings match the settings in *Period:Start* and *Period:End* of the exception program of the scheduler.

Setting	Description	Default
Choice 1	1st entry – activation and type of entry	-
-(Start)date	1st entry - day (choice = date) 1st entry – first day (choice = range)	", ". ".”"
-End date	1st entry – last day (choice = range)	", ". ".”"
-Weekday	1st entry - weekday (choice = WDay)	", ", "
Choice 2	2nd entry – activation and type of entry	-
-(Start)date	2nd entry - day (choice = date) 2nd entry – first day (choice = range)	", ". ".”"
-End date	2nd entry – last day (choice = range)	", ". ".”"
-Weekday	2nd entry - weekday (choice = WDay)	", ", "
…	…	…
Choice 10	10th entry - activation and type of entry	-
-(Start)date	10th entry - day (choice = date) 10th entry – first day (choice = range)	", ". ".”"
-End date	10th entry – last day (choice = range)	", ". ".”"
-Weekday	10th entry - weekday (choice = WDay)	", ", "

Setting choice		
-	Entry not active	
Date	Usage of the start date	
Range	Usage of the start and end date, date range	
WDay	Usage of the weekday	

Table 27: Calendar setting "AHU off"

15.2.4 Date / time setting

Select the first line (date, time) and press *Ok* to set the date and the time; enter now for each field (day, month, year, hour, ..) the correct value and confirm with *Ok*.

Line	Description	Default display
Date, time	Current date, time	
Operating mode	Current operating mode	
HMI	Operating mode from the operating display / AHU	Off
Room unit	Operating mode from the room unit	
BMS	Operating mode from the building management system	
Scheduler	Current operating mode from the scheduler	
Monday	Set the scheduler for Monday	
Tuesday	Set the scheduler for Tuesday	
Wednesday	Set the scheduler for Wednesday	
Thursday	Set the scheduler for Thursday	
Friday	Set the scheduler for Friday	
Saturday	Set the scheduler for Saturday	
Sunday	Set the scheduler for Sunday	
Copy...	Copy the Scheduler (Mo → Tu..Fr, Mo → Tu..Su, Sa → Su)	-
Exception	Set the exception program of the scheduler	-
Period:Start	Set the start date of the exception period	", ". ".""
Period:End	Set the end date of the exception period	", ". ".""
Calendar fix off	Set the calendar for AHU fix off	Passive

Table 28: Settings display page operating mode / scheduler

16 Room unit

If a room unit is connected, then depending on the enabling state the operating mode can be changed, a temperature offset can be entered and the alarms can be acknowledged. If a room temperature sensor is mounted additionally, then the room unit displays the temperature of the room sensor and not of its own sensor.

The room unit displays additional information about the AHU:

- **Operating mode**; mode (upper right button) and power (upper left button)
  mode changeover via mode button, off / on via power button
- **Overtime / party**; house button
  on via short pressure, off via long pressure (2s)
  time setting in 30 minutes steps via keys +/- (0:30 .. 9:30)
- **Fan offset**, fan button
  on: press short, Off: press longer (2s)
  offset adjustable with 12 steps by using the buttons +/-
- **Temperature offset** by pressing the button „+“ or „-„
  offset setting with the button „+“ and „-„
- **Alarm acknowledge** with the button “Ok”

- **lindicated symbols**
  - Room temperature, clock
  - Leaf (heat recovery active)
  - Heating symbol (heating active), cooling symbol/snow (cooling active)
  - Water drop (dehumidification active)
  - Alarm symbol (blinking = not acknowledged alarm, lights = active alarm)
  - Fans bar (offset active)
  - Each 30s temperature offset and overtime rest time becomes visible

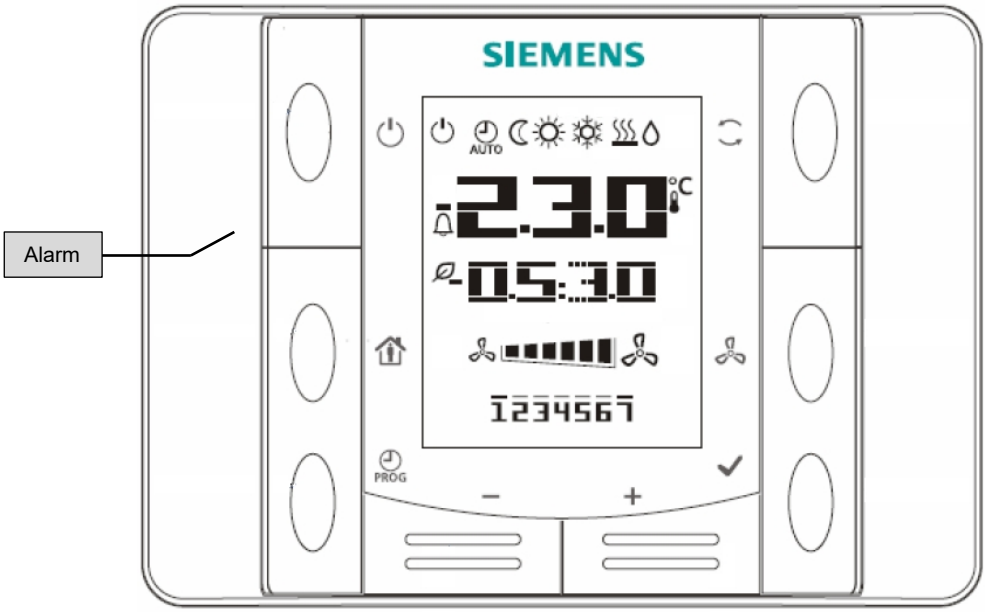

Figure 103: Room unit

17 Alarm state

The display page does not display the individual alarms, but which alarm classes are active. Individual alarms are displayed on the alarm display (**chapter 21**).

	Alarm state 1/8
	AHU: Danger - - Maintain(C) DX: - Alarm(A) -

Figure 104: Active alarm classes

4 alarm classes are used for the AHU and the compressor unit.

Alarm class	Description
Danger	Danger for the AHU; AHU stops

Alarm class	Description
Alarm(A)	Serious alarm with priority A (high)
Warning(B)	Warning message with priority B (low)
Maintain(C)	Maintenance message with priority C; e.g. dirty filter

Table 29: Alarm classes

Alarms and warnings are provided as a potential-free contact via the signal module. Alarms of alarm class *Danger* and *Alarm(A)* are reported at the alarm contact, alarms of the alarm class *Warning(B)* and *Maintain(C)* are reported as a warning.

18 Password handling

The login and logout as well as the change of passwords are performed via the password handling. The lines *Log in*, *Log out*, and *Change user password* appear only after the login with the user password *1000* (level 6) or *1001* (level 5); without login, the password entry appears immediately.

The setting of values is only possible after login. The login is indicated by a key symbol in the top left corner. A login is possible from any menu by long pressing the *Ok*-button.

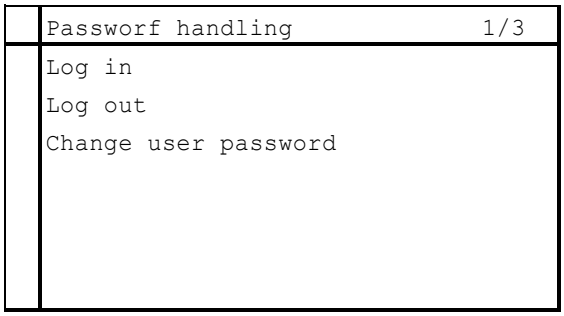

Figure 105: Passord handling

Attention: If the changed password is forgotten, then this only can be reset by the service engineer!

Setting	Description	Default
Log in	Login to higher access level, e.g. level 5	
Log out	Logout, the display shows the main / start page	
Change user password	Change user password for access level 6 The password for access level 5 is greater by 1 and cannot be changed	

Table 30: Password handling

19 Language selection

The language selection is possible without login. English, Italian, German and French can be selected. The selected language does not change even after a power failure.

20 Application info

By pressing the *Info*-button, the display shows the main / start page; by pressing the *Info*-button you can switch from the main / start page to the application info page, which provides information about the software.

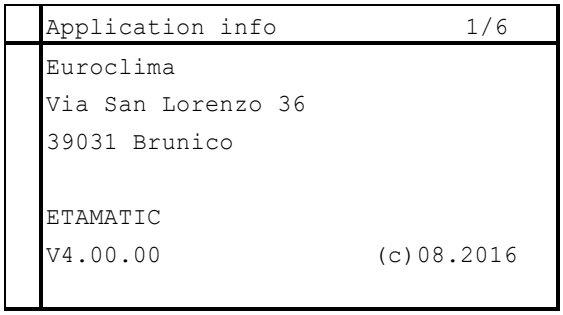

Figure 106: Application info

21 Alarm display

21.1 General

If a new alarm occurs, then the *Alarm*-button starts flashing. Alarms require an acknowledgement, i.e. the alarm is consciously perceived by the user and thus only after the acknowledgment the alarm is no longer considered actively for the control system (if it is corrected now). For example, in case of fire alarm, the AHU is switched off and the alarm message fire alarm is displayed. After the fire alarm has been corrected at the fire alarm control panel, the AHU does not start anyway, but only after the alarm has been acknowledged.

The *Alarm*-button shows the state of the alarms and is used to call up the alarm pages.

Alarm-button	Description
Off	No alarm is active
Red flashing	A new alarm occurred; a unacknowledged alarm is active
Red	Alarms are active

Table 31: Alarm-button - display

It is also possible to set an alarm so, that it is acknowledged itself. In this case, the *Alarm*-button flashes for a few seconds and then switches itself to continuous light. Once the alarm is corrected, the *Alarm*-button will turn off. To return to the example above, this can be used for the fire alarm off when the AHU is not easily accessible. This setting can only be performed by a service engineer.

By pressing the *Alarm*-button, you can always call up the alarm menu, which consists of 4 pages.

- **Press 1 time**
  Details of the last alarm (or the first alarm of those, which occurred the last)
- **Press 2 times**
  Alarm list with the possibility of acknowledgment
- **Press 3 times**
  Alarm history (alarm came in, alarm went, ...)

- **Press 4 times**
  Setting of the sort order for the alarm list / alarm history, delete alarm list / alarm history

A priority / alarm class is displayed for each alarm, which can be changed by a service engineer. With this priority is signalized, whether it is a very critical or non-critical event.

- **Danger**
  It is a very critical alarm, which requires an immediate switchoff of the AHU
- **Alarm / A**
  Critical alarm; it may lead to the switchoff of the AHU, or the AHU may continue to run. The affected component of the AHU is usually not fully functional (e.g. recovery alarm).
- **Warning / B**
  Alarm with low priority; the AHU is not switched off. Shows a fault, which should be corrected to ensure a reliable operation of the AHU (e.g. sensor failure).
- **Maintain / C**
  Warning message; the AHU is not switched off. Usually shows no failure, but only the need to check a component of the AHU (e.g. dirty filter)

21.2 Alarm list, alarm list detail

The alarm list displays all unacknowledged or still active alarms. The alarms can be acknowledged via the first line (login is necessary).

By selecting another line details can be called up, which show the priority of the alarm, date / time of the occurrence.

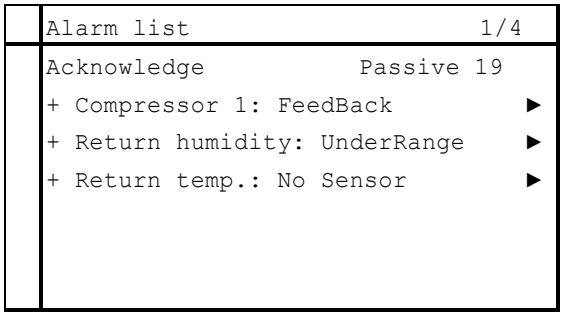

Figure 107: Alarmlist

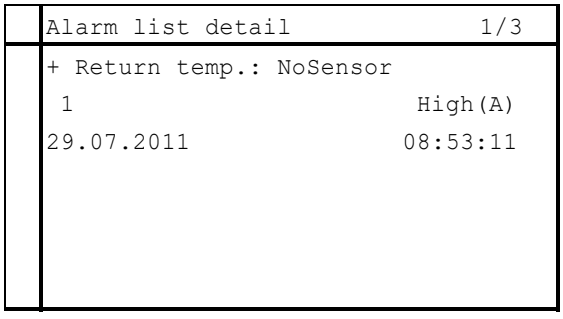

Figure 108: Alarm list detail

Important: Try to perform the following points for troubleshooting:

- **Note alarm(s) and correct the cause of the failure(s); further helpful information is in chapter 21.5 / Table 34**

- **Acknowledge alarm(s) (via the line *Acknowledge* in the alarm list)**
- **If the AHU does not start or the fault occurs repeatedly, then the cause of the fault has to be identified more accurately (e.g. availability of warm water in case of frost alarm, in case of fire alarm, whether this is really corrected or all fire dampers are open)**
- **If you cannot find the cause or you are unfamiliar with the meaning of the message, contact your AHU fitter, service engineer or call the TRANE hotline (see the title page of this document).**

21.3 Alarm history

All alarms are shown in this list, also the already corrected. So this list provides a subsequent monitoring of the alarm history.

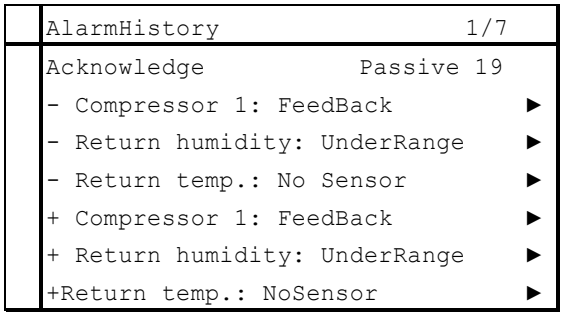

Figure 109: Alarm history

Again, the detail page can be called up and thus the occurrence and the acknowledgement of an alarm can be looked up in detail (priority, date, time).

21.4 Alarm lists configuration

Via the last alarm page, the alarm lists can be configured according to the user's needs. It is possible to sort according to 2 criteria and to display in descending / ascending order. Also, it is possible to clear the list completely (reset). The settings are performed separately for the alarm list and the alarm history.

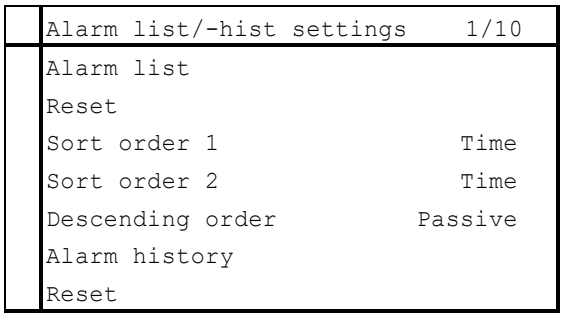

Figure 110: Alarm lists configuration

Setting	Description	Default
Alarm list:		
Reset	Clear the entire alarm list	

Setting	Description	Default
Sort order 1	1st sort order criteria	Time
Sort order 2	2nd sort order criteria	Time
Descending order	Last occurred alarm on the top of the list	Passive
Alarm history:		
Reset	Clear the entire alarm list	
Sort order 1	1st sort order criteria	Time
Sort order 2	2nd sort order criteria	Time
Descending order	Last occurred alarm on the top of the list	Active

Table 32: Alarm lists configuration

Sort order	Description	Default
Time	Sort by date / time	
ID	Sort by alarm ID	
Class	Sort by alarm class Danger, High(A), Low(B) or Warning (C)	
State	Sort by state (error type)	

Table 33: Sort order configuration for the alarm lists

21.5 Alarm index

The following table shows possible error messages, which consist of a text for the part of the AHU and a text for the alarm (alarm type) itself.

Message	Description	Alarm class
Outdoor temp.	The outdoor temperature sensor is broken Call the service engineer for the replacement of the sensor	Low(B)
Supply temp.	The supply air temperature sensor is broken; AHU stops Call the service engineer for the replacement of the sensor	Danger
Return temp.	The return air temperature sensor is broken; AHU stops Call the service engineer for the replacement of the sensor	Danger
Saturation temp.	The saturation temperature sensor is broken Call the service engineer for the replacement of the sensor	High(A)
Room temp.	The room temperature sensor is broken Call the service engineer for the replacement of the sensor	High(A)

Message	Description	Alarm class
Supply humidity	The supply air humidity sensor is broken Call the service engineer for the replacement of the sensor	Low(B)
Return humidity	The return air humidity sensor is broken Call the service engineer for the replacement of the sensor	Low(B)
Room humidity	The room humidity sensor is broken Call the service engineer for the replacement of the sensor	Low(B)
Supply airflow 1	The pressure sensor for supply fan 1 is broken; AHU stops Call the service engineer for the replacement of the sensor	Danger
Return airflow 1	The pressure sensor for return fan 1 is broken; AHU stops Call the service engineer for the replacement of the sensor	Danger
Supply duct press.	The supply air duct pressure sensor is broken; AHU stops Call the service engineer for the replacement of the sensor	Danger
Return duct press.	The return air duct pressure sensor is broken; AHU stops Call the service engineer for the replacement of the sensor	Danger
Recovery alarm	Alarm message from the heat recovery system (ACCU, ROT) Check the heat recovery and the power supply Call the service engineer	High(A)
Recovery pressure	Overpressure message at the plate heat exchanger Check the dampers Call the service engineer when this message occurs repeatedly	Danger
Freeze protection recovery	Freeze protection alarm from the heat recovery system Check the outdoor and indoor temperature Call the service engineer when this message occurs repeatedly	Low(B)
Freeze protection	Freeze protection alarm from fresh air heating battery Check the hot water supply, valves and pumps Call the service engineer when this message occurs repeatedly	Danger

Message	Description	Alarm class
Electric battery	Alarm message from the electric heating battery Check the power supply (electric protection) and the security thermostat Call the service engineer when this message occurs repeatedly	High(A)
Humidifier	Alarm message from the humidifier Read the failure message on the humidifier Call the service engineer when this message occurs repeatedly	High(A)
Supply filter 1: dirty	Supply air filter 1 is dirty; clean / replace Check, clean or replace the filter	Warning(C)
Return filter 1: dirty	Return air filter 1 is dirty; clean / replace Check, clean or replace the filter	Warning(C)
Controller	Hardware error message from the controller Call the service engineer	Danger
AHU module 1 (955)	Hardware error message from the AHU expansion module 1 Call the service engineer	Danger
Supply fan: feedback	No feedback from the supply fan inverter; check the inverter and read failure message on the Inverter	Danger
Return fan: feedback	No feedback from the return fan inverter; check the inverter and read failure message on the Inverter	Danger

Table 34: Alarm messages – AHU controller

Alarm type	Description
NoSensor	No sensor is connected / recognized
OverRange	Measured value is greater than the allowed value; > 10V, > 20mA
UnderRange	Measured value is lower than the allowed value; < 0V, < 4mA
OpenLoop	Measuring circuit is open
ShortedLoop	Measuring circuit is shorted
Other	Not defined error, communication error
ConfigErr	Configuration error, measured value completely outside of allowed values; << 0 V
MultiFault	Multiple faults on inputs with multiple states; e.g. operating mode
Fault, Alarm	Alarm message from a digital input, contact, freeze protection, feedback
Dirty	Dirty filter message from a filter with pressure monitoring
HighLimit	Measured value greater than the high limit; e.g. filter pressure too high

Alarm type	Description
LowLimit	Measured value lower than the low limit; e.g. temperature too low

Table 35: Alarm type

Data point list

COMPACT V0.06
April 2018

Hotline
+39 335 1334212

22 Introduction and configuration

The interfaces will be set up by the service technician and afterwards they will be ready for operation. Subsequently, the configuration of the interfaces is described, in order to change the interface parameters.

22.1 Access levels

The device has 5 access levels; each level has its own password. A lower level has access to all settings and menus of its own and of the higher levels. The lower the level, the more settings are available. A lower access level can change the passwords of all other levels.

Access level	Description	Key-symbol	Password
4	Service level; access to all settings for service and maintenance except some configurations; password changeable	2 keys	6975
5	Special user level; password automatically generated out of level 6 (password level 6 +1)	1 key	1001
6	User level; password changeable	1 key	1000

Table 36: Access levels

The password can be entered from any menu by long pressing the *Ok*-button; alternatively, the menu item *All Settings → Password handling* can be selected.

22.2 Configuration of communication interfaces

The communication with a higher-level control system is processed through various communication modules. Up to 3 communication modules can be used simultaneously. Depending on the used communication module, a reset is required after installation to activate the module in the configuration menu (several resets are necessary while replacing modules); the module type appears automatically, so no need to configure. **After login with the password 6975 it`s possible to change settings for Bacnet IP, Bacnet MSTP, Modbus RTU, LON as following: All settings =>Configuration=>Communication modules=>... .For Modbus IP: All settings=> Configuration=> Controller communication=>IP-Config=>... .**

Protocol	Module	Description
Modbus RTU	POL902	Communication interface for Modbus RTU
BACnet MS/TP	POL904	Communication interface for BACnet MS/TP
BACnet IP	POL908	Communication interface for BACnet IP
LON	POL906	Communication interface for Lonworks

Table 37: Communication protocols

22.2.1 Modbus RTU

This module provides two communication ports (channel 0, channel 1), in which only channel 0 can be used for communication to the superior system. Channel 1 is reserved for internal applications.

Parameter	Value	Description
State	Display hardware state of the module	
Comm failure	Display communication error	
	Passive	No communication error
	Active	Communication error
Channel 0:	**Configuration of channel 0**	
Slave	Display communication state with the superior system	
	Passive	No communication
	Active	Communication
Slave address	Slave address setting [1]	
Baud rate	Baud rate setting [9600]; 1200, 2400, 4800, 9600, 19200 Baud	
Stop bits	Number of stop bits [Two]	
	One	1 stop bit
	Two	2 stop bits
Parity	Parity setting [None]	
	None	No parity
	Even	Even parity
	Odd	Odd parity
Response timeout	Response timeout setting [5 s]	
Termination	Enable 120Ω termination resistor [Passive]	
	Passive	No termination
	Active	Termination (120Ω)
Channel 1:	**Configuration of channel 1**	
Enable	Enable communication for channel 1 [Passive]	
Slave	Display communication state with the superior system	
	Passive	No communication
	Active	Communication
Slave address	Slave address setting [2]	
Baud rate	Baud rate setting [9600]; 1200, 2400, 4800, 9600, 19200 Baud	
Stop bits	Number of stop bits [Two]	
	One	1 stop bit
	Two	2 stop bits
Parity	Parity setting [None]	
	None	No parity

Parameter	Value	Description
	Even	Even parity
	Odd	Odd parity
Response timeout	Response timeout setting [5 s]	
Termination	Enable 120Ω termination resistor [Passive]	
	Passive	No termination
	Active	Termination (120Ω)
General	**Module configuration/info**	
Software version	Display software version	
Device ID	Display device ID	
Module	Display module information	
Use default	Active	Set back to the default settings

Table 38: Modbus RTU configuration

22.2.2 BACnet MS/TP

Parameter	Value	Description
State	Display hardware state of the module	
Comm failure	Display communication error	
	Passive	No communication error
	Active	Communication error
BACnet:	**Configuration of the BACnet side**	
Device name	Device name setting [POL904_.....]	
Device ID	Device ID setting [4194303]	
Address	BACnet MS/TP address setting [18]	
Imperial unit system	Use of imperial unit system [No]	
	No	Metric unit system
	Yes	Imperial unit system (inch, °F, …)
Unicode	Enable Unicode [Passive]	
Description language	Description language setting for data point list [English]; do not change it!!	
Security level	Security level setting [0]	
Alarm server ID	Alarm server ID setting [1]	
Alarm device ID1	Alarm device ID1 setting [0]	
Alarm device ID2	Alarm device ID2 setting [0]	
Comm mapping	Used mapping setting [16384 = COM1]; do not change it!!	
Interface:	**Configuration of the physical interface**	

Parameter	Value	Description
Termination	Enable the termination resistor of the bus line [Passive]	
Baud rate	Baud rate setting [76800]	
MX info frame	MX info frame setting [1]	
Max master	Max master setting [18]	
General:	**Module configuration/info**	
Software version	Display software version	
Device ID	Display device ID	
Module	Display module information	
Diagnostics	Display diagnostic information from the module	
Use default	Active	Set back to the default settings

Table 39: BACnet MS/TP configuration

22.2.3 BACnet IP

Parameter	Value	Description
State	Display hardware state of the module	
Comm failure	Display communication error	
	Passive	No communication error
	Active	Communikation error
BACnet:	**Configuration of the BACnet side**	
Device name	Device name setting [POL908_.....]	
Device ID	Device ID setting [4194303]	
Port	Communication port setting [47808]	
Imperial unit system	Use of imperial unit system [Passive]	
	Passive	Metric unit system
	Active	Imperial unit system (inch, °F, …)
Unicode	Enable Unicode [Passive]	
Description language	Description language setting for data point list [English]; do not change it!!	
Security level	Security level setting [0]	
Alarm server ID	Alarm server ID setting [1]	
Alarm device ID1	Alarm device ID1 setting [0]	
Alarm device ID2	Alarm device ID2 setting [0]	
Alarm device ID3	Alarm device ID3 setting [0]	
Comm mapping	Used mapping setting [16384 = COM1]; do not change it!!	
TCP/IP:	**IP-interface configuration**	

Parameter	Value	Description
DHCP	Enable DHCP [Active]	
→	Display effective DHCP state	
WINS name	Display WINS name [POL908_.....]	
IP	IP address setting [127.0.0.1] ***NOTE: The IP address must be entered in the form xxx.xxx.xxx.xxx, i.e. 3 digits per digit group !!***	
→	Display effective IP address	
Mask	IP mask setting [255.255.255.0] ***NOTE: The IP address must be entered in the form xxx.xxx.xxx.xxx, i.e. 3 digits per digit group !!***	
→	Display effective IP mask	
Gateway	Gateway address setting [127.0.0.1] ***NOTE: The IP address must be entered in the form xxx.xxx.xxx.xxx, i.e. 3 digits per digit group !!***	
→	Display effective gateway address	
Save settings	Save IP address, IP mask and gateway settings before reset	
General:	**Module configuration/info**	
Software version	Display software version	
Device ID	Display device ID	
Module	Display module information	
Diagnostics	Display diagnostic information from the module	
Use default	Active	Set back to the default settings

Table 40: BACnet IP configuration

22.2.4 LON

Parameter	Value	Description
State	Display hardware state of the module	
Comm failure	Display communication error	
	Passive	No communication error
	Active	Communication error
Location	Display location [-]	
Application	Display application	
Neuron ID	Display neuron ID	
Send heartbeat	Transmission time interval setting [2700 s]	
Receive heartbeat	Reception time interval setting [3600 s]	
Min send interval	Minimum transmission time interval [5 s]	
Service pin	Release/actuate the service pin	

Parameter	Value	Description
General:	**Module configuration/info**	
Software version	Display software version	
Device ID	Display device ID	
Module	Display module information	
Use default	Active	Set back to the default settings

Table 41: LON configuration

22.2.5 Modbus RTU/ IP controller interfaces

Directly on controller there are 2 communication ports available (1 for IP and 1 for RTU). The IP interface you can use for Web-Application (within your network), where you can monitor the same situation like on the local HMI display.
Modbus RTU (on board) has no galvanic isolation and is just to use for building management; if power measurement will be done over IP, connection to BMS is not possible!
The configuration is carried out in the menu *Configuration → Communication controller*.

Parameter	Value	Description
IP-Config: (TCP-Port: 502)		
IP	Display IP address of controller	
Mask	Display subnet mask	
Gateway	Display gateway address	
DHCP	Display DHCP status (automatic reference of IP address from a DHCP server)	
Name	Controller name	
MAC	Display MAC address	
Change settings	Submenu IP configuration	
IP	Config of IP address of controller	
Mask	Config of subnet mask (controller)	
Gateway	Config of gateway address (controller)	
DHCP	Config DHCP [Active]	
	Passive	Manual address config
	Active	Automatic address config by DHCP server
100 Mbit	Switch-over interface speed 10/100Mbps [Active]	
	Passive	Speed 10Mbps
	Active	Speed 100Mbps
Link	Activate IP interface [Active]	
	Passive	Interface deactivated (no communication)
	Active	Interface activated
User name	User name for WebVisu	

Parameter	Value	Description
Password	Password for WebVisu	
Modbus:		
Modbus RTU:		
State	Displays hardware status of interface	
Slave address	Adjustment slave address [1]	
Baudrate	Adjustment baudrate [9600]; 1200, 2400, 4800, 9600, 19200, 38400 Baud	
Parity	Parity setpoint [None]	
	None	No parity
	Even	Even parity
	Odd	Odd parity
Stop bits	Adjustment quantity of stop bits [1]	
	1	1 Stop bit
	2	2 Stop bit
Response delay	Adjustment delay between master request and slave respond [0ms]	
Termination	Activate 120Ω end resistion [Passive]	
	Off	No termination
	On	Bus line terminated (120Ω)
Modbus TCP/IP:		
State	Displays hardware status of interface	

Table 42: Modbus RTU/IP on controller

23 Data points AHU

Description	R/W	Unit	Modbus	BACnet	LON
Measured values:					
Outdoor- / fresh air temperature	R	0,1 °C	I1	OutDoorTemp	nvoTemp01
Supply air temperature	R	0,1 °C	I2	SupplyTemp	nvoTemp02
Supply air humidity	R	0,1 %	I6	SupplyHumidity	nvoHum00 [%]
Return air temperature	R	0,1 °C	I3	ReturnTemp	nvoTemp03
Return air humidity	R	0,1 %	I7	ReturnHumidity	nvoHum01 [%]
Room temperature *Room unit*	R	0,1 °C	I22	RoomTemp	nvoTemp06
Saturation temperature	R	0,1 °C	I4	SaturationTemp	nvoTemp04
Return air quality CO2	R	ppm	I16	ReturnAirQuality	nvoPpm00
Supply airflow rate	R32	m³/h	I17	SupplyFlow	nvoFlow00 [l/s]
Return airflow rate	R32	m³/h	I19	ReturnFlow	nvoFlow01 [l/s]
Supply air duct pressure	R	Pa	I8	SupplyDuctPressure	
Return air duct pressure	R	Pa	I9	ReturnDuctPressure	
Actual outdoor enthalpy	R	0.1 kJ/kg	I23	Act_OutEnth	
Actual supply enthalpy	R	0.1 kJ/kg	I24	Act_SuEnth	
Actual return enthalpy	R	0.1 kJ/kg	I25	Act_EhEnth	
Actual room enthalpy	R	0.1kJ/kg	I27	Act_RoomEnth	
Operating mode:					

Description	R/W	Unit	Modbus	BACnet	LON
Operating mode from HMI 0=Off, 1=Night Setback, 2=Eco, 3=Comfort, 4=Auto	R	0..4	H1	Opmode_HMI	
Operating mode from room unit 0=Off, 2=Eco, 3=Comfort, 4=Auto	R	0..4	H2	Opmode_RoomUnit	
Operating mode from BMS 0=Off, 1=Night Setback, 2=Eco, 3=Comfort, 4=Auto	R/W	0..4	H3	Set_Opmode_BMS	nviOpMode
Operation mode from hardware contact 0=Auto, 1=Eco, 2=Comfort	R	0..2	H4	Opmode_HWcontact	
Current operating mode 0=Off, 1=Night Setback, 2=Eco, 3=Comfort	R	0..3	H5	Opmode_act	nvoOpMode
Current AHU state / operating mode source 0=No request/off, 1=Start, 2=Configuration changed, 3=Command from HMI, 4=Command from BMS, 5=Command from room unit, 6=Command from scheduler	R	0..6	H6	Opmode_Unitstate	
Operating mode from scheduler 0=-/no request, 1=Off, 2=Night Setback, 3=Eco, 4=Comfort	R	0..4	H7	Opmode_Scheduler	
Winter/Summer-Switching 0=-, 1=Winter, 2=Summer	R/W	0..2	H224	Set_BMS_WinSum	
Ventilatorregelung:					
Smoke fan mode 0=Supply/Return, 1=Supply, 2=Return	R/W	0..2	H83	Set_SmokeFanMode	
Fireman fan mode 0=Supply/Return, 1=Supply, 2=Return	R/W	0..2	H84	Set_FiremanFanMode	
Fan start delay (open dampers)	R/W	0.1 s	H88	Set_DmpOpenDelay	
Fan shut down delay electric battery	R/W	0.1 s	H89	Set_FanShutDownDelay	

Description	R/W	Unit	Modbus	BACnet	LON
Supply speed smoke fan	R/W	0.1 %	H90	Set_SupplySpeedSmoke	
Supply speed fireman fan	R/W	0.1 %	H91	Set_SupplySpeedFire	
Return speed smoke fan	R/W	0.1 %	H109	Set_ReturnSpeedSmoke	
Return speed fireman fan	R/W	0.1 %	H110	Set_ReturnSpeedFire	
Supply fan request value	R	0.1 %	H34	SupplyFanSpeed	
Return fan request value	R	0.1 %	H35	ReturnFanSpeed	
Supply fan request stage 0=-, 1=Off, 2=Stage 1, 3=Stage 2, 4=Stage 3	R	0..4	H36	SupplyFanStage	
Return fan request stage 0=-, 1=Off, 2=Stage 1, 3=Stage 2, 4=Stage 3	R	0..4	H37	ReturnFanStage	
Fan control with air flow control:					
Supply airflow rate for Eco mode(1)	R32/W32	m³/h	H10	Set_SupplyFlowEco	nviPress_Flow00
Supply airflow rate for Comfort mode(1)	R32/W32	m³/h	H12	Set_SupplyFlowCmf	nviPress_Flow01
Supply airflow rate for Night Setback mode(1)	R32/W32	m³/h	H18	Set_SupplyFlowNht	nviPress_Flow04
Return airflow rate for Eco mode(1)	R32/W32	m³/h	H14	Set_ReturnFlowEco	nviPress_Flow02
Return airflow rate for Comfort mode(1)	R32/W32	m³/h	H16	Set_ReturnFlowCmf	nviPress_Flow03
Return airflow rate for Night Setback mode(1)	R32/W32	m³/h	H20	Set_ReturnFlowNht	nviPress_Flow05
Maximum supply airflow rate from air quality control(1)	R32/W32	m³/h	H22	Set_SupplyFlowQAirMax	
Maximum return airflow rate from air quality control(1)	R32/W32	m³/h	H24	Set_ReturnFlowQAirMax	
Maximum supply airflow rate from dehumidification(1)	R32/W32	m³/h	H30	Set_SupplyFlowDeHumMax	
Maximum return airflow rate from dehumidification(1)	R32/W32	m³/h	H32	Set_ReturnFlowDeHumMax	
Supply airflow rate – request from air quality control(1)	R32	m³/h	H106	SupplyFlowQAir	

Description	R/W	Unit	Modbus	BACnet	LON
Return airflow rate – request from air quality control[1]	R32	m³/h	H101	RetunFlowQAir	
Supply airflow rate – request from dehumidification[1]	R32	m³/h	H103	SupplyFlowDeHum	
Return airflow rate – request from dehumidification[1]	R32	m³/h	H92	RetunFlowDeHum	
Supply airflow rate – current setpoint[1]	R32	m³/h	H26	SupplyFlowSet	
Return airflow rate – current setpoint[1]	R32	m³/h	H28	ReturnFlowSet	
Fan control with speed control:					
Supply fan speed for Eco mode[2]	R/W	0,1 %	H10	Set_SupplySpeedEco	
Supply fan speed for Comfort mode[2]	R/W	0,1 %	H12	Set_SupplySpeedCmf	
Supply fan speed for Night Setback mode[2]	R/W	0,1 %	H18	Set_SupplySpeedNht	
Return fan speed for Eco mode[2]	R/W	0,1 %	H14	Set_ReturnSpeedEco	
Return fan speed for Comfort mode[2]	R/W	0,1 %	H16	Set_ReturnSpeedCmf	
Return fan speed for Night Setback mode[2]	R/W	0,1 %	H20	Set_ReturnSpeedNht	
Maximum supply fan speed from air quality control[2]	R/W	0,1 %	H22	Set_SupplySpeedQAirMax	
Maximum return fan speed from air quality control[2]	R/W	0,1 %	H24	Set_ReturnSpeedQAirMax	
Maximum supply fan speed from dehumidification[2]	R/W	0,1 %	H30	Set_SupplySpeedDeHumMax	
Maximum return fan speed from dehumidification[2]	R/W	0,1 %	H32	Set_ReturnSpeedDeHumMax	
Supply fan speed – request from air quality control[2]	R	0,1 %	H100	SupplySpeedQAir	
Return fan speed – request from air quality control[2]	R	0,1 %	H111	ReturnSpeedQAir	
Supply fan speed – request from dehumidification[2]	R	0,1 %	H98	SupplySpeedDeHum	
Return fan speed – request from dehumidification[2]	R	0,1 %	H94	ReturnSpeedDeHum	
Supply fan speed – current set point[2]	R	0,1 %	H26	SupplySpeedSet	
Return fan speed – current set point[2]	R	0,1 %	H28	ReturnSpeedSet	

Description	R/W	Unit	Modbus	BACnet	LON
Fan control with duct pressure control:					
Supply duct pressure for Eco mode(3)	R/W	Pa	H10	Set_SupplyPressEco	nviPress_Flow00
Supply duct pressure for Comfort mode(3)	R/W	Pa	H12	Set_SupplyPressCmf	nviPress_Flow01
Supply duct pressure for Night Setback mode(3)	R/W	Pa	H18	Set_SupplyPressNht	nviPress_Flow04
Return air duct pressure for Eco mode(3)	R/W	Pa	H14	Set_ReturnPressEco	nviPress_Flow02
Return duct pressure for Comfort mode(3)	R/W	Pa	H16	Set_ReturnPressCmf	nviPress_Flow03
Return duct pressure for Night Setback mode(3)	R/W	Pa	H20	Set_ReturnPressNht	nviPress_Flow05
Maximum duct pressure from air quality control(3)	R/W	Pa	H22	Set_SupplyPressQAirMax	
Maximum return duct pressure from air quality control(3)	R/W	Pa	H24	Set_ReturnPressQAirMax	
Maximum supply duct pressure from dehumidification(3)	R/W	Pa	H30	Set_SupplyPressDeHumMax	
Maximum return duct pressure from dehumidification(3)	R/W	Pa	H32	Set_ReturnPressDeHumMax	
Supply duct pressure – request from air quality control(3)	R	Pa	H97	SupplyPressQAir	
Return duct pressure – request from air quality control(3)	R	Pa	H108	RetunPressQAir	
Supply duct pressure – request from dehumidification(3)	R	Pa	H99	SupplyPressDeHum	
Return duct pressure – request from dehumidification(3)	R	Pa	H96	RetunPressDeHum	
Supply duct pressure – current setpoint(3)	R	Pa	H26	SupplyPressSet	
Return duct pressure – current setpoint(3)	R	Pa	H28	ReturnPressSet	
Temperature control:					
Temperature control mode 0=Return air/supply air cascade, 1=Constant supply air, 2=Return air, 3=Room/supply air cascade, 4=Room	R/W	0..4	H40	Set_TempCtrlMode	

Description	R/W	Unit	Modbus	BACnet	LON
Minimum supply air temperature	R/W	0,1 °C	H41	Set_MinSupplyTemp	nviTemps {standby_cool}
Maximum supply air temperature	R/W	0,1 °C	H42	Set_MaxSupplyTemp	nviTemps (standby_heat}
Saturation temperature setpoint (low limit)	R/W	0,1 °C	H43	Set_SatTemp	
Heating temperature setpoint for Eco mode	R/W	0,1 °C	H45	Set_HeatEco	nviTemps {unoccupied_heat}
Heating temperature setpoint for Comfort mode	R/W	0,1 °C	H46	Set_HeatCmf	nviTemps {occupied_heat}
Cooling temperature setpoint for Eco mode	R/W	0,1 °C	H47	Set_CoolEco	nviTemps {unoccupied_cool}
Cooling temperature setpoint for Comfort mode	R/W	0,1 °C	H48	Set_CoolCmf	nviTemps {occupied_cool}
Night Setback setpoint (Return air or room temperature)	R/W	0,1 °C	H59	Set_NightPurge	
Release temperature Night cooling (Release=Outdoortemp.> value)	R/W	0,1 °C	H112	Set_MinOutTempNight	
Summer compensation – fresh air temperature startpoint	R/W	0,1 °C	H50	Set_SumCompStart	
Summer compensation – fresh air temperature endpoint	R/W	0,1 °C	H51	Set_SumCompEnd	
Summer compensation – offset at endpoint	R/W	0,1 °C	H52	Set_SumCompDelta	
Summer compensation – current offset	R	0,1 °C	H53	SumCompVal	nvoTemp05
Winter compensation – fresh air temperature startpoint	R/W	0,1 °C	H55	Set_WinCompStart	
Winter compensation – fresh air temperature endpoint	R/W	0,1 °C	H56	Set_WinCompEnd	
Winter compensation – offset at endpoint	R/W	0,1 °C	H57	Set_WinCompDelta	
Winter compensation – current offset	R	0,1 °C	H58	WinCompVal	nvoTemp05
Current controlled variable/temperature	R	0,1 °C	H60	CtrlTemp_act	

Description	R/W	Unit	Modbus	BACnet	LON
Current heating setpoint	R	0,1 °C	H61	CtrlHeatSet_act	
Current cooling setpoint	R	0,1 °C	H62	CtrlCoolSet_act	
Current heating setpoint for saturation temperature (HR, heating 1, cooling 1)	R	0,1 °C	H63	CtrlSatHeatSet_act	
Current cooling setpoint for saturation temperature (HR, heating 1, cooling 1)	R	0,1 °C	H64	CtrlSatCoolSet_act	
Minimal temperature difference cascade control	R/W	0,1 °C	H8	Setpoint_DiffMin	
Maximal temperature difference cascade control	R/W	0,1 °C	H9	Setpoint_DiffMax	
Recirculation damper – Minimum fresh air damper position (always valid)	R/W	0,1 %	H71	Set_CircDmpMinFreshAir	
Recirculation damper – Maximum fresh air damper position control (always valid)	R/W	0,1 %	H72	Set_CircDmpMaxFreshAir	
Recirculation damper (0=closed, 1=open)	R	0..1	H38	CircDmp_DO	
Heating/Cooling battery actual request value	R	0.1 %	H76	H/CBatt_ActReq	
Heating/Cooling battery actual mode 0=Winter, 1=Summer	R	0..1	H74	H/CBatt_ActMode	
Heating battery 2/post heating battery – valve position	R	0,1 %	H75	HeatBatt2_Valve	nvoPerc03
Heating battery 2/post heating battery – Auto start temperature	R/W	0.1 °C	H77	HBatt2_PumpAutoSrtTemp	
Heating battery 2/post heating battery – Preheating active	R	0..1	H73	HBatt2_PreheatAct	
Heating battery 1/pre heating battery – valve position	R	0,1 %	H80	HeatBatt1_Valve	nvoPerc04
Heating battery 1/pre heating battery – pre heating active	R	0..1	H44	HeatBatt1_PreHeatAct	
Heating battery 1/pre heating battery – Auto start temperature	R/W	0.1 °C	H39	HBatt1_PumpAutoStrtTemp	
Electric heating battery – power request	R	0,1 %	H85	EBatt_Req	nvoPerc05

Description	R/W	Unit	Modbus	BACnet	LON
Electric heating battery – stage 0=Off, 1=Stage 1	R	0..1	H86	EBatt_Stage	nvoSwitch00
Electric heating battery – power request thyristor stage 1	R	0,1 %	H87	EBatt_Triac	
Electric heating battery – Request Stage 1	R/W	0,1 %	H54	EBatt_Stage1On	
Electric heating battery – Request shut down	R/W	0,1 %	H49	EBatt_StageDownHyst	
Heat recovery – power request, bypass damper position(inverse)	R	0,1 %	H95	HeatRec_Req	nvoPerc06
Heat recovery – Release temperature	R/W	0.1 °C	H69	HRec_EnableTemp	
Heat recovery – Startup temperature	R/W	0.1 °C	H67	HRec_StartupTemp	
Heat recovery – Startup time	R/W	0.1 s	H68	HRec_StartupTime	
Heat recovery – Release request pump	R/W	0.1 %	H65	HRec_PumpOnVal	
Heat recovery – Shut down request pump	R/W	0.1 %	H66	HRec_PumpOffVal	
Cooling battery 1 – valve position	R	0,1 %	H105	CoolBatt1_Valve	nvoPerc07
Cooling battery 1 – Release temperature	R/W	0.1 °C	H70	CBatt1_EnableTemp	
Humidity control:					
Humidification – setpoint for Eco mode	R/W	0,1 %	H130	Set_HumEco	
Humidification – setpoint for Comfort mode	R/W	0,1 %	H131	Set_HumCmf	NviHum00 [%]
Dehumidification – setpoint for Eco mode	R/W	0,1 %	H132	Set_DeHumEco	
Dehumidification – setpoint for Comfort mode	R/W	0,1 %	H133	Set_DeHumCmf	NviHum01 [%]
Maximum supply air humidity	R/W	0,1 %	H134	Set_SupplyHumMax	
Minimum fresh air damper position (for humidity control)	R/W	0,1 %	H135	Set_MinFreshAirDeHum	
Maximum fresh air damper position (for humidity control)	R/W	0,1 %	H136	Set_MaxFreshAirDeHum	

Description	R/W	Unit	Modbus	BACnet	LON
Humidifier – power	R	0,1 %	H140	Humidifier_Req	nvoPerc08
Dehumidification – power request for dehumidification	R	0,1 %	H145	Dehumidification	
Air quality control:					
CO2 – return air quality setpoint for Eco mode	R/W	ppm	H165	Set_CO2Eco	
CO2 – return air quality setpoint for Comfort mode	R/W	ppm	H166	Set_CO2Cmf	nviPpm00 [%]
Minimum fresh air damper position (for air quality control)	R/W	0,1 %	H169	Set_MinFreshAirQCtrl	
Maximum fresh air damper position (for air quality control)	R/W	0,1 %	H170	Set_MaxFreshAirQCtrl	
Air quality control request value	R	0.1 %	H78	Act_AirQCtrlVal	
Humidity control mode 0=Return humidity, 1=Supply humidity, 2=Room humidity	R/W	0..2	H79	Set_HumCtrlMode	
Circulation damper dehumidification priority 0=Auto, 1=Fresh air, 2=Return air	R/W	0..2	H81	Set_DmpDehumPrio	
Circulation damper actual dehumidification priority 0=Fresh air, 1=Return air	R	0..1	H82	Act_DmpDehumPrio	
Other:					
Alarm acknowledge (1=Acknowledge, automatic return to 0 after 2s)	W	0..1	H220	Set_AlarmAck	

Description		R/W	Modbus		BACnet	LON
AHU: sensor alarms	0=Outdoor / fresh air temperature 1=Supply air temperature 2=Return air temperature 3=Saturation temperature 4=Supply fan pressure (nozzle) 5=Return fan pressure (nozzle) 6=Supply air duct pressure 7=Return air duct pressure 8=Return air quality 9=Room temperature 10=Supply humidity 11=Return humidity	R	I300		AHU_SenAlm1 OutDoorTemp SupplyTemp ReturnTemp SaturationTemp SupplyFlow ReturnFlow SupplyDuctPressure ReturnDuctPressure ReturnAirQuality RoomTemp SupplyHumidity ReturnHumidity	nvoAlarm Bit 0..15
AHU: alarms	0=Supply/fresh air filter 1 1=Return air filter 1 2=Thermostat/electric protection for electric battery 3=Fire alarm 4=Freeze alarm from heating battery 1 5=Alarm heat recovery 6=Freeze alarm from heat recovery 7=Humidifier alarm 8= Pressure plate heat exchanger 9=Supply fan alarm 10=Return fan alarm 11=External Alarm	R	I302		AHU_DigIpt1 Alm_SupplyFilter1 Alm_ReturnFilter1 Alm_EBatt Alm_Fire Alm_Freeze Alm_HeatRec Alm_HeatRecFreeze Alm_Humidifier Alm_HeatRecPress SupplyFan_Run ReturnFan_Run Alm_UnivExt	nvoState Bit 0..15

Description		R/W	Modbus		BACnet	LON
AHU: alarm states	0=Alarm class 0, Danger 1=Alarm class 1, High(A) 2=Alarm class 2, Low(B) 3=Alarm class 3, Warning(C) 4=AHU stop (Alarm, configuration changed, ...) 5=Hardware error from controller 6=Hardware error from expansion module 1 7=Communication error with room uni	R	I304		AHU_UnitAlm AHU_Alarmclass0 AHU_Alarmclass1 AHU_Alarmclass2 AHU_Alarmclass3 - Alm_Controller Alm_AHUModule1 Alm_RUCom	nvoAlarm Bit 24..31
AHU: digital inputs	0= Operation signal from supply fan 1 1= Operation signal from supply fan 2 2= Operation signal from return fan 1 3= Operation signal from return fan 2	R	I305		AHU_InSta1 SupplyFan_Run ReturnFan_Run	nvoDI Bit 0..7

Description		R/W	Modbus		BACnet	LON
AHU: digital outputs	0=Supply fan 1 1= Return fan 1 2=Pump/enable heat recovery 3=Pump heating battery 1 4=Pump heating battery 2 5=Pump cooling battery 1 6=Stage 1 electric battery 7=Humidifier pump/enable humidifier 8=Humidifier filling valve 9=Humidifier draining valve 10=Fresh/Exhaust damper 11=AHU Run 12=AHU Alarm 13=AHU Warning 14=Cool/Heating mode 15=Winter/Summer mode	R	I310		AHU_OutSta1 SupplyFan_Stage ReturnFan_Stage HeatRec_Pump HeatBatt1_Pump HeatBatt2_Pump CoolBatt1_Pump - Humidifier_Pump Hum_FillVlv Hum_DrainVlv SuEx_Dmp AHU_Run AHU_Alarm AHU_Warning AHU_CoolHeat WinSumSwitch	nvoDO Bit 0..15
	0=Hardware contact operation mode	R	I311		AHU_OutSta2 HW_OPMFix	

Legend	*(1)*	*Flow rate setpoints valid with flow rate control*
	(2)	*Speed setpoints valid with speed control*
	(3)	*Pressure setpoints valid with duct pressure control*
	(4)	*Stage setpint valid with stage control*
	(5)	*Bit number*
	16Bit	*Unsigned Integer, 16Bit, the single bits are states/alarms* *0= .. Bit 0* *1= .. Bit 1*
	R32, W32	*Double Integer (32 Bit), MSW/LSW*
Modbus functions		*Register I: Read Input Register (FC4),* *Register H: Read Holding Register (FC3)* *Write single Holding Register (FC6),* *Write multiple Holding Registers (FC16)* *Statusbit S: Read Input Status (FC2)*

Table 43: Data point list AHU

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Trane - by Trane Technologies (NYSE: TT), a global climate innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.eu or tranetechnologies.com.

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