

Installation Operation Maintenance

CCEB/CCEC Air Handling Units



AH-SVX01F-GB Original instructions

March 2018



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



Contents

1	Introduction	6
	1.1 Model code	6
	1.2 Intended use / foreseeable misuse	7
	1.2.1 Intended use	7
	1.2.2 Foreseeable misuse	7
	1.3 Modular design	7
	1.4 Documentation	8
2	Safety instructions	
	2.1 CE-conformity / installation instructions for safe operation	9
	2.1.1 CE-conformity declaration according to Machinery Directive 2006/42/EC	
	2.1.2 Installation instructions for the proper installation in the building system	9
	2.2 Indications for minimizing specific hazards	10
	2.2.1 General indications	
	222 Refrigeration circuit	12
	2.2.3 ATEX units	
	2.3 Staff selection and qualification	14
3	Beception control / unloading / transportation to installation site	
Ū	3.1 Reception control	
	3.2 Unloading / transportation to installation location	17
	3.3 Overlifting of AHU sections with crane lugs	18
	3.3.1 Control of weight limits of delivery sections	10
	3.3.2 Necessary actions before lifting delivery sections with crane lugs	20
	3.3.3 Mounting of crane lugs	
	3.3.4 Lifting of delivery sections with crane lugs	
	3.4 Overlifting of monoblocs	21
	3.4 Overheining of monobloos	27 21
	3.4.2 Lifting of monoblocs	27
	3.4.2 Entring of molecular for the every lifting of both delivery sections on errors lyrs as well as monobless	20
	3.6 Storage	Z1 20
1	5.0 Studge	20 20
4		20
	4.1 FOUNDATION	29
	4.2 Election.	30
	4.2.1 Folential fists that may arise through the election site	
	4.2.2 Actions to prevent potential risks	
	4.2.3 General matcauons for the election	
5	4.2.4 Special guidelines for hat units – ceiling units	33 25
5		30 25
	5.1 Assembly of casing	30 25
	5.1.1 Actions before the assembly of casing	
	5.1.2 Standard connections and connection components	
	5.1.3 Detailed solutions and comection components	
	5.1.4 Assembly of derivery sections	
	5.1.5 Special realities for foor units and device separations at wet areas	
	5.1.6 Cable giario	43
	0.2 DUUIS	45
	5.3 Dampers	47
	5.4 Filters	41
	5.4.1 Laterally removable prefilters	
	5.4.2 Pretilters and / or bag filters in tilter frame	
	5.4.3 Laterally removable bag filters with clamping mechanism	
	5.4.4 HEPA filters	
	5.5 Dampers with external gear wheels	51
_	5.6 Hygienic AHU's	51
6	Installation	51
	6.1 Heat exchanger connection	52
	6.1.1 General notes	
	6.1.2 Steam heat exchanger	53
	6.1.3 Plate heat exchangers for refrigeration circuits	54
	6.2 Connection of indirect adiabatic cooling	55
	6.3 Condensate drain	55
	6.3.1 Standard siphons	55
	6.3.2 Ball siphons	57
	6.4 Duct connection	58
	6.4.1 Insulation of fresh air damper	59
	6.5 Pumps	59



7	EI	lectrical	connection	5	59
	7.1	Conne	cting to an external protective conductor system	. 59	
	7.2	AC mo	tors	. 59	
	7.3	Repair	switch (emergency stop switch)	. 64	
	7.4	Variabl	e, frequency-controlled drives (VFD, frequency converters)	. 65	
	7.5	Electric		. 66	~~
	7.	5.1	AHUS equipped from TRANE with control ETAMATIC	6	56
	1.	5.2 ononoih	AHUS which are not equipped from TRAINE with control (which have to be equipped with controls on		~~
	76	Differen	nily of the chefit)	0 60	00
	7.0	Lightin	nual pressure restriction for plate field exchangers	. 00 70	
8	'.' C(ommiss	jionina	. 70	70
U	81	Prelimi	narv stens	70	U
	8.	1.1	Variable frequency controlled drives - parameters		71
	8.	1.2	Airflow measurement by differential pressure measurement at the fan nozzle		73
	8.	1.3	Heat exchanger		75
	8.	1.4	Electric heater		76
	8.	1.5	Filters		76
	8.	1.6	Humidifier / Air washer		77
	8.2	Refrige	ration circuit	. 78	
	8.	2.1	General notes		78
	8.	2.2	Manually starting the compressor via TRANE control system		78 70
	8.	2.3	Keirigerant		79 70
	0. 0.0	Z.4 Toot m	Compressor iubricant		79
٥	0.3 M	aintona	II	.79. S	22
3	9.1	Contro	l cabinet	82	72
	9.1	Fan / m	י סמטוויכניייייייייייייייייייייייייייייייייי	82	
	9.	2.1	Fan	8	82
	9.	2.2	Motor	8	84
	9.	2.3	V-belt drive	8	84
	9.	2.4	Re-tensioning of belts	8	86
	9.	2.5	Replacing of belts	8	88
	9.3	Air filte	rs	. 88	
	9.	3.1	Panel filters	8	3 9
	9.	3.2	Bag filters	9	90
	9.	3.3	HEPA filters	§	90
	9.	3.4	Auto roll filters		91
	9.4		Modium water (steem	. 91	01
	9. 0	4.1 12	Neuluiii walei / Sieaiii	·····è	91 02
	9. Q	4.2 4 3	Flectric Heater		92 02
	95	Humidi	fier Air washers	92	,2
	9.	5.1	Pump		92
	9.	5.2	Air washers		93
	9.	5.3	Steam humidifiers	9	93
	9.	5.4	Honey comb humidifiers	9	93
	9.	5.5	Spray tube humidifiers	9	94
	9.6	Dampe	rs	. 94	
	9.7	Sound	attenuators	. 94	
	9.8	Weathe	er louver	. 94	
	9.9	Energy	Plate head such as a second seco	. 94	<u> </u>
	9.	9.1	Plate heat exchangers	§	94
	9.	9.2	Heat wheels		95 05
	9.	9.3	neal pipes	····· ؟	90 05
	9. Q 10	J.7 Rofri	neration circuit	 AQ	90
	9.10 Q	10.1	l eakage checks	. 30	96
	<u>9</u>	10.2	Maintenance		97
	9.	10.3	Inspection		98
	9.11	Hyai	enic units	. 99	2
	9.12	Main	tenance plan	. 99	
10) In	formati	on on airborne noise emitted by the air conditioning units - on request	10)1
11	A	TEX uni	ts	10)1
	11.1	Gene	eral notes1	101	
	11.2	Infor	nation regarding the unit, protective systems and components1	103	
	11.3	Infor	nation for commissioning, maintenance and repair1	104	<u>.</u>
	11	1.3.1	Foundation and erection	10)4



	11.3.2	Assembly connection	
	11.3.3	Fan section	
	11.3.4	Air filters	
	11.3.5	Heat exchangers / steam humidifiers	
	11.3.6	Field devices	
	11.3.7	Declaration of conformity	
12	Disasse	mbly and disposal	106
	12.1.1	Disassembly	
	12.1.2	Disposal	
Figu	re index	·	
Tabl	e index		110



1 Introduction

1.1 Model code



Legend used for AHU type

CCEB/CCEC 2000 / CCEB/CCEC T- TWO / CCEB/CCEC INOVA	Housing types
FTA XXX	key FTA: including control
	including refrigeration circuit
	atopdard
	Statiualu
ETA POOL SPA	circuit (option)
ETA POOL OLYMPIC	for pool dehumidification including plate heat exchanger
	and reingeration circuit
	heat recovery by plate heat exchanger
	neat recovery by accumulator
ETAROT	heat recovery by heat wheel
ETA WP	refrigeration circuit, heat pump function
ETA PAC	indirect adiabatic cooling
CLEANLINE	for hygienic use, including control
Design key AHU execution	
9	A HIL for indeer installation
	All for outdoor installation
	ATU IN OULOOU INStallation
	AHU Industrial – neavy version of the panels
HG	AHU hygienic execution
Legend for the unit size	
Clear width / clear height - supply air	From the given number, the clear length in mm can be
-	United as 10110WS. VX * $100 - multiples 152.5 mm$ recorded to 2 dicite
air	100 = multiples 152.5 mm rounded to 2 digits



Example above: $15 \rightarrow 15 \times 100 = 1500$

 $6 \rightarrow 6x100 = 600$

152.5 mm x 10 = **1525 mm = clear width supply air** (in this example also for exhaust air) 152.5 mm x 4 = **610mm = clear height supply air** (in this example also for exhaust air)

1.2 Intended use / foreseeable misuse

1.2.1 Intended use

An AHU is used, depending on the chosen model, to create a desired indoor air quality. Parameters are...

- air change
- air temperature and humidity
- to filter normal contaminated air
- in special cases for filtering air for clean room applications

The units are suitable for...

- an ambient air temperature range of -20°C to +70°C and for the supplied air from -20°C to +40°C
- normal air
- for the operation within the agreed technical data

Operation at other conditions must be agreed in writing.

If products and components of other manufacturers are used, these must be recommended or approved by TRANE.

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

1.2.2 Foreseeable misuse

Other than above use, is considered as improper and must be excluded totally:

- The commissioning of equipment, prior performing the steps indicated in the assembly instructions and operating with an open fan unit door is a serious security risk.
- Opening the unit, without securing the repair switch in the off position, represents a massive security risk.
- The operation of an AHU equipped with electric heater while fan-motor is cut off, or if fan is working at a limited airflow for example caused by closed dampers or similar, but with electric heater in operation produces an imminent fire risk.
- The operation in an explosive atmosphere is prohibited, as long as the AHU is not executed in accordance with the ATEX directive. Application of ATEX units, see **chapter 11 (ATEX units)**.
- Handling of air with corrosive / aggressive components.

1.3 Modular design

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

Manual CCEB/CCEC 2000 / T-TWO / INOVA / cardboard box / nylon bag in the fan section ETA

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

Components operating manual AHU drawing

Wiring diagram for ETA Operating instruction control ETA MATIC / ETA POOL cardboard box / nylon bag in the fan section applied on each delivery section and glued on the inside of the fan section door in control cabinet in control cabinet

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

K-value for airflow measurementglued on the inside of the fan section doorBelt drive and tension dataglued on the inside of the fan section doorData point listin control cabinetPiping & instrumentation diagramin control cabinetRecords for refrigeration circuit applicationin control cabinet

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 threat picto-gram



Indication to avoid damage

In addition to the contents of this manual, the instruction manuals of the component manufacturers must be followed. In the corresponding chapters is pointed on the manuals. In case of contradiction between manual CCEB/CCEC 2000 and components manufacturer for safety instructions, the most restrictive interpretation is valid.



2 Safety instructions

2.1 CE-conformity / installation instructions for safe operation

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

An AHU (or any part thereof) supplied by TRANE is by definition of Machinery Directive 2006/42/EC an incomplete machine, because it is limited in function and is only a part of the building system. Accordingly, for a safe operation before the initial start-up, the general in **chapter 2.1.2** (Installation instructions for the proper installation in the building system) and in particular in the following chapters described on-site work must be carried out for a safe operation.

2.1.2 Installation instructions for the proper installation in the building system

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

Assembly of delivery sections

The deliver sections of the AHU must be assembled and linked together, according to the drawing supplied on the inner face of fan section door. See the **chapter 4 (Foundation / erection)** and **chapter 5 (Assembly)**.

Secure inlet and outlet openings

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

Repair switch

See chapter 7.3 (Repair switch (emergency stop switch)).

Installation of ceiling units – flat units See chapter 4.2.4 (Special guidelines for flat units – ceiling units).

Installation of filters See chapter 5.4 (Filters).

Temperature limitation

By a control system must be ensured, that the AHU is only operated with a supply air temperature below the allowable maximum (40 ° C, 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 basis for on-site sound measures calculation (such as for sound attenuators) the on request available sound data can be used. 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 air conditioning units - on request).

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



Motor connection See chapter 7.2 (AC motors).

Frequency controller for Plug fans

Also if not supplied by TRANE a frequency converter must be installed to reach the calculated operating point. For details see **chapter 7.4 (Variable, frequency-controlled drives (VFD, frequency converters)**).

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

Electric heater

Installation (if not supplied by TRANE) and connection of thermostats for safety shutdown, see **chapter 7.5 (Electric heaters)**.

Plate heat exchanger

Installation (if not supplied by TRANE) and connection of differential pressure switches to protect the plate heat exchanger from damage in **chapter 7.6 (Differential pressure restriction for plate heat exchangers)**.

Siphons

Connecting according to chapter 6.3 (Condensate drain).

Dampers with external gear wheels

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

Flexible connection

Installations (if not supplied by TRANE) refer to chapter 6.4 (Duct connection).

Frost protection for heat exchangers

Venting, draining of heat exchangers

2.2 Indications for minimizing specific hazards

2.2.1 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) is to provide 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 noxious substances. In addition, harmful vapours can escape from the unit. 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 AHU note the following risks:



Indentation of body parts in moving parts (belt drive, fan impeller, ...).



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 must be ensured prior working on the unit, that...

- all current-carrying parts, such as fan motors, valves, motors and electric heaters are disconnected from the power supply by using the repair 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 fan wheel, motor and heat wheel have come to a standstill; wait at least 2 minutes after switching off before opening the doors.
- for maintenance of frequency controlled motors, a waiting time of 15 minutes is recommended - time to break down the residual capacitive charge of the frequency converter.
- Remove the key from doors with door lock before entering in the casing of the AHU. Keep the key out of reach of unauthorized persons.
- Check that the hot media supply such as steam is interrupted and all the heat registers, heat exchangers, etc. are cooled to ambient temperature.



In case of standstill of the plant (e.g. power failure), the repair switch is always to check. Only when it is in the off position and secured against unintentional restart, appliance doors can be opened and work on the device can be carried out.

Start of the AHU

Be ensured after working and before the start that...



- nobody is in the AHU.
- all protective devices are working, (optional safety devices such as door guard and belt guard mounted again) and doors equipped with door locks are locked and the keys are removed refer to **chapter 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 media 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. 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 mouthguard, because of the risk of poisoning by inhaling the vapors.

Prevention of hazards caused by steam heaters or humidifiers



By hot steam there is a danger of burns. Therefore, make sure that no steam pressure is present and the system is cooled before working on the steam piping.



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



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

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

2.2.2 Refrigeration circuit

Preventing the risk of exceeding the maximum operating pressures PS



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



Risk of burns on hot surfaces



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

Prevention of risks due to contact with refrigerant



Physical contact with refrigerant must be strictly avoided as it can cause severe frostbite and damage the retina - temperature range, for example R407C at ambient pressure is approximately - 44°C!

Prevent the risk of suffocation



Safety refrigerants are odourless and tasteless, can replace oxygen in a technical room and cause suffocation (MAK - value 1000 ppm).

- In case of refrigerant leaks leave immediately the affected room. Enter only with breathing protection or care for adequate ventilation.
- Refrigerant is heavier than air and will collect at the lowest room point. For small refrigerant charges, this risk is significantly reduced.
- Refrigerant and compressor oil create as soon as in touch with open flame toxic substances. Do not inhale!
- Do not smoke in the technical room!
- For more information refer to chapter 8.2.3 (Refrigerant).

2.2.3 ATEX units

General safety indications

ATEX units may not be used near:



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

Safety indications for the operation

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

- Operating conditions in accordance to the intended use.





- Permanent and adequate ventilation of the installation room to prevent the creation of an explosive atmosphere, which is caused by leakage.
- Do not exceed the maximum permitted speed of the fan, as it could otherwise lead to sparking.
- Take measures to prevent any kind of ignition sources.

Safety indications for maintenance and repair work



- For maintenance and repair work, the power supply of the unit must be interrupted.
- Use only suitable tools according to EN 1127-1:2011 to prevent sparking.
- Perform work only with conductive footwear (according to BGR 132) in order to avoid electrostatic charging.



- Work may only be performed at non-explosive atmosphere.
- The creation of an explosive atmosphere needs to be counteracted by adequate ventilation.
- Avoid any kind of ignition sources.

2.3 Staff selection and qualification

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

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

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

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

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

Execution of maintenance / monitoring of the operation:

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

Work on optionally installed refrigeration components must be performed only by trained and according to EU-directive 303/2008 certified refrigeration technicians.

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

3 Reception control / unloading / transportation to installation site

Note: Chapter 3.2 (Unloading / transportation to installation location), chapter 3.3 (Overlifting of AHU sections with crane lugs) and chapter 3.4 (Overlifting of monoblocs) do not apply to flat units (ceiling units), since they are not equipped with base frame.

3.1 Reception control

- Upon arrival of the equipment, please check immediately the package for completeness and damage.
- Loose supplied parts and assembly materials are in a nylon bag or a box in the unit.





 If damages are found, immediately a damage report must be created and sent to TRANE. Only then the transport company can make the claim against the insured (Note damage on the shipping documents with date and signature in the presence of the carrier). Complaints about apparent damaged or missing parts of the delivery cannot be subsequently recognized. In case of complaints please inform immediately the TRANE office.



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.

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



Figure 1: Do not climb on the unit

Differentiation of delivery

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

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

1) Supplied in parts (delivery sections)





Figure 2: Delivery in parts (delivery sections)

- Delivery sections allow the supply of major equipment in small and more easily insertable parts.
- Sections have a base frame, on which on each corner a (supplied) crane lug can be attached.
- Size and weight of the sections are indicated on the AHU drawing, see Figure 7.



2) Supplied as monobloc



Figure 3: Delivery as monobloc

- If the space conditions allow the delivery of a monobloc, then the assembly at the installation location is much faster.
- Monobloc units have an additional counter-frame on which the components are already preassembled.
- The counter-frame is provided with holes diameter 50 mm, which can be used for the overlifting, see **chapter 3.4 (Overlifting of monoblocs)**.
- Size and weight of the monobloc must be determined from the data on the AHU drawing and have to be considered for the determination of the load carrying equipment and hoists, see **chapter 3.4.1 (Weight details for monoblocs)**.

3.2 Unloading / transportation to installation location

Forklift, lift truck transport

In accordance with the TRANE drawing the AHU will be delivered as one or more delivery section(s). The AHU parts are delivered on a pallet and can be unloaded and moved by forklift or lift truck. Forces must always act on the base frame, see **Figure 4**.



Figure 4: Transport correct

Figure 5: Transport incorrect

Center of gravity must be centrally located between the forks (see **Figure 6**). For large parts use several lift trucks.



Figure 6: Center of gravity centrally between the forks



For the overlifting directly from the truck applies the following **chapter 3.3** (Overlifting of AHU sections with crane lugs) for AHU sections or **chapter 3.4** (Overlifting of monoblocs) for monoblocs.

3.3 Overlifting of AHU sections with crane lugs

Chapter 3.3 is only valid for the delivery form "Delivery in parts (delivery sections)". For overlifting of units delivered as "Monobloc", see **chapter 3.4**.



- In addition to the actions mentioned in this **chapter 3.3**, the instructions according to chapter **3.5** (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 screw parts together before lifting.
- Lateral load on lifting lugs is not allowed.





The Lifting of monoblocs by crane lugs is permitted only in exceptional circumstances and requires the **written approval** by TRANE.

3.3.1 Control of weight limits of delivery sections



Depending on the base frame height (see **Figure 15**), delivery sections may be lifted with lifting lugs up to the following weight, refer to **Table 1**.

Base frame height H [mm]	Max. section weight [kg]
80	1.500
100	1.500
150	4.000
200	4.000

The weight of single delivery sections is shown in the attached drawing (on each delivery section). The delivery sections are marked with L1, L2, L3, ... on the drawing and with the same number on the section itself. Example, refer to **Figure 7**: Delivery section L5 = 628 kg



Figure 7: AHU section drawing with weight details



3.3.2 Necessary actions before lifting delivery sections with crane lugs

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

Example 1:



Figure 8: Delivery section with mounted damper









Figure 10: Delivery section with mounted crane lugs



Figure 11: Delivery section with mounted flexible connection



Figure 12: Delivery section with dismounted flexible connection

Example 2:





Figure 13: Delivery section with mounted crane lugs

3.3.3 Mounting of crane lugs

Crane lugs are supplied in two versions and will be attached on the front side of the respective delivery section in accordance with the necessary preparations. Execution of the lifting lugs:

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



Attention to correct mounting of the crane lug according Figure 14:

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



Figure 14: Mounting of crane lugs

Screws and nuts are delivered with the lifting lugs and must be tightened with the torque according to **Table 2**.





Figure 15: Base frame height

		A A
Base frame height H [mm]	Screw type	Nm
80	M8x20	10
100	M8x20	10
150	M12x30	30
200	M12x30	30

 Table 2: Anzugsdrehmoment f
 ür Schrauben

3.3.4 Lifting of delivery sections with crane lugs

- The load carrying equipment must not run over the operating side of the AHU, but it must run over the opening or the front side of the AHU (**Figure 16**).
- The force effect has to take place uniformly across all four crane lugs of a delivery section.
- After the pre-positioning of the delivery section at the desired position, remove the lifting lugs and use them for the next delivery section.



Figure 16: Load carrying equipment guided over front side

Figure 17: Uniform force effect

3.4 Overlifting of monoblocs

If several sections or even the entire AHU is combined into one delivery unit, then this is called a monobloc.

Chapter 3.3 (Overlifting of AHU sections with crane lugs) is only valid for the delivery form "Monobloc".

For overlifting of units delivered as "Delivery in parts (delivery sections)", see **chapter 3.3** (Overlifting of AHU sections with crane lugs).

3.4.1 Weight details for monoblocs

The weight of the unit is specified on the AHU drawing (attached on monobloc). Calculation example referring to monobloc from **Figure 18**.

Section L1 = 553 kg Section L2 = 205 kg

 \rightarrow Total weight: L1 + L2 = 758 kg





Figure 18: A monobloc, which consists of the two sections L1 and L2

3.4.2 Lifting of monoblocs

- Monoblocs are generally delivered with a perforated counter-frame hole diameter 50 mm for inserting suitable tubes/rods, where the unit is lifted, see **Figure 19** and **Figure 20**.
- The tubes/rods are not included in the delivery scope, but have to be provided by the company, which is responsible for the lifting operation.
- Two, three or more holes per side of the monobloc are available according to the length and weight of the unit. As a consequence, two or more tubes/rods can be used.
- The determination of the number and the dimensions of the tubes/rods and the load carrying equipment are the responsibility of the performing company.
- We recommend varifying the suitability of the selected tubes/rods by a structural engineer.
- The force effect has to take place uniformly across all tubes/rods.
- The load carrying equipment must be secured against slipping off, e.g. see Figure 21.







Figure 19: Guiding of load carrying equipment (monobloc)

Figure 20: Uniform load of the form tubes



Figure 21: Securing against slipping off of the load carrying equipment



In addition to the actions mentioned in this **chapter 3.4**, the actions according to **chapter 3.5** (Further necessary actions for the overlifting of both, delivery sections on crane lugs as well as monoblocs) have to be performed.

The Lifting of monoblocs by crane lugs is permitted only in exceptional circumstances and requires the **written approval** by TRANE.



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

- The AHU sections or monoblocs must be lifted with appropriate equipment e.g. belt with hook.
- The recommended minimum load capacity per load carrying equipment is 50% of the total weight of the delivery section or monobloc.
- The length of the load carrying equipment must permit a favorable course, see **Figure 22**.
- 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.
- After a slow lifting from the floor for a few centimeters the correct course of the load carrying equipment as well as the safe support of all fastening elements should be checked.

Before further lifting it must be checked, that no abnormal deformation at the suspension points/load carrying equipment can be detected by visual inspection.

- Avoid jerky lifting.
- Make sure that nobody is under the raised load.
- Never lift AHU sections or monoblocs on heat exchanger connections or other attachments.
- 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 22**.



Figure 22: Permitted angle for load carrying equipment guidance



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 unit.

Standstill maintenance



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

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

Entfernen der Nylonverpackung



Remove the nylon packaging after delivery and place the units 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 present – e.g. white rust may be formed within a short time on galvanized surfaces. It can further arise an excessively high temperature under the packaging, which can also cause damages at the components.

lf

you want to give pleasure to yourself, the planner, the owner and other observers of the AHU then

we strongly recommend to cover and protect the unit against dirt and damage during the installation and commissioning, see **Figure 23**.



Figure 23: 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 unit 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 takes over any function of the building, neither in terms of tightness nor insulation.



4.1 Foundation

Recommended are solid foundations of reinforced concrete, as shown in **Figure 24** left, or strip foundations, as shown in **Figure 24** right. For strip foundations, concrete or steel beams shall be used, see **Figure 24** bottom-right. Steel beams constructions must have an appropriate stiffness in relation to the unit size. The foundation must be flat and leveled, it may not have fall in any direction or uneven surfaces.



Figure 24: Solid foundation and strip foundation

- The AHU parts should be supported by underlayment specified in section 4.2 (Erection). The distance between these underlayments is not permitted to exceed 1.500 mm.
- The height difference between 2 neighbouring underlayments should not exceed 2 mm.
- The total height difference is not permitted to exceed 2 mm. This means that the difference in level of all underlayments together, has to be within the range of 5 mm.

Attention!

If these demands are not met, this may be the cause of jammed doors and other problems with the AHU.



4.2 Erection

4.2.1 Potential risks that may arise through the erection site

- For heating or cooling water, water-glycol circuits or steam lines for heating or cooling can be connected to the AHU. There may also be internal (closed) water or water-glycol circuits. In addition, a humidifier with inlets, outlets, overflows may be installed for humidification.
 → The pipes or hoses and their fittings can become leaky or loose, so that inside or outside of the AHU water or the medium exits.
- Cooling processes can cause dehumidification and the associated formation of condensation in the AHU. The unit is then equipped with condensate collecting trays and outlets.
 → Nevertheless, condensate can exit from the AHU in case of errors on the unit, under inadmissible or extreme operating conditions. Errors on the unit, 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.

4.2.2 Actions to prevent potential risks

These risks can be prevented by the following actions:

- It does not matter, whether the AHU is floorstanding, heightened (e.g. on a scaffold) or suspended from the ceiling, the easy assembling and maintenance of the unit has always to be guaranteed on site
- Depending on the erection, suitable protective actions must be taken to ensure that persons, building and equipment are not jeopardized by falling parts (e.g. tools, screws, etc.) and possible exit of water or other media.
- The ground around the erection site should be watertight and executed 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 units suspended from the ceiling, it is recommended in any case to provide a sufficiently dimensioned collecting tray with outlet under the unit.

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 air handling unit 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

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

After the prepositioning the AHU-sections can be pulled together with belts which act on the base frame, as shown on **Figure 25** and **Figure 26**.



Figure 25: Pulling AHU sections together



Figure 26: Pulling AHU sections together (detail)

For noise insulation, 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. The providers of such products indicate the respective design criteria. For the weight specifications see the technical data sheet. For standard units without feet the maximum allowed distance between the layup points is 1500 mm. Floor units must be fixed on the foundation to secure the position. A direct coupling, see **Figure 27** 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 27** right).



Figure 27: Securing the position on the foundation

If floor units shall be mounted on the ceiling, then the device must be fixed with the base frame on an encompassing suspension see **Figure 28** right. The handling of the structure-borne noise insulation is analogously as for floor units.





Figure 28: Suspension of ceiling units

AHU which are not designed to stack, may not be stacked (one on the other). Air washer will need either one-both sides higher foundations or on one-both sides feet, which are supplied if ordered, refer to **Figure 29**.



Figure 29: Air washer with both sides feet

Treatment of GfK air washer and plastic parts

Thermoplastics are compared with steel impact and shock sensitive. At low temperatures an additional brittleness exists. Please treat the pieces of fiberglass or plastic such as piping, nozzles and droplet eliminators with caution.

Lightning protection for roof units



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



4.2.4 Special guidelines for flat units – ceiling units

<u>Usage</u>

- For the suspension under a ceiling.

Assembly of the individual components of the flat units

The individual components are screwed together by use of comfort compound – see Figure 30.

- The assembly should still be done on the ground, since the comfort compounds on the top side of the flat unit may no longer be accessible after positioning on the ceiling.

Suspension

- The dimensioning of the suspension and fixture must be carried out on site and has to be adapted to the size and weight of the flat unit.
- All necessary material for suspending and fixing the flat unit on the ceiling, like longitudinal and transverse profiles for bottom side, threaded rods, dowels, etc. must be provided by the customer.
- The suspension can consist only of transverse profiles (transversely to the air flow), as shown in **Figure 31**, or of transverse profiles with additional longitudinal profiles (longitudinal to the air flow), see **Figure 32**.
- In order to prevent deflection of the bottom panel, the maximum distance of the supporting profiles should not exceed 1 m to each other.
- Profiles must be positioned so that downward-opening doors, processes of wells, etc. are not blocked by them, see **Figure 31**.
- Longitudinal profiles are intended to support the aluminium profiles on the bottom edges of the flat unit.
- Furthermore, it is recommended that the supporting profiles should be screwed together with the aluminium profiles of the bottom edge for secure positioning e.g. by means of threaded rivets.
- To avoid transmission of structure-borne noise is recommended to use sound-absorbing material between suspension and unit. A possible solution is shown in **Figure 28**.



Figure 30: Comfort compound





Figure 31: Suspension with transverse profiles



Figure 32: Suspension with longitudinal and transverse profiles



5 Assembly

5.1 Assembly of casing

5.1.1 Actions before the assembly of casing

If several AHU sections have to 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 unit in the exact assembling position, it can be moved by a rod (leverage). Use the rod only on the base frame profile.

Remove external panels at butt joints

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



Figure 33: Removable external panels

Procedure:

To remove the external panel - start at the corners - use a screwdriver – refer to **Figure 34**. After removing the external panel, remove the insulation.





Figure 34: Removal of the external panel

Applying the sealing strip

The supplied self-adhesive sealing strip (**Figure 35**) has to applied on the inner edge of the section flange, refer to **Figure 36**.



Figure 35: Sealing strip



Figure 36: Applying the sealing strip

For roof units as well as at device separations directly before or after a wet area (e.g. cooler, humidifier, air washer), special actions for sealing the AHU must be carried out by using the supplied sealing agent (Sikaflex). Further information will follow in **chapter 5.1.5 (Special features for roof units and device separations at wet areas)**.



Figure 37: Sealing agent (Sikaflex)



Figure 38: Applying the sealing agent


5.1.2 Standard connections and connection components

Base frame connection



Figure 39: Hexagon bolt with locknut M8x20 / M10x30 / M12x40



Figure 40: Screw connection of base frames

Connection via panels, connection angles and connection frame

Depending on the cross section of the AHU, cases A, B and C (as described below) can be differentiated.

Case A: unit height <= 610 mm

Screw the internal panels, screw spacing minimum 305 mm

Case B: unit height >= 915 mm, unit width < 2.440 mm



Figure 41: Hexagon bolt with nut M6x16

Connection angle



Figure 42: Hole spacing of the internal panel



Figure 43: Hexagon bolt with locknut M8x20



Figure 44: Connection via connection angle

<u>Case C: unit width >= 2.440 mm</u>
 Connection frame, screw spacing minimum 305 mm





Figure 45: Hexagon bolt with nut M6x6



Figure 46: Connection frame

Additionally the following rule applies:

- Internal mounted connection angles and frames are accessible and the sections are properly aligned - The following connection is sufficient:
 - in case B, connection only via connection angles
 - in **case C**, connection only via connection frames
- 2) Internal mounted connection angles and frames are **not accessible** and/or the sections are **not properly aligned**:

Connection between the internal panels, as described in case A, must be carried out additionally.

5.1.3 Detailed solutions and connection components

 <u>Connection between door frame / door frame and door frame / internal panel</u> Screw spacing: 152 mm



Figure 47: Tapping screw ø8 x 11



Figure 48: Joint on the AHU drawing



Figure 49: Connection between door frame / internal panel

- Connection of 3 mm thick casing components without holes



Figure 50: Self-tapping screw Ø6,3 x 22



Figure 51: Application of self-tapping screws

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



Figure 52: Self-tapping screw TORX 25 Ø4,8 x 16



Figure 53: Joint on the AHU drawing



Figure 54: Joint at the AHU

<u>Connection of roof plates</u>
 Screw spacing: minimum 305 mm



Figure 55: Hexagon bolt with nut (stainless steel) M6x16



Figure 56: Connection of roof plates



Figure 57: Mounting of the sliding bar

5.1.4 Assembly of delivery sections

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

Moving delivery sections together

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

- In the base frame profiles (Figure 58 left).
- If accessible, in the connection angles located in the upper corners of the unit (**Figure 58** bottom center).
- If accessible, in the circumferential connection frame (Figure 58 top center).
- In the panels (Figure 58 right).
- For roof units in the roof flange.





Figure 58: Screwing delivery sections together

Is only one side accessible (panels and connection frame) the tapping screws Ø8 x 11 shall be used, otherwise bolts and nuts (all supplied separately):

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

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

After placing all the screws loosely they shall be tightened - starting with the base frame – in two stages, refer to **Figure 59**.



Figure 59: Tightening the screws

Reinsert the insulation and remount the external panel

From the external panels of roof units, or units with external aluminum panels the white protective film from the sealing tape must be removed before mounting (**Figure 60**).





Figure 60: Removing the protective film

Start at the bottom to mount the external panels (Figure 61).



Figure 61: Pushing in the external panel

For roof units also the supplied slide bar must be mounted on the roof flange.

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

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

- 1. The sealing agent (Sikaflex) has to be applied instead of the sealing strip across the whole flange of the unit, 5 mm from the inner edge (see **Figure 63** and **Figure 65**). Immediately thereafter, the relevant delivery sections have to be moved together and then screwed together.
- If the unit separation is accessible at the inside via a door (see Figure 66), then the joints (Figure 67) have to be closed over the entire circumference with the supplied sealing agent (Sikaflex) after screwing together the delivery sections (Figure 58 and Figure 59).



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



Figure 62: Sealing surfaces



Figure 63: Sealing the frontal joints

Only careful sealing secures the long tightness of the unit. For roof units, also the roof flange is to seal, refer to **Figure 64**.



Figure 64: Sealing the roof flange





Figure 65: Applying the sealing agent on the frontal joints



Figure 66: Unit separation accessible via door



Figure 67: Sealing the section connection (joint) with the sealing agent

5.1.6 Cable gland

For the connection of engines, pumps, electric heaters, sensors, etc., TRANE loosely supplies material for cable glands (**Figure 71**), which must be installed properly. The following procedure is recommended:

- 1. Drilling through unit casing (at right angles to the surface).
- 2. Enlarge drillings on external panel and internal panel according to **Table 3** (by using a step drill see **Figure 68**).



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

Table 3: Drilling diameters for cable glands



Figure 68: Step drill

3. Insert sleeve (inside – see **Figure 69**) and screwing (outside – see **Figure 70**) into the drillings and screw them together (see **Figure 71**).



Figure 69: Sleeve



Figure 70: Screwing



Figure 71: Cable gland

A drilling with the diameter for the corresponding screwing (see **Table 3**, column 2) is sufficient for the insertion of cables into a cabinet or a single walled housing. In this case the screw is locked with the supplied locknut from the inside.

Transport lock

Remove the, on fan-motor base frame of spring isolators mounted transport lock (signed with red point) according to **Figure 72** below.

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





Figure 72: Transport lock

5.2 Doors

Hinged doors

The EU-hinge doors have the following design features:

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

For open door, the handle is in horizontal position; refer to **Figure 73**. For closed door, the handle is in vertical position; see **Figure 74**.



Figure 73: Door ,open'



Figure 74: : Door ,closed', not ,locked'

Doors which allow access to the fan section

- are equipped with a door lock. **Figure 75** shows the lock in the position 'locked'
- offer a physical barrier as a protection against the danger zone
- stay securely in position and can be opened only by using a key
- during the operation do not permit access to the fan section

The keys are provided attached to the handle, refer to Figure 76.





Figure 75: Door ,closed' and ,locked'



Figure 76: Delivery of the keys

Abovementioned doors with lock are an effective safety device according to EN ISO 12499: there is no case where entering during fan operation is required, refer also to **chapter 2.2 (Indications for minimizing specific hazards)**.

The locking mechanism of the hinged door is on the inside of the door panel and is shown in **Figure 77** (closed position) and **Figure 78** (open position). The rolling piston can be pressure from above (if you are in the unit) with your thumb in the position 'open'.



Closed', Figure 77:



Figure 78: ,Open'

<u>Readjustment of the door panel position</u> Because of the handling of AHU sections, the position of the door panel can move (see **Figure 79**). Due to the inclination of the door panel of the EU hinged doors, problems can arise when closing and sealing of the door panel. The door panel can be readjusted through the screws on the hinges. For this purpose, first the screws on the hinge (**Figure 80**) must be loosened. Then, the door panel can be brought in the correct position (**Figure 81**) and the screws can be tightened again.



Figure 79: Inclined door panel – varying slit width



Figure 80: Adjustment of the door panel



Figure 81: Adjusted – constant slit width

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



5.3 Dampers

CRUCH USER CRUCH USER CLOSED

Figure 82: Closed position



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 Filters

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



Incorrectly mounted filters can be sucked in by the fan and lead to its destruction.

5.4.1 Laterally removable prefilters

The filters are supplied mounted and are equipped with a pull-out tool for more than one filter per guiding.





The close position of the dampers is indicated as shown in Figure 82.



Figure 83: Pulling out the filters

Figure 84: Pull-out tool



5.4.2 Prefilters and / or bag filters in filter frame

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

- 1. Take the filter clips, which are included in the supply and are attached in brackets on the filter frame (**Figure 85**).
- 2. Four filter clips have to be inserted in the respective brackets according to Figure 86.
- 3. Finally, the filter must be fixed by the clips in the filter frame (Figure 87).



Figure 85: Delivery of the clips



Figure 86: Insertation of the clips



Figure 87: Fixed filter

Bag filters are installed similarly. Bags shells hang vertically.

5.4.3 Laterally removable bag filters with clamping mechanism

When inserting and fixing the laterally removable bag filters with clamping mechanism has to be proceeded 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 88).
- 2. Slide one filter after the other in the filter frame (Figure 89).
- 3. Press the last filter of the row against the rear panel. Then press with the lever the filter cells against the sealing (**Figure 90**).



Figure 88: Loosen the clamps



Figure 89: Slide in the filters



Figure 90: Clamping the filters



Attention: For soft bags the lower bags of the filter cells are to lift up in order to prevent damage with the clamping system (**Figure 91**)!





Figure 91: Lifting the filter bags

5.4.4 HEPA filters

If a sealing is not included in the manufacturer delivery, a suitable sealing is delivered (loose) by TRANE. This sealing is then to fix on the filter cell, or alternatively on the filter frame. The assembly of the filter is done through the filter fixer supplied loose, as shown in **Figure 92** up to **Figure 95**.



Figure 92: Attaching the brackets



Figure 94: Inserting the clamps



Figure 93: Inserting the filter cell



Figure 95: Clamping the filter cell

Camfil Airopac filters

In the case of filter frame without sealing:

If you order this filter from Camfil, please ask for the type with sealing. Alternatively, another sealing must be installed on site!



5.5 Dampers with external gear wheels



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



Figure 96: Damper with external gear wheels

5.6 Hygienic AHU's

- After assembly all grooves and joints at the connection positions must be sealed with the supplied sealing agent.
- In case of exchange of components sealing must be restored.
- Access of components is ensured by door positions upstream and downstream of the component, therefore components are accessible or side removable for cleaning and maintenance.
- Carry out installation of ducts, tubes and electrical installation in order to ensure access and function of doors.

6 Installation

The following instructions shall be observed exactly!



6.1.1 General notes

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



To prevent damage of the heat exchanger connection, it is necessary to hold against with a pipe wrench during the screwing (**Figure 97**).



Figure 97: Holding against with a pipe wrench



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.

The piping of the heat exchanger should hinder a for maintenance required expansion of the heat exchanger as less as possible.

Recommended sealing material for threaded sleeves:

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

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

The connection of the heat exchanger is to execute as indicated on the label on the AHU (connection diagrams in **Figure 98**).





Figure 98: Heat exchanger connection

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

- 1. All standard heating and cooling heat exchangers counter flow
- 2. Steam heat exchangers: steam inlet top, condensate bottom counter flow
- 3. Preheat heat exchanger (freezing risk on request) parallel flow

Hydraulic connection schemes of heating or cooling coil should be carried out as shown in the scheme **Figure 99** 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 99: Hydraulic connection scheme

To vent and drain the heat exchanger connection, valves are mounted (on request). To ensure correct operation must be ensured, however, that the vent is on the highest point of the whole water cycle and the drain at the lowest. Otherwise, the valves shall be mounted on another suitable point in the circuit.



Figure 100: Drain valve



Figure 101: Vent valve

6.1.2 Steam heat exchanger

The heater is heated to above 70 °C, next to heater plastic parts are installed. To prevent damage on the plastic parts, on responsibility of the client is requested the following:



- Supply and installation of thermostat
- thermostat trigger temperature: 70°C
- thermostat probe position: approx. 100 mm downstream of airflow through steam heat exchanger / approx. 100mm below of top panel
- integration of thermostat in AHU control system in a way that immediately after triggering steam supply to heat exchanger is interrupted
- function: interruption of steam supply at overtemperature for example because of missing airflow

6.1.3 Plate heat exchangers for refrigeration circuits

Refrigeration circuits of ETA-POOL-Units may contain a plate heat exchanger as optional. Connect it to pool water or water for domestic use according to blue arrows of **Figure 102**:

- Bottom inlet
- Top outlet



Figure 102: Plate heat exchangers for refrigeration circuits



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

- Never install the chloration in front of the water inlet of the plate heat exchanger. The chloration schould be as far away from the plate heat exchanger as possible (see **Figure 103**).
- The water inlet should be close to the surface and the outlet near to the bottom. This improves the mixing of the heated water and mainly prevents the entrance of chlorine particles or concentrated solution into the plate heat exchanger (see **Figure 103**).



Warning: Unfortunately, in practice the chlorination is often located in front of the plate heat exchanger inlet. This improves the chlorination, but it is potentially harmful to the plate heat exchanger.





ETA-PAC-AHU's are equipped with an indirect adiabatic cooling device. Carry out connection to piping system as shown in **Figure 5** Of wimming pool chlorination.



Figure 104: Indirect adiabatic cooling

6.3 Condensate drain

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

6.3.1 Standard siphons



A space-saving design of the necessary siphon height we can do 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 case of outdoor units 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 pressurepges= 1196 PaDynamic pressurepdyn= 83 PaTotal static pressurepstat = pges - pdyn= 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 105.

H1 [mm] > p [mm WS] H2 [mm] > p/2 [mm WS]



Figure 105: Siphon on suction side

Siphon on pressure side (in direction of airflow after the fan), see Figure 106.

 $\begin{array}{ll} H3 \; [mm] > p & [mm \; WS] \\ H4 \; [mm] \geq 0 \end{array}$



Figure 106: Siphon on pressure side



6.3.2 Ball siphons

- Pa

+ Pa

=

If ball siphons with the below shown design are included in the delivery from TRANE, then the following items 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 107**) corresponds to the flow direction.

pressure side

Figure 107: Observe the mounting position - flow direction according to the arrow

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

suction side



Figure 108: 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 110).



Figure 109: Pressure side execution



Figure 110: Pressure side installation: remove the black closing plug

6.4 Duct connection

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



6.4.1 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.

6.5 Pumps

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

7 Electrical connection

- The electrical connection must be executed in compliance with international regulations such as the Low Voltage Directive and the requirements of electromagnetic compatibility of national legislation and the requirements of the local electricity provider.
- For systems, which operate in hazardous areas, are special provisions for component / equipment design and used materials. For details refer to **chapter 11 (ATEX units)**.

7.1 Connecting to an external protective conductor system

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

- connected at the base frames 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.

7.2 AC motors

The three-phase motors fulfill the following criteria:

- Protection class: IP 55
- Thermal class: F
- Type: B3

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

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

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



Single-speed motors

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

All single-speed motors are suitable for frequency converters. The frequency range of the motor is shown in **Figure 111**.



Figure 111: Workspace of single-speed motors

Speed range in which the motor reaches the rated output:

Nn x 0,6 bis Nn x 1,75 Nmin = 0,1 x Nn Minimum performance by Nmin: 0,1 x Pn

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

Two or three speed motors

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



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

For CCEB/CCEC units the following on site equipment is required:

1) Motor without frequency converter: motor protection switch

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

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

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

2) Motor with frequency converter: circuit braker is sufficient



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

In addition to 1) or 2) full motor protection with PTC (thermistor) As standard a PTC thermistor (specified in the technical data sheet as PTC) is used for:

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



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

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

How it works: For single-speed three-phase AC motors, 3 temperature sensors are installed in series on the exhaust air side of the motor in the winding head. At 135 °C, a sharp increase of resistance occurs, which switches the PTC relay off. For an example of connection diagram refer to **Figure 112**.



Figure 112: Wiring diagram for thermistors

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

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



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

<u>Alternative to PTC: Motors with integrated bimetal sensor (thermal contact, Clixon) - optional</u> Bimetal detectors are used for thermal monitoring of motor windings and consist of two successive rolled metals, with unequal thermal expansion coefficients. When they are heated, they expand unevenly and can switch a contact. They have the advantage that they can be placed directly on the switch and so no special relay (as for PTC) is needed.



Block diagram for connection: refer to Figure 113.



Figure 113: Wiring diagram for thermal contacts

ETA - AHU

Are as standard equipped with circuit protection switch and frequency converters. When the motor is equipped with a PTC, it is connected to the temperature monitoring of the frequency converter.



Single speed 4 poles : 1500 min⁻¹ 2 poles : 3000 min⁻¹ 6 poles : 1000 min⁻¹ 8 poles : 750 min⁻¹ Dual voltage supply up to 4 kW 220V in Δ , 380V in Y from 5,5 kW 380 in Δ , 660 in Y



Two speed, 2 separate windings 4/6 Poles 1500/1000 min⁻¹



Figure 114: Motor circuits

Correct direction of motor rotation is a result of direction of fan impeller rotation which is signed by an arrow: for plug fan refer to **Figure 115**, for fan with housing refer to **Figure 116**. Before connecting the motor check the rotating field of mains connection with a suitable device. Afterwards, connect the phases accordingly to motor terminal or repair switch (if supplied and wired by TRANE).





Figure 115: Rotation marking of plug fans



Figure 116: Rotation marking of housing fans

Fastening torque for electrical connections on the control panel refer to Table 4:

(Ante	Th	read Ø	M4	M5	M6
e Sr	Nim	min.	0,8	1,8	2,7
	INITI	max.	1,2	2,5	4

 Table 4: Torques for the motor terminal board

and

Before connecting to the local power network, must be controlled, 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, they may lead to thermal overloading of the motor.

7.3 Repair switch (emergency stop switch)

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

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

- 1. Is used as a repair, maintenance or safety switch, because the actuation of the switch does not reset the control commands from control system.
- 2. Has clearly marked OFF (0) and ON (I) position.
- 3. In OFF position lockable, to secure against unauthorized or unintentional restart.
- 4. For outdoor installation the repair switch at least must be IP65.
- 5. Interrupts the power supply to the AHU (lighting can be excluded, refer to **chapter 7.7** (Lighting)).
- 6. Separates the electrical equipment from the main supply.
- 7. Is easily accessible
- 8. Mounted within sight of the AHU.
- 9. The assignment to the AHU can be clearly seen.
- Emergency stop function: The emergency stop function, which is signaled by the red handle with yellow background, has to be implemented by additional components in control system. Reset means that a manual start command – separate from repair switch – must be activated.





Figure 117: Repair switch

CCEB/CCEC-AHU with TRANE-control

- Control box is equipped with repair switch in execution RED-YELLOW as specified above
- On responsibility of the client must be ensured that of the above specified Requirements according to DIN VDE 0660 and IEC 947-3 on a repair switch in RED-YELLOW execution are fulfilled
 - a) items 7 to 9
 - b) item 10, implementation of emergency stop function in control system

CCEB/CCEC-AHU without TRANE-control

- Specified repair switch must be provided on responsibility of the client
- Is to carry out independent from TRANE supply of repair switch for fan motor. Fan motor repair switch cuts just the motor off.
- Furthermore on responsibility of the client must be ensured that all items 1 to 10 of the above specified Requirements according to DIN VDE 0660 and IEC 947-3 on a repair switch in RED-YELLOW execution are fulfilled

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

If the frequency converter is supplied from someone else then TRANE, please note the following points to ensure proper operation:

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



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

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

Plug fans



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

7.5 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 electric heater in operation, the heating elements may arrive to a temperature of several hundred °C.

In case of malfunction – heater in operation without adequate airflow – inadmissible temperatures may occur. Plastic parts as for example filters, gaskets, droplet eliminators etc. close to electric heater may become damaged or even catch fire. Subsequent damages up to fire spread to the building are possible.

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

7.5.1 AHUs equipped from TRANE with control ETAMATIC

The recommended execution and function as described in **chapter 7.5.2 (AHUs which are not equipped from TRANE with control (which have to be equipped with controls on responsibility of the client)**) is included in the TRANE delivery. Units, which are supplied from TRANE with control, are limiting the supply air temperature to a default value of 35°C.

7.5.2 AHUs which are not equipped from TRANE with control (which have to be equipped with controls on responsibility of the client)

Supply of TRANE contains:

- 2 independent safety thermostats
- assembly of the safety thermostats

The safety related correct implementation of control has to be carried out on full responsibility of the client.



The safety related correct implementation of control has to be carried out on side in full responsibility of the client.

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



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

The control of the electric heater has always to take place so, that the air temperature after the electric heater never exceeds the permitted air temperature in the unit (40°C, if not differently specified in the technical data). This item must be especially observed, when the air handling unit 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 provided very quickly and with ON-OFF operation in the full amount, arises a significant risk of overheating the unit, which results in damaging several components, especially when the unit is operated with low airflows.
- For this purpose, the air handling unit has to be equipped with a supply air sensor, which directly measures and monitors the air temperature generated by the electric heater.
- The control engineering must be 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 unit.

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 must ensure that fan motor keeps on running for at least 5 min after cut off of electric heater! By the use of an enabling contact (see **Figure 121**) the control engineering has also to ensure, 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 electric heater.
- In order to avoid damages, an uninterrupted power supply is recommended.
- If AHU is not operated by an uninterrupted power supply after every main power failure an AHU inspection is requested as indicated in **chapter 9 (Maintenance)**.

Safety concept

Electric heater power supply is to be equipped with 2 contactors in serial connection The 2 safety thermostats must be connected such to protect the AHU both, by contactors in power supply and by software of control. In case of failure contactors must immediately cut off electric heater from power supply

- The 2 safety thermostats are to be connected in serial connection
- The 2 safety thermostats are equipped with manual reset.
- After triggering the reason for stopping must be detected and eliminated before reset of the thermostat!

Thermostat 1(Figure 118 and Figure 119)

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



Figure 118: Thermostat with cover cap on the reset button

Cover cap on reset button

Reset button



Figure 119: Thermostat with uncovered reset button

Thermostat 2 (Figure 120)



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



Figure 120: Thermostat 2

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

<u>Connection scheme for electric heater according to the specified safety concept as minimum re-</u> <u>quirement.</u>



Figure 121: Connection scheme for electric heater

In case of dehumidification wheel downstream of electric heater ensure that control rotates the wheel while electric heater is on (additional enabling contact). If control is not supplied by TRANE, this feature has to be ensured on responsibility of client.

7.6 Differential pressure restriction for plate heat exchangers





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

The following factors cause pressure increasing:

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

TRANE provides as optional differential pressure switches, which shall be used as described below:

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

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

Differential pressure switch

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

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

Electrical connection

The electrical connection of the fans must be done on site, that when exceeding the maximum allowable differential pressure, the fan motors will immediately be disconnected from the power supply until the restart by hand. Example for connection diagram: refer to **Figure 122**.



Figure 122: Electrical connection scheme

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



7.7 Lighting

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

1 switch	
1 switch	1 junction box
1 switch	2 junction box
1 switch	3 junction box
	1 switch 1 switch 1 switch 1 switch

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

The AHU will be delivered in parts, and for this reason the lights have to be connected on site.

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

- humidifier sections
- sections with condensate, such as cooling sections
- lighting with an at least protection of IP65 were used.

Switches or junction boxes mounted on the outside of rooftop units must also have at least protection class IP65.

For units 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 repair switch is switched off (prerequisite for access to the AHU).

8 Commissioning

8.1 Preliminary steps

- Clean thoroughly the AHU and all components of dust and other debris.
- Remove all loose parts like tools, etc. and documentation from the unit. Such parts can be sucked in by the fan and lead to its destruction.
- 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 given some points, which could cause problems after transport or not appropriate unit handling.

- Rotate the impeller of the fan by hand, to check whether it rotates freely.
- Check that the screws of variable pulleys are tightened refer to **Figure 123**, tightening torque depends on the type of bush, according to **Table 5**.

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



Table 5: Tightening torque for variable pulleys



Figure 123: Fixing screws

- Check the tension of the belt and the alignment of the pulleys, refer to chapter 9.2.4 (Retensioning of belts).
- Check the motor connection and the matching of the supply voltage at the rated voltage a fluctuation of supply voltage between + -5% is permitted.

8.1.1 Variable frequency controlled drives - parameters

The frequency converter must be configured, if not done by TRANE (please refer to technical data sheet): parameterization using the following **Table 6** respectively the provided manufacturer's operating instructions and data from TRANE technical data sheet.



- Observe safety instructions of **chapter 2.2 (Indications for minimizing specific hazards)** and safety instructions of manufacturer (supplied by TRANE).
- Observe safety instructions of fan manufacturer (supplied from TRANE) regarding fan minimum starting up time. Otherwise fatigue fracture of impeller may occur.



Parameters for Danfoss frequency converter FC102

Nr. 0	Description Display	Value	Note
0-01	Language	[1] German	[0] English, [5] Italian
0-02	Switching between Hz/rpm	[1] Hz	Display in Hz or rpm
0-20	Display line 1.1	[1601] Setpoing [unit]	
0-21	Display line 1.2	[1610] Power [kW]	
0-22	Display line 1.3	[1614] Current [A]	
1 00	Control type	[0] Speed control	
1-00	Torque behaviour of load	[3] Automatic energy optimiza-	
1.00	rorque benaviour or loud	tion VT	
1-20	Motor nominal power	kW	According to motor nameplate
1-22	Motor nominal voltage	V	According to motor nameplate
1-23	Motor nominal frequence	Hz	According to motor nameplate
1-24	Motor nominal current	A	According to motor nameplate
1-25	Motor nominal speed	rpm	According to motor nameplate
1-90	I nermal motor protection	[2] Switch off of thermistor	Connect PIC/Clixon
1-93 3-	Setnoints/ramps	[2] Analog Input 54	Connect thermistor to 50/54
3-02	Minimum setpoint	15 Hz	
3-03	Maximum setpoint	Hz	According to AHU data sheet
			Max[Hz]=max speed [rpm]/nominal
			speed [rpm]*50[Hz]
3-15	Variable setpoint 1	[1] Analog input 53	
3-16	Variable setpoint 2	[0] Disabled	
3-17	Variable setpoint 3	[0] Disabled	
3-41	Speed increase after start 1	30 S	
3-42 4 -	Limits/Warnings	30 \$	
4-10	Motor rotation direction	[0] Only clockwise	
4-12	Minimum frequency	15 Hz	
4-14	Maximum frequency	Hz	According to AHU data sheet Max[Hz]=max speed [rpm]/nominal speed [rpm]*50[Hz]
4-16	Torque limit	110 %	obecca [.h] co[]
4-18	Current limit	110 %	
4-50	Warning low current	0 A	
4-51 -	Warning high current	A	Nominal current according to motor nameplate
5	Digital inputs/outputs		
5-10 5-11	Clamp digital input 18	[8] Start	Start command clamp 12/18
5-12	Clamp digital input 19	[2] Motor coast (inv)	Bridge 12/27 necessary for operation
5-13	Clamp digital input 29	[0] Without function	
5-14	Clamp digital input 32	[0] Without function	
5-15	Clamp digital input 33	[0] Without function	
5-40	Relais 1 [0]	[5] Motor rotates	
	Relais 2 [1]	[2] Ready	
6	Analog inputs/outputs	[0] O#	
6-10	Clamp 53 minimum voltage		
6-11	Clamp 53 maximum voltage	10.00 V	
6-14	Clamp 53 minimum frequence	15 Hz	
6-15	Clamp 53 maximum frequence	Hz	According to AHU data sheet Max[Hz]=max speed [rpm]/nominal
6-17	Clamp 53 signal error	[0] Disabled	speed [ιμπ] ου[π2]
0.17			
	Connections control cables:		
	PTC/Clixon	Clamp 50 and 54	50=+10V, 54=analog input 2
	Start	Clamp 12 and 18	12=+24V, 18=digital input
	Kelease	Clamp 12 and 27	12=+24V, 27=digital input

Table 6: parameters for Danfoss frequency converter FC102


8.1.2 Airflow measurement by differential pressure measurement at the fan nozzle

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

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

$$V_h = K \sqrt{(2 \times \Delta p) / \rho}$$

 V_h = Airflow [m³/h] K = K-factor [m²s/h] Δp = Differential pressure [Pa] ρ = Air density [kg/m³]

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

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

Note: If in the TRANE delivery the device for airflow measurement is included, this must be configured on site in responsibility of the client before commissioning.

Air flow measurement type SENSO

The specified K-factor corresponds to the K-factor necessary for SENSO airflow measurement. Following you will find the instructions of the manufacturer.



SENSO-VP

Flow rate display, monitor and transmitter with alarm signal





Technical data Housing:

Colour front panel: Colour housing body: Protection:

Operating temperature: Storage temperature: Relative humidity: Dimensions basic unit: Dimensions: Rectangular front panel: Round front panel: Flexible tube connection: Working range: Measurement range: Burst pressure: Protection class: Tolerance: Long-term stability: Approbation (EMV): Power supply: Analogue outputs: Digital outputs:

High impact ABS beige anthracite IP 54, IP 64 with supplementary seal -10 to +40 °C -20 to +60 °C max. 75 %, non-condensing 112 x 58 mm [Ø x T] 184 x 139 x 20 mm [L x W x H] 145 mm Ø 5 to 6 mm internal diameter 50 – 5000 Pa 0-99,999 m³/h, l/s, ft³/min 75 kPa II (IEC 60536) ≤ 1.5 % ≤±0.5 % V. EW/a EN61000-6-1, EN6000-6-2 EN61000-6-3, EN61000-6-4 24V AC at 50/60 Hz or 24V DC, -20% +5% 0(2)-10 V, 0.1 mA and / or (0) 4-20 mA, max. load 600Ω Relay contact, changeover activated when under power 240V 2A contact loading 24V 5mA M16 bushing with cable clamp Screw terminals

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

Specification

The SENSO-V consists of a round measurement instrument and a rectangular or round front panel.

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

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

On the rear of the housing, two cable break-outs are provided. Two M18x1.5 cable bushings are included in the mounting set

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

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



i	Or Low (ce (measuring range)			
	VPS000	≤S0 Pa	vafable	A(V)= <u>50Pa</u> * 10V A(mA)= <u>50Pa</u> * 20mA	A(V)= 50Pa RA(Pa)* 8V+2V A(mA)= 50Pa RA(Pa)* 16mA+4mA
1	Model		N/ULL Pa	0010-20	0014-20

Models

Cable connection:

Working range Front plate	60 + 6000 Pa
reotangular	VP5000-00
round	VP5000-01

Datasheet no. 13156



SENSO-VP

Flow rate display, monitor and transmitter with alarm signal



Activation and operation

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

The device is immediately ready for operation: Display on the LCD. The setting of the unit's parameters is carried out using the three buttons that are accessible when the front panel is removed. Below 50 Pa (model VP5000), low-value suppression LO (= low) is active.

Setting the units displayed (Dimension)

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

Programming the SENSO-VP

While programming, the current values on the display and the analogue output are frozen. By pressing the lower button (S1) longer, the unit goes into programming mode. The selected parameter is indicated by a flashing display. By repeatedly pressing S1 for a short time, the menu items can be cycled through:

Limit (alarm value) - max. range (measuring range) - Out (mA) - K-factor - air density p

When the appropriate menu item flashes, the top left (S2) and top right (S3) buttons can be used to adjust the programmed values:

Short press → single step,

Long press → increasing rate of change.

Limit: The lower limit is entered in the chosen unit.

If the value drops below this, the LED flashes and the relay drops off (ditto if supply voltage fails).

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

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

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

Store (OK)

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

Zero-point correction

Remove device's supply voltage. Then make the measuring inputs pressure-free (pull off both tubes). Press and hold button (S1). Restore device's supply voltage (→ display flashes). Release button S1 (→ pressure displayed: 0 Pa).

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

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

Extended calibration possibilities on request.

Scope of delivery: The standard version comprises the measurement instrument, the front plate and fitting instructions. SENSO-ZP mounting set Accessories:

SENSO-D O-ring for IP 64, SENSO-CS air-conditioning set, SENSO-H mounting cover for 30 or 50 mm height.

Sensomatik AG

Processing the pressure signal in other devices

http://www.sensomatik.ch

Subject to change without prior notice Devices from other manufacturers may require a conversion of the K-value herefore always ask for the formula, which the device is using.

8.1.3 Heat exchanger



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

Function

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

K

ρ

The following basic formula is the basis for the calculation:



٩b

Vh = volume flow [m³/h] = K-factor [m³s/h] = differential pressure [Pa] Δn = air density [kg/m³]

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

Fitting

A 115 mm Ø hole is drilled in the sandwich plate or the control cabinet door and the measurement instrument is slid into the aperture from the front side. The correct alignment of the instrument is indicated by an upwards-pointing arrow on the rear of instrument. Using a screwdriver, the threaded bolt is firmly screwed into the threaded bushing; the mounting bracket is placed over it and secured with the wing-nut. When connecting the pressure tubing, great care should be taken that the correct polarity is adhered to (+ overpressure, - underpressure). Finally, the front panel can be snapped on.

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

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

Attention!

Refrigerant

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

Water heat exchangers

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

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

Steam heat exchanger filling

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

Attention!

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

8.1.4 Electric heater

Observe specifications of chapter 7.5 (Electric heaters) -safety thermostats.



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

8.1.5 Filters

- Differential pressure measuring devices U-tube manometer and inclined manometer- are optional and must be filled with the supplied test liquid (bottle) of density 1 kg/l.
- Is a differential pressure switch is mounted (option) or is it installed on site, it is to set to the final pressure drop. Information regarding final pressure drop can be found at the technical data sheet.
- In addition, the output of a warning message when the final pressure loss is reached must be ensured during the commissioning. The resulting maintenance actions are described in **chapter 9.3 (Air filters)**.



8.1.6 Humidifier / Air washer



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

- Check pumps strainer, washer nozzles and tubes for proper fit.
- Check pump strainer and clean it if necessary.
- Fill pan and U-trap with fresh water and adjust float valve so that valve closes with a water level 2-3 cm below the overflow. Ensure in any case, bubble-free suck in.
- Check the pump rotation direction (arrow on the pump). Measure the current consumption. Compare the values with the data on the nameplate.



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

- The water pressure for the water supply should be 3.0 bar. Maximum allowable pressure is 6.0 bar.
- For air washers the target pressure of the nozzles must be set at the built in discharge pipe regulating valve.
- Check the right set with a manometer.
- The bleed off quantity is to be setup at the bleed off valve.
 Recommended setting (thumb): Bleed off rate = evaporation rate
 On request, we will advise you in determining the correct bleed off quantity.
- Check the proper installation of honeycomb and droplet eliminator. The arrow must point in direction of airflow (**Figure 124**).
- Check the tightness of the flange connection of the air washer / humidifier to the adjoining components. If necessary reseal.
- Combs made from cellulose material can have initially an odor that is normal and will soon disappear.



Figure 124: Installation of honey comb and droplet separator packages

Water quality for air washer and honey comb humidifier

Please check the supply water quality for air washer and honey comb humidifier. Critical to the need for water treatment is particularly the carbonate hardness of fresh water.

Depending on water hardness and operational importance of the device, a suitable water treatment method is to select. To ensure sufficient reliability, the recommended water qualities are shown in below:

Appearance	clear, colorless, no sediment
pH value	7 to 8.5
Conductivity	max. 30 mS/m



Total hardness	max. 1.2 mol/m ³
Carbonate hardness	max. 0,7 mol/m ³
with carbonate hardness	
stabilization	max. 3,5 mol/m ³
Total salt content	max. 250 g/m³
Chloride content	0 g/m³
Sulfate	0 g/m³
Manganese	max. 0.01 g/m ³
Aggressive carbonic acid	0 g / m
KMnO4-consumption	max. 20 g/m ³

max. 7 °d.H. max. 12,5 °f.H max. 4 °d.H. max. 7 °f.H

max. 20 °d.H. max. 35 °f.H

8.2 Refrigeration circuit

8.2.1 General notes

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

8.2.2 Manually starting the compressor via TRANE control system

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

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



8.2.3 Refrigerant

Refrigerants used by TRANE are halogenated hydrocarbons, preferably R407C and R134a. These are also known as safety refrigerants (safety group A1 according to EN378 part 1) in contrast to flammable refrigerants such as Propane or toxic refrigerants such as Ammonia. They are actually non-flammable under normal operating conditions and do not create explosive mixtures with air, but are odourless. Only higher concentrations in the air can be noted by the ol-

factory sense.



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



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

If the room must be entered at high refrigerant concentrations, then a breathing apparatus that is independent from the ambient air must be used. Furthermore such a breathing apparatus can only be used by specially trained and medically suitable people.

8.2.4 Compressor lubricant

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

8.3 Test run

After having done the preparatory work the unit can be started for the test run.

- For testing the device and measuring the motor data and the volumetric flow rate, the device must be fully connected to the operational duct system.
- The unit doors must be closed, because by eliminating the system-side pressure drop measurement errors will be the result.



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



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

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

Two cases can occur:

The airflow is too low

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

The airflow is too high

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

Adjusting variable pulleys



Figure 125: Smallest working diameter

Figure 126: Biggest working diameter



Belt type	Pulley type	Min. working di- ameter [mm]	H max. [mm]	Max. working di- ameter [mm]
	RST 84	62	9	80
007	RST 95	73	9	91
3PZ	RST 100	78	9	96
	RST 108	90	7	104
	RST 108	76	13	102
	RST 120	88	13	114
	RST 129	97	13	123
	RST 139	109	12	133
SPA	RST 146	116	12	140
	RST 156	126	12	150
	RST 164	134	12	158
	RST 177	149	11	171
	RST 187	159	11	181
	RST 156	117	19	149
	RST 164	125	19	157
CDD	RST 178	139	19	171
JPD	RST 187	148	19	180
	RST 200	161	19	193
	RST 250	211	19	243

Table 7: Data of pulley types

Changing the working diameter of a variable pulley:

- 1. Decrease the belt tension.
- 2. Open the over the disk circumference distributed screws (position see Figure 128)
- 3. Twist the outer ring (the outer rings for pulleys with 2 slots) to the desired diameter, observe the limits as per **Figure 125** and **Figure 126**.
- 4. Fix the Allen screws.
- 5. Tighten the belts (refer to chapter 9.2.4 (Re-tensioning of belts)).



Figure 127: Schematic structures of a variable pulley



Figure 128: Position of the Allen screws on variable pulleys

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



Determination of frequency converter caused problems

You can determine whether problems are caused by the frequency converter by connecting the fan motor directly to mains power supply. Most commercially available frequency converters have a feature to address these problems.

If the air flow is incorrect, then please contact in doubt the competent TRANE office.

9 Maintenance

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



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

In order to avoid corrosion in case of components of stainless steel like drain pans or bottom take care that parts of carbon steel laying around are removed and stainless steel parts are cleaned from swarf of carbon steel.

For ordering spare parts please contact your TRANE sales partner.

TRANE recommends to perform maintenance and repair work in consideration of the specifications according to VDI 6022 sheet 1 chapter 5.

9.1 Control cabinet

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 roof units)

9.2 Fan / motor group

9.2.1 Fan

- Check for dirt, debris, damage and corrosion, clean if necessary.
- Coat surface damage of the housing and impeller with zinc dust paint.
- Flexible connections are to be checked for damage / visual inspection.



- Check vibration isolators for proper mounting / damage (visual inspection).
- Check the protection grid (Fan in and/or outlet) if available for correct installation / damaged (visual inspection).
- Check the drain (if available) for function.
- Test the wheel by rotating it by hand for abnormal noises.
- Rotate the wheel by hand and check for strange bearing noise.
- Renew both bearings if there are irregular or rough sounds.
- The theoretical lifetime, depending on the operating conditions, is at least 20,000 hours.
- The fan bearings are lubricated for life, only the large fan sizes with pillow block bearings annually must be lubricated with adverse operating conditions according to the following **Table 8** with lithium soap grease (see **Table 9**). After three lubricate the bearings must be removed, cleaned and greased again.

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

Table 8: Lubrication intervals for fan bearings



Figure 129: Fan bearing with grease nipple (example Comefri NTHZ)

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

Table 9: Recommended grease types



Plug fan

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

9.2.2 Motor

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

Motor bearings

- Small and medium sized motors are equipped with closed bearing running for several years without need of lubrication.
- Bearings of larger motors, depending on the motor manufacturer and motor size, are equipped with nipples for lubrication. For exact details and information regarding grease type and quantity for lubrication please refer to operating instructions of motor manufacturer. After three re-lubrications the bearings must be dismounted, cleaned and greased again. For lubrication intervals under normal operating conditions and 24 h/day load refer to Table 10.

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

Table 10: Lubrication intervals for motor bearings (in month)

- For different, unfavorable operating conditions, the intervals are to be reduced according to motor manufacturer's instructions.
- Recommended grease types for relubrication of motor bearings can be taken from **Table 9 chapter 9.2.1 (Fan).**

9.2.3 V-belt drive

The V-belt drive is a reliable, low-maintenance component provided that unfavorable working conditions as shown in **Figure 130** up to **Figure 133** which may reduce durability and result in reduced efficiency. The unfavorable conditions include high temperatures and inadequate filtered air and thus formation of deposits.

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



Reasons for increased belt wear or defect

Belt contact the groove bottom / unequal set of belt / tension is too high or too low – Figure 130



Figure 130: Unfavourable operating conditions (1)

Slippage / pulley too small / overloading / damaged disc / eccentricity, wobble – Figure 131



Figure 131: Unfavourable operating conditions (2)

- Disc worn / grooved not uniform / dust, dirt / moisture, humidity - Figure 132



Figure 132: Unfavourable operating conditions (3)

- Alignment / offset wheels / non-parallel plates / discs rotated to each other - Figure 133



Figure 133: Unfavourable operating conditions (4)



9.2.4 Re-tensioning of belts

Moving the motor away from the fan does the tensioning of the belt. Depending on the size of the motor is this:

- On a rocker swivel
- On rails slidably mounted.

Loosening the lock nut and then turning the adjustment screws make the adjustment. It is important to maintain the alignment of the discs accordingly – **Figure 134** and **Table 11.** This should be checked after each tensioning with a straight edge.



Figure 134: Adjustment of pulleys

Pulley diameter dd1, dd2 in mm	Max. distance x1, x2 in mm
< 112	0,5
< 224	1
< 450	2
< 630	3

Table 11: Maximum deviation at adjustment of pulleys

For quick results at the pulley alignment for factory mounted pulleys we recommend to set the same thread overhang of the threaded rods on the left and right side – **Figure 135**.





Figure 135: Adjustment of pulleys via threaded rods

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

Belt tension

The correct tension of the belt is obtained if you have the same data as calculated (separately for each drive). The necessary information to tension new and used belt can be found on the tensioning data sheet, which is on the inside of the fan door (**Figure 136**).

eur We care	for better a	ma air	a ®	Order Position Unit Drawing Pieces Rev. Nr.	12-291-0001 10 AHU-10 10 1 -	
BELT TRANSMISSI	ON AND TE	NSIC	NING DA	ATA		Supply air
fan type: revolutions: fan shaft power: fan pulley: pulley work diameter: fan bush helt section	Nicotra/Gebhar 1.724 1/mir 3,82 kW 1 SPB 160 160,0 1610-40	dt / RD.	A E6-0500		motor type revolutions: motor shaft power motor pulley: pulley work diameter: motor bush	ELVEM 6XM 132S-4 1.450 1/min 5,50 kW 1 SPB 190 190,0 2012-38 1 × SPB - 2 000 0
avle distance		Δ	[mm]			725.0
static tension per belt strand		FS	[N]		NEW BELTS 295,0	USED BELTS 226,9
deflection force		FE TE			75,0	75,0
deflection under deflection for	ce	IE 4	[mm]		27,0	20,8
AMPERAGE measure motor amperage	during commissio	ning			28,0 [++10 %] /TE	
- for max. motor current see motor type plate BELT TENSIONING - check belt tension after the first 10 hours of operation - respect the above mentioned tensioning date - use measuring instrument for check - check periodically the belt tension - maintain unit according to service handbook ATTENTION: OVERTENSIONED BELTS CAN CAUSE EXPENSIVE SUBSEQUENT DAMAGES MODIFICATION OF BELT TRANSMISSION ONLY WITH WRITTEN CONFERMATION BY EUROCLIMA						
IMPORTANT FREQ	UENCY CO	NTRO		RAMETER	S	
nom. freq. [HZ] 50,1		r	nax freq. [Hz]		77,0	max. current [A] 10,9

Figure 136: Belt transmission and tensioning data sheet



Following two methods for determining the tensioning are described:

Force-way measurement

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

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

Frequency Measurement

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

9.2.5 Replacing of belts

- Loosen the belt tension so far that the old belt can be removed.
- Cleaned before putting the new belt pulleys and check for damage and wear.
- Never push the new belt with a tool on the pulley, to avoid damage which shorten the lifetime.
- On multi-groove pulleys all belts must be replaced simultaneously.
- Ensure that the belt number coincides with the number of pulley grooves.
- When tensioning the belt on multi-groove drives, ensure that all belts have their loose side on the same side otherwise they can be damaged see **Figure 137**.



Figure 137: Multi-groove pulleys – attaching the belts

- Tension the belts, turn the drive a few turns with no load and re-measure the belt tension.
- Check axle and wheel alignment, see chapter 9.2.4 (Re-tensioning of belts).
- Repeat these steps until alignment and belt tension are correct.

9.3 Air filters



To ensure the performance and the energy-efficient operation of the air handling unit, the air filters must be replaced regularly.



If units are equipped with TRANE control, then a corresponding warning message is displayed on the HMI (see **Figure 138**) when the differential pressure limitation is reached.

+ Supply filter 1	: Dirty
3	Warn(C)
07.12.2015	17:28:02

Figure 138: 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). Reaching the pressure difference indicated in the technical data sheet, cleaning or replacement is required.

Cleaning:

- Dirty filters dismount, tapping, suck off with a vacuum cleaner or clean it with air pressure (max. 5 bar).
- Wash the filter in max.35° C warm water with mild commercial detergent, then rinse thoroughly.
- Let fatty filters about 1h in suds.
- Not wrestle cleaned filter, let filters drain before mounting. The synthetic fibers dry quickly and can be installed and put back into service also if they are still wet.
- Clean also the filter section before remounting the filters, check filter tightness and reseal if necessary.
- Filters can be cleaned 2-3 times then a replacement of the filters is necessary.

Seals for panel filters and soft bag filters

Seals are self-adhesive and are supplied loose. Sealing: only the front side, only 1 sealing stripe...

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



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

Bag filters of class G3, G4 are repeatedly reclaimable. Clean the bags from the dust airside with a vacuum cleaner. This cleaning can be repeated several times. If this cleaning is not sufficient, also wet cleaning can be executed. Remove the bag filter, keeping the opening up, see **Figure 139**.



Figure 139: Transport of filter bags

Wet cleaning

- Rinse the bag with upward opening with a not too strong jet of water. The mud must pass flushed through the filter material to the outside. Possibly, add to the water a little bit detergent.
- Let the clean filter bags drain well, they can be remounted wet and immediately put back into service.
- Clean also the filter section before remounting the filters, check filter tightness and reseal if necessary.
- Filters can be cleaned 2-3 times then a replacement of the filters is necessary.
- Filter elements in the clamping frame must be fitted with four springs per filter. Check air tightness!
- Bag filter with class EU5 and above cannot be regenerated and must be renewed after the first lifetime.

9.3.3 HEPA filters

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



9.3.4 Auto roll filters

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

9.4 Heat exchangers

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

9.4.1 Medium water / steam

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

Cleaning

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



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

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

Antifreeze protection

Check antifreeze activity before each winter season. Check frost protection thermostat for correct setting.

Drain pan

Drain pan and drain should be checked for debris and cleaned, if necessary - Figure 140.



Figure 140: Cleaning of air coolers



Droplet eliminator

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



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

Steam Coil

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

9.4.2 Refrigerant

For the medium refrigerant (direct evaporator or condenser coil) the same actions apply as described in **chapter 9.4.1(Medium water / steam)**. Additional actions to be taken see **chapter 9.10 (Refrigeration circuit)**.

9.4.3 Electric Heater

- When working on the electric heater, refer to instructions in **chapter 2 (Safety instruc-tions)**.
- 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 Humidifier, Air washers

9.5.1 Pump

The maintenance of pumps and motors is done according to the manufacturer's instructions.

In general:

- Regular cleaning of all components largely determines the hygiene of the entire system.
- Never let operate the pump without liquid.
- Protect the pump from any solids.
- When unused for long periods the water must be released for hygiene reasons and the drain must be cleaned properly. Drain the pump as well.
- The need for a sterilizing system depends on the operating conditions and is to check case by case.



9.5.2 Air washers

In general:

- Check water supply for properly function and check the water level, adjust if necessary.
- Fill tank and siphon with clean water and adjust the float valve so that the valve closes at a water level of 2-3 cm below the overflow.
- Depending on water pollution, hardness and processing the air washer are to rid of deposits and impurities: Severe calcification of components such as nozzles and droplet eliminators indicate an insufficiently effective water treatment. Calcification of nozzles and droplet eliminators can be removed by treatment with dilute formic acid. After treatment rinse well with clean water.
- Replace corroded or damaged droplet eliminator fins.
- Check sieves for dirt deposits and clean if necessary.
- Disassemble and clean the nozzles.
- Check water tank overflow, and U-trap for debris and clean if necessary.
- Damage nozzles are to be replaced. Never clean the nozzle holes with hard objects. Clean drain valve with, high-pressure water.
- Check the bleed of valve settings and proper function.
- Check pump piping for leaks.
- Check hoses for cracks, replace if necessary.
- Check that hose clamps are tight.

9.5.3 Steam humidifiers

Maintenance according to the instruction of the manufacturer.

The following informations are general rules:

- Check water sieves for contamination and clean if necessary.
- Check operation of solenoid valves, and clean if necessary.
- Check steam distribution for deposits.
- Check steam supply for leaks.
- Check function of the condensate drain.
- Check electrical contacts on the pump for corrosion.
- Measure the current consumption.
- Clean entire piping system, control and safety devices.
- Check proper function of control and security devices.
- Measure the humidifier performance after maintenance.

9.5.4 Honey comb humidifiers

Please refer to the indications for air washers in chapter 9.5.2 (Air washers).

In general:

- The float valve has to close securely at a water level of 2-3 cm below the overflow to ensure bubble free suction. Possible readjustments have to be performed in the course of any regular inspections.
- Heavily calcified honeycomb packets must be renewed.



- In mild calcification the parked can be cleaned by adding decalcifier to the circulating water (shut down the unit before adding decalcifier). After that clean the section and tubes properly with fresh water.

9.5.5 Spray tube humidifiers

Please refer to the indications for air washers in chapter 9.5.2 (Air washers).

In general:

- Remove tubes and nozzle for cleaning.
- Clean drain pan and drain.

9.6 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.

9.7 Sound attenuators

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

9.8 Weather louver

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

9.9 Energy recovery systems

9.9.1 Plate heat exchangers

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

The only maintenance required is cleaning:

- Clean the condensate drain, control and fill the U-trap. The plate pack is normally selfcleaning.



- Removed fibers and dust at the exchanger inlet with a brush.
- Clean oils and fats with hot water, household cleaners or degreasing steam.
- Check for proper operation of differential pressure switch for function refer to chapter 7.6 (Differential pressure restriction for plate heat exchangers).
- If there is a bypass damper, please refer to chapter 9.6 (Dampers).

9.9.2 Heat wheels

Check the drive unit according to manufacturer's instructions.

In general:

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

9.9.3 Heat pipes

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

- Clean the drain pan and check the siphon. Fill the siphon if necessary.
- Fins cleaned by:
 - o Compressed air against the air flow direction or
 - o Spraying with low pressure water, if required add household cleaning detergent.
- If bypass dampers exists, please refer to chapter 9.6 (Dampers).

9.9.4 Accublocs

Electrical connection:

The accubloc is supplied including controller supplied loose (configured with default values), including operating instruction. On site must be provided:

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

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



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







Figure 141: Scheme of an accubloc

Figure 142: Position of the sensor

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

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

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

9.10 Refrigeration circuit

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

9.10.1 Leakage checks

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



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

Refrigerant contains fluorinated hydrocarbons indicated in the Kyoto Protocol with the following global warming potential (GWP = Global Warming Potential), based on CO2 (data from EN378 part 1):

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

9.10.2 Maintenance

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

Whole system:

- Check pressures and temperatures of the system.
- Pay attention to unusual operating noises and to possible vibrations.

Compressor:

- Check oil sight glass in the crankcase (if present); in the on mode must be visible oil in the sight glass; otherwise must be checked if there has been loss of oil (even outside of the unit is possible); and optionally fill in oil directly by an oil pump directly into the compressor suction side. Only use oil that is approved by compressor manufacturer.
- Out of compressor operation compressor crankcase heater switches on in order to avoid an accumulation of refrigerant in the oil. Too much refrigerant in the oil causes a dilution of the oil resulting in a loss of viscosity leading to reduced lubrication of all moving parts. To start the compressor manually, it has to be proceeded as described in chapter 8.2.2 (Manually starting the compressor via TRANE control system).
- Follow maintenance and inspection requirements of compressor manufacturer. These instructions are supplied from TRANE or can be ordered from TRANE.

Filter drier:

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

Sight glass in liquid line and on receiver

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

Indicator green	=	dry
Indicator yellow	=	wet

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

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

Expansion valve:

- Check superheating of expansion valve which should amount to 5 to 10K. Check that the temperature sensor is correctly fitted as well as the pressure compensation pipe.



- With an electronic expansion valve the corresponding values must be followed by control unit. Instructions from valve manufacturer are supplied by TRANE.

High pressure safety switch:

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

Low pressure safety switch:

The low pressure switch stops the compressor when the equipment pressure decreases the allowed low pressure. A functional check must be carried out during commissioning and must be performed at each maintenance work.

Handling:

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

Electrical superheat controller

The electronic superheat controller has an internal battery, so that the valve closes securely even during power failures. Without this feature the valve remains open, resulting in liquid hammering in the compressor at the restart. Liquid hammering can cause damage of the compressor.



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

9.10.3 Inspection

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

All equipment:

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

Air-cooled condenser, direct expansion evaporator:

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

Compressor:

Check oil sight glass in the crankcase (if mounted). Pay attention to unusual noise. To start the compressor manually, it has to be proceeded as described in **chapter 8.2.2 (Manually starting the compressor via TRANE control)**.

Coolant contents:

Check the inspection glass in the liquid line, to see whether the inspection glass is completely full. Under full load, if bubbles appear in the inspection window, the contents are not in order and must be rectified by a specialist. The appearance of bubbles under partial load can



occur under certain performance windows and is not a sign of a prevailing fault with the refrigerant.

Condensate tray and outlet:

- Examine condensate outlet and tray for dirt and clean if necessary.
- Clean or rinse out condensate outlet from time to time.

9.11 Hygienic units

The maintenance plan for TRANE AHU's you will find in the general part of instruction manual. TRANE recommends maintenance in dependence on:

- VDMA 24186 part 1 and
- VDI6022 part 1. In chapter 5 of VDI 6022 part 1, you can find detailed requests on operation and maintenance.

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

9.12 Maintenance plan

The maintenance intervals specified in **Table 12** 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, C = Clean, M = Maintenance

Component	Action	Section	month- Iv	¼ year	½ year	year	Reference chapter
Fan / motor	Ch	Corrosion check			Х		9.2.1 Fan
	Ch	Flexible connection			Х		-
	Ch	Vibration isolators			Х		_
	Ch	Protection grid			Х		-
	Ch	Water drain			Х		_
	Ch / Cl / M	Fan bearings		Х			-
	Ch / Cl / M	Fan bearings with lubricat- ing nipples	according	g to Table 8 for fan t	(Lubricatior bearings)	n intervals	_
	Ch / Cl / M	Motor, general			Х		9.2.2 Motor
	Ch / M	Motor bearings		Х			_
	Ch / Cl / M	Motor bearings with lubri- cating nipples	accordir vals f	ng to Table for motor be	10 (Lubricat arings (in m	ion inter- onth))	_
	Ch	Check current consumption		Х			
	Ch / Cl / M	Belt drive, general		Х			9.2.3 V-belt drive
	Ch / M	Belt tension	first ti	me after op X	eration of 10	hours	
	М	Belt change	if nec	essary / at	least after 2	years	_
Filter	Ch / Cl / M	Panel filters	Х			-	9.3.1 Panel filters
	Ch / Cl / M	Bag filters		Х			9.3.2 Bag filters
	CI / M	HEPA filters		Х			9.3.3 HEPA filters
Heat exchanger	Ch / Cl	Fins				Х	9.4 Heat exchangers
Ū	Ch	Frost protection				Х	-
	Ch / Cl	Drain pan				Х	-
	Ch / Cl	Droplet eliminator				Х	-
	Ch	Steam coil			Х		_
Electric heater	Ch / Cl	E-heater			Х		9.4.3 Electric Heater
		Check e-heater section for th failure!	nermal dam	ages after e	every mains	supply	
Humidifier	Ch / M	Pump	Х				9.5.1 Pump
	Ch	Air washer	Х				9.5.2 Air washers
	Ch / Cl	Decalcify / cleaning		if nec	essary		
	Ch	Nozzles	Х				9.5.5 Spray tube humidifiers
	Ch	Drain pan	Х				
	Ch	Bleed off settings / valves	Х				
	Ch / Cl / M	Steam humidifier	Х				9.5.3 Steam humidifiers
	Ch / Cl / M	Honey comb humidifier	Х				9.5.4 Honey comb humidifi-
	Ch / Cl / M	Sprav tube humidifier	Х				9.5.5 Spray tube humidifiers
Dampers	Ch / Cl	Dampers				Х	9.6 Dampers
Silencer	Ch / Cl	Silencer				Х	
Weather louver	Ch / Cl	Weather louver, grid and hood				Х	
Energy recovery	Ch / Cl	Plate heat exchanger			Х		9.9.1 Plate heat exchangers
	Ch / Cl	Heat wheel		Х			9.9.2 Heat wheels
	Ch / Cl	Heat pipe				Х	9.9.3 Heat pipes
Refrigeration circuit	Ch	Leakage check		>=500 Data in to	>=50 ns of CO ₂ -equ	>=5 iivalent	9.10.1 Leakage checks
	Ch / Cl	Maintenance				Х	9.10.2 Maintenance
	Ch	Inspection		Х			9.10.3 Inspection
Control Cabinet	М	Filter				Х	9.1 Control cabinet
	Ch	Fan				Х	
	Ch	Heater				Х	

Table 12: Maintenance plan



10 Information on airborne noise emitted by the air conditioning units - on request

Sound data can be printed on request on the technical data sheet, sample see **Figure 143**. 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.

63	125	250	500	1000	2000	4000	8000	Tot db (A)
88,0	81,0	78,4	62,0	56,2	50,7	41,1	32,6	71,9
93,2	90,0	96,0	87,0	77,0	74,0	72,0	66,0	89,7
97,0	98,0	99,0	89,0	86,0	82,0	79,0	75,0	93,8
68,7	61,7	59,1	42,7	36,9	31,4	21,8	20,0	52,6
85,8	83,3	90,0	81,5	71,7	68,8	67,1	61,1	83,9
89,6	91,3	93,0	83,5	80,7	76,8	74,1	70,1	88,1
	63 88,0 93,2 97,0 68,7 85,8 89,6	63 125 88,0 81,0 93,2 90,0 97,0 98,0 68,7 61,7 85,8 83,3 89,6 91,3	63 125 250 88,0 81,0 78,4 93,2 90,0 96,0 97,0 98,0 99,0 68,7 61,7 59,1 85,8 83,3 90,0 89,6 91,3 93,0	63 125 250 500 88,0 81,0 78,4 62,0 93,2 90,0 96,0 87,0 97,0 98,0 99,0 89,0 68,7 61,7 59,1 42,7 85,8 83,3 90,0 81,5 89,6 91,3 93,0 83,5	63 125 250 500 1000 88,0 81,0 78,4 62,0 56,2 93,2 90,0 96,0 87,0 77,0 97,0 98,0 99,0 89,0 86,0 68,7 61,7 59,1 42,7 36,9 85,8 83,3 90,0 81,5 71,7 89,6 91,3 93,0 83,5 80,7	63 125 250 500 1000 2000 88,0 81,0 78,4 62,0 56,2 50,7 93,2 90,0 96,0 87,0 77,0 74,0 97,0 98,0 99,0 89,0 86,0 82,0 68,7 61,7 59,1 42,7 36,9 31,4 85,8 83,3 90,0 81,5 71,7 68,8 89,6 91,3 93,0 83,5 80,7 76,8	63 125 250 500 1000 2000 4000 88,0 81,0 78,4 62,0 56,2 50,7 41,1 93,2 90,0 96,0 87,0 77,0 74,0 72,0 97,0 98,0 99,0 89,0 86,0 82,0 79,0 68,7 61,7 59,1 42,7 36,9 31,4 21,8 85,8 83,3 90,0 81,5 71,7 68,8 67,1 89,6 91,3 93,0 83,5 80,7 76,8 74,1	63 125 250 500 1000 2000 4000 8000 88,0 81,0 78,4 62,0 56,2 50,7 41,1 32,6 93,2 90,0 96,0 87,0 77,0 74,0 72,0 66,0 97,0 98,0 99,0 89,0 86,0 82,0 79,0 75,0 68,7 61,7 59,1 42,7 36,9 31,4 21,8 20,0 85,8 83,3 90,0 81,5 71,7 68,8 67,1 61,1 89,6 91,3 93,0 83,5 80,7 76,8 74,1 70,1

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 143: Sound data information

11 ATEX units

The ignition hazard assessment was performed according to EN 13463-1:2009 and EN 1127-1:2011.

Applied protection: EN 13463-5:2011 Protection by constructional safety "c".

11.1 General notes

Hazardous areas must be rated on the frequency and duration of the occurrence of hazardous explosive atmospheres (gas / air or steam / air mixtures and / or dust / air mixtures). This is described in Directive 1999/92/EC.

Because of this zoning an adapt AHU must be used.

The relationship between zones and category as per **Table 13** described.

|--|

- Group II: Surface installations, category 1, 2 and 3
- Letters: G gases, vapors, mists D dust



Unit category	Selection for type of explosive atmosphere	Avoidance sources of ignition	Degree of security	Use in zone
1 G	Gas / gas-mixture or steam / gas-mixture or fog	Even in rare malfunctions	very high	0
2 G	Gas / gas-mixture or steam / gas-mixture or fog	Even with the usu- al malfunctions	high	1
3 G	Gas / gas-mixture or steam / gas-mixture or fog	In normal operation	normal	2
1 D	Dust / gas-mixture	Even in rare malfunctions	very high	20
2 D	Dust / gas-mixture	Even with the usu- al malfunctions	high	21
3 D	Dust / gas-mixture	In normal operation	normal	22

 Table 13: AHU categories

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

Temperature class	Max. surface temperature (°C)
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

Table 14: Temperature classes of AHU category 2 G

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



The maximum allowable surface temperature must always be lower than the ignition temperature of the explosive atmosphere.



11.2 Information regarding the unit, protective systems and components

Example of designation



Evidence of compliance with EC - Directive 2014/34/EC

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

Type of use:

 $(\in \langle Ex \rangle)$ II 3 G c T3 (inside)

The AHU are designed for processing and transport of explosive atmospheres of Zone 2 but not for installation in Zone 2.

Equipment in this category provides in normal operation, the required level of security.

CE (inside)

The AHU are designed for processing and transport of explosive atmospheres of zone 1 but not for installation in Zone 1.

The device-specific explosion protection measures in this category must provide themselves with frequent disturbances or equipment faults, which normally have to be considered, the required level of security.

CE (II 2/3 G c T3 (inside / outside)

The AHU are used for processing and transport of explosive atmospheres of zone 1 and for installation in Zone 2.

The device-specific explosion protection, inside this category must provide themselves with frequent disturbances or equipment faults, which normally have to be considered, the required level of security.



The device-specific explosion protection, outside this category must provide themselves with frequent disturbances or equipment faults, which normally have to be considered, the required level of security.

Air leakage rate:

The air leakage rate of the air conditioner is determined at a vacuum of 400 Pa. The device corresponds to the tightness class L1 to EN 1886.

- Tightness Class L1 corresponds to a maximum air leakage rate of 0.15 l/(s*m2).
- This must be considered, therefore installation of equipment in areas with natural convection.
- During maintenance work must be ensured, that no explosive atmosphere is present.

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

The following conditions must prevail:

- On the intake side and in the vicinity of the device, the temperature shall not exceed -20 °C to +60 °C.
- An atmosphere with pressures from 0.8 bar to 1.1 bar shall be present in the environment of the AHU.

11.3 Information for commissioning, maintenance and repair

11.3.1 Foundation and erection

- Refer to chapter 4 (Foundation / erection).
- The AHU must be connected to an external protective conductor system.

11.3.2 Assembly connection

Motor:

- Electrical connection, refer to **chapter 7.2 (AC motors)**: standard repair switches must be assembled outside the hazardous area.
- Connection potential compensation: according to the provided instructions of the motor manufacturer.

In general:

- All conductive connections (WT piping, siphon, ducts, ...) must be connected to a potential compensation.
- It must be ensured that parts that are necessary to achieve the degree of protection, cannot be removed accidentally or unintentionally.
- All doors are equipped with a closure device. The doors must be locked and the key removed.



During maintenance is to take care that no tools or other objects remain in the unit or duct system, to avoid malfunctions and sparks. – **Risk of explosion!**



- 11.3.3 Fan section
- Refer also to chapter 9.2 (Fan / motor group).
- Belt: It's only allowed to use electrically conductive, flame retardant and self-extinguishing belts (ISO 9563 or ISO 1813).
- Use original spare parts.

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

11.3.4 Air filters

- It's only allowed to use electrostatic deductive filter.
- Use original spare parts.
- For filter types that are equipped with potential equalization cable, each filter cell must be connected to the potential settlement with the AHU in the fixed-mounted metal filter frame using self-tapping screws or bolts.
- To prevent the formation of an explosive atmosphere by stirring up of dust deposits, the equipment has protective systems and components designed to avoid deposits of combustible dusts as far as possible. Therefore, for all components corresponding service openings are provided.
- Periodically the AHU shall be cleaned (depending on the amount of dust) from dust.

11.3.5 Heat exchangers / steam humidifiers



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

11.3.6 Field devices

On site assembled field devices must comply the ATEX class specified by TRANE.

- The electrical components (switches, lights, sensors, motors, etc.) must be approved for operation in explosive atmospheres and must be equipped with an appropriate marking.
- The cabling must meet the relevant standards.
- Appropriate potential equalization has to be prepared.
- Outdoor units must be equipped with a professional lightning protection system and all metal parts have to be connected to the ground conductors.
- For indoor units all electrically conductive parts must be protected with a professional grounding measure (potential equalization). By derivation of lightning currents, this measure prevents the formation of ignition sources.
- Pipelines must be considered as a potential ignition source, since their temperature can rise up to 110°C.



11.3.7 Declaration of conformity

The declaration of conformity to ATEX applies only to the original delivery AHU and with proper repair and maintenance. When changes on the AHU are made, which are not agreed in writing, the declaration of conformity loses its validity.

12 Disassembly and disposal

12.1.1 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 casing can be disassembled relatively easy:

Disassembly of the casing:

- 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 unit see **Figure 144**.
- Handling: securing with belt see Figure 145.



Figure 144: Lifting with chain hoist



Figure 145: Securing with belt



12.1.2 Disposal

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

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

Components	Material	CER / EWC			
(examples)	Material	European Waste Code			
Casing panels, built-in	VZ and VZB sheet metal	170405			
components, base	Stainless steel	170405			
frames, heat exchangers	Aluminium	170402			
	Copper tube	170401			
Copper cable	Copper cable	170411			
Casing insulation	Mineral wool	170604			
Air filter	Plastic, metal	150106			
Droplet separator slats					
Insulation profile					
CCEB/CCEC Inova	Plastic	150102			
Sealing tape					
Piping					
EC – motor	Guidelines for the disassembly and instructions for the disposal can				
Electronic components	be found on the homepage of the m	nanufacturer. Detailed information			
	of the manufacturer can be found on the component.				

A standard AHU consists of 95% recyclable metallic materials.

 Table 15: Information for disposal



Figure index

Figure 1: Do not climb on the unit	15
Figure 2: Delivery in parts (delivery sections)	16
Figure 3: Delivery as monobloc	17
Figure 4: Transport correct	18
Figure 5: Transport incorrect	18
Figure 6: Center of gravity centrally between the forks	18
Figure 7: AHU section drawing with weight details	19
Figure 8: Delivery section with mounted damper	20
Figure 9: Delivery section with dismounted damper	20
Figure 10: Delivery section with mounted crane lugs	21
Figure 11: Delivery section with mounted flexible connection	21
Figure 12: Delivery section with dismounted flexible connection	21
Figure 13: Delivery section with mounted crane lugs	22
Figure 14: Mounting of crane lugs	22
Figure 15: Base frame height	23
Figure 16: Load carrying equipment guided over front side	24
Figure 17: Uniform force effect	24
Figure 18: A monobloc, which consists of the two sections L1 and L2	25
Figure 19: Guiding of load carrying equipment (monobloc)	26
Figure 20: Uniform load of the form tubes	26
Figure 21: Securing against slipping off of the load carrying equipment	26
Figure 22: Permitted angle for load carrying equipment guidance	27
Figure 23: Protection against dirt	28
Figure 24: Solid foundation and strip foundation	29
Figure 25: Pulling AHU sections together	31
Figure 26: Pulling AHU sections together (detail)	31
Figure 27: Securing the position on the foundation	31
Figure 28: Suspension of ceiling units	32
Figure 29: Air washer with both sides feet	32
Figure 30: Comfort compound	33
Figure 31: Suspension with transverse profiles	34
Figure 32: Suspension with longitudinal and transverse profiles	34
Figure 33: Removable external panels	35
Figure 34: Removal of the external panel	36
Figure 35: Sealing strip	36
Figure 36: Applying the sealing strip	36
Figure 37: Sealing agent (Sikatiex).	30
Figure 38: Applying the sealing agent	00 27
Figure 39. Hexagon bolt with locking Mission / Milox30 / Milox30 / Milox30 / Milox40.	،د حد
Figure 40. Screw connection of base frames	،د حد
Figure 41. Hexagon bolt with hut Mox10	،د حد
Figure 42. Flore Spacing Of the international parter international space international space bolt with locknet M8x20	37 27
Figure 43. Liezagoli boli with locking linozo	37 37
Figure 44. Connection via connection angle	 אצ
Figure 46: Connection frame	ວບ ຊຂ
Figure 47: Tanning screw ø8 x 11	 אצ
Figure 48: Joint on the AHI I drawing	ວບ 38
Figure 40: Connection between door frame / internal panel	ວບ 38
Figure 50: Self-tapping screw ø6 3 x 22	39
Figure 51: Application of self-tapping screws	39
Figure 52: Self-tapping screw TORX 25 Ø4.8 x 16	
Figure 53: Joint on the AHU drawing	
Figure 54: Joint at the AHU	
Figure 55: Hexagon bolt with nut (stainless steel) M6x16	
Figure 56: Connection of roof plates.	39
Figure 57: Mounting of the sliding bar	39
Figure 58: Screwing delivery sections together	40
Figure 59: Tightening the screws	40
Figure 60: Removing the protective film	41
Figure 61: Pushing in the external panel	41
Figure 62: Sealing surfaces	42


Figure 63: Sealing the frontal joints	42
Figure 64: Sealing the roof flange	42
Figure 65: Applying the sealing agent on the frontal joints	43
Figure 66: Unit separation accessible via door	43
Figure 67: Sealing the section connection (joint) with the sealing agent	43
Figure 68: Step drill	44
Figure 69: Sleeve	44
Figure 70: Screwing	44
Figure / 1: Cable gland	44
Figure 72: Transport lock	45
Figure 73. Door closed' not locked'	40
Figure 74. Dool , closed ; not ,locked	40
Figure 73: Dobi, gosed and jocked	40
Figure 77: Closed'	46
Figure 78: .Open'	
Figure 79: Inclined door panel – varving slit width	46
Figure 80: Adjustment of the door panel	46
Figure 81: Adjusted – constant slit width	46
Figure 82: Closed position	47
Figure 83: Pulling out the filters	48
Figure 84: Pull-out tool	48
Figure 85: Delivery of the clips	49
Figure 86: Insertation of the clips	49
Figure 87: Fixed filter	49
Figure 88: Loosen the clamps	49
Figure 69. Slide III the litters	49
Figure 90. Clamping the filter base	49
Figure 91. Litting the finer bays	50
Figure 93: Inserting the filter cell	50
Figure 94: Inserting the clamps	50
Figure 95: Clamping the filter cell	
Figure 96: Damper with external gear wheels	51
Figure 97: Holding against with a pipe wrench	52
Figure 98: Heat exchanger connection	53
Figure 99: Hydraulic connection scheme	53
Figure 100: Drain valve	53
Figure 101: Vent valve	53
Figure 102: Plate heat exchangers for refrigeration circuits	54
Figure 103: Notes concerning plate heat exchangers	55
Figure 104: Indirect adiabatic cooling	55
Figure 105: Siphon on suction side	
Figure 100. Siphon on pressure side	
Figure 108: Suction side execution	57
Figure 109: Pressure side execution	
Figure 110: Pressure side installation: remove the black closing plug	58
Figure 111: Workspace of single-speed motors	60
Figure 112: Wiring diagram for thermistors	61
Figure 113: Wiring diagram for thermal contacts	62
Figure 114: Motor circuits	63
Figure 115: Rotation marking of plug fans	64
Figure 116: Rotation marking of housing fans	64
Figure 117: Repair switch	65
Figure 118: Thermostat with cover cap on the reset button	67
Figure 119: I nermostat with uncovered reset button	67
Figure 120: Thermostat 2	68
Figure 121. Connection scheme for electric fleater	80
Figure 122: Electrical confidence internet	09
Figure 120. Fixing solews	71
Figure 125: Smallest working diameter	
Figure 126: Biggest working diameter	80
Figure 127: Schematic structures of a variable pulley	81
Figure 128: Position of the Allen screws on variable pulleys	81



Figure 129: Fan bearing with grease nipple (example Comefri NTHZ)	
Figure 130: Unfavourable operating conditions (1)	85
Figure 131: Unfavourable operating conditions (2)	85
Figure 132: Unfavourable operating conditions (3)	85
Figure 133: Unfavourable operating conditions (4)	85
Figure 134: Adjustment of pulleys	
Figure 135: Adjustment of pulleys via threaded rods	
Figure 136: Belt transmission and tensioning data sheet	
Figure 137: Multi-groove pulleys – attaching the belts	
Figure 138: Warning message filter	
Figure 139: Transport of filter bags	
Figure 140: Cleaning of air coolers	
Figure 141: Scheme of an accubloc	
Figure 142: Position of the sensor	
Figure 143: Sound data information	
Figure 144: Lifting with chain hoist	
Figure 145: Securing with belt	
5	

Table index

Table 1: Base frame heights, depending on the AHU weight	
Table 2: Anzugsdrehmoment für Schrauben	
Table 3: Drilling diameters for cable glands	
Table 4: Torques for the motor terminal board	64
Table 5: Tightening torque for variable pulleys	71
Table 6: parameters for Danfoss frequency converter FC102	
Table 7: Data of pulley types	
Table 8: Lubrication intervals for fan bearings	
Table 9: Recommended grease types	
Table 10: Lubrication intervals for motor bearings (in month)	
Table 11: Maximum deviation at adjustment of pulleys	
Table 12: Maintenance plan	
Table 13: AHU categories	
Table 14: Temperature classes of AHU category 2 G	
Table 15: Information for disposal	





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