Planning, Assembly, Commissioning, Maintenance

Swegon GRAND

Manual for engineers and technicians as a planning document, for the plant builder for assembly, commissioning and maintenance of GRAND air handling units

Swegon

Content

The document was originally written in German.

1. General information about GRAND air handling units

1.1 Overview of air handling units

The GRAND air handling unit system is designed to be flexible so that it can be used for most applications and covering a wide range of airflow and capacity requirements. The flexibility allows us to design the units according to customer requirements for the system and the materials used.
We can supply units for indoor or outdoor installation and units can be built to meet demanding hygienic requirements or, for example, installation in ATEX zones. Units can be supplied with rotary-, plate- or liquid coupled heat exchangers for energy recovery.
GRAND units can be delivered with or without controls and we can also supply the pump system for the liquid coupled heat recovery systems.

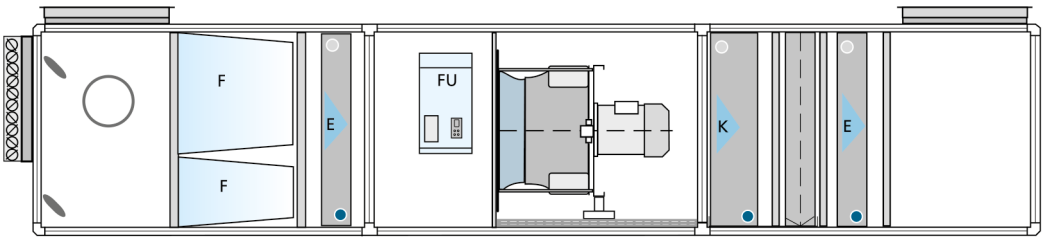
Individual components:
System HPWRG, closed loop heat recovery system (run-around system), heater, cooler, evaporator, condenser, heat pipe, fan system ETA, connecting pieces, air control and shut-off dampers, spray humidifier, contact humidifier system HYDROplus,

The units can be composed of the following components:
Fan - filter - heater - cooler - heat recovery systems (HRS), (HE), (run-around) - humidifier - droplet separator sound attenuator - universal module (empty part) - plate heat exchanger - rotors or rotor heat exchanger, etc.

Construction:
A Modular, self-supporting construction using purpose designed aluminium frame profiles and plastic corners.

Wall panels, filled with heat- and sound-insulating material and with seals embedded in the frames. Panel materials: Stainless steel or sendzimir galvanised or strip-coated sheet steel, available in several RAL colours (on request).

Central unit with fan part system ETA FC



F: Filter
E: Heater
K: Cooler
FC: Frequency converter

1.2 General regulations and information

Intended use

The function of this product is to heat, ventilate and condition normal air. Any other use is expressly excluded and no liability for incorrect use will be accepted.

Air handling units are not generally intended to be installed in, or operate with hazardous atmospheres. Air handling units may not be used to cause a hazardous atmosphere.

The design of the unit does not include any special explosion protection measures in accordance with ATEX Directive 2014/34/EU unless otherwise stated.

NOTE: Only use the unit as intended!

NOTE: Any unauthorized alterations to the product are subject to personal liability.

NOTE: The operation of any electrical and/or mechanical unit, whose operating instructions and name plate do not contain any information regarding ATEX protection is not permitted in ATEX areas!

Limits of use:

In operation -20°C to +40°C.
At standstill -30°C to +70°C.

Attention!

In both cases, the freeze protection of the media is to be observed. The pipes filled with water may need to be drained!

Max. casing differential pressure according to name plate and design 2500 Pa.

Max. fan speed according to name plate and design.

Max. operating pressure and operating temperature of the liquid media according to the design data sheet.

Max. currents and voltages according to design data sheet.

Risk of condensation on casing components, see 2.2.1.

In the event of non-compliance with the currently valid assembly, operation and maintenance instructions, the warranty obligations of the manufacturer are void.

Assembly

If the unit is supplied in separate parts, they must be assembled in accordance with these assembly instructions and all protective devices must be activated.

The declaration of conformity or the installation declaration is only valid if the lead installer has confirmed that the work has been carried out correctly in accordance with the assembly instructions by signing the declaration and a copy of the declaration has been sent in a verifiable manner to Swegon.

Sealing materials

The material properties and resistances of the sealing materials (EPDM profiles) can be found in the material overview in the download area of our website: https://www.swegon.com.

Before commissioning

The unit may only be put into operation if it has been installed according to this assembly instructions.

All protective devices must be effective. In the vicinity of the access door of the fan section, a lockable isolating switch must be installed.

1.2.1 Safety information regarding all work (installation, maintenance, repair and decommissioning)

Ensure that the power supply of the system is disconnected at all poles before starting work. (observe the waiting time for possible discharge currents, e.g. at frequency converters).

All work on electrical systems must be carried out by certified electricians.

Caution: Secure against switching on (e.g. padlock on repair switch) before starting maintenance work.

The unit may only be entered or worked on if the following criteria are met.

All moving parts must come to a complete standstill , in particular the fan impeller, belt drive, motor, rotor heat recovery system.

Waiting time min. 5 minutes!

Heat exchanger cooled to ambient temperature.

Observe explosion protection notice ATEX 2014/34/EU)!

After completion of the work, the following must be fulfilled before switching on:

Close all doors and ensure safety devices are operating correctly.

Verify that there are no people in the unit

Because some doors cannot be opened from the inside, the responsible technician must ensure that nobody remains inside the GRAND air handling unit before it is restarted.

1.2.1.1 EC conformity assessment of air handling units

We certify that this product conforms with relevant Directives and Regulations. A Declaration of Conformity is supplied separatly.

Manufacturer:
Howatherm Klimatechnik GmbH
A Swegon Group company
Keiperweg 11-15
55767 Brücken
Germany

Labelling of GRAND air handling units according to Machinery Directive 2006/42/EC

GRAND air handling units, when supplied without controls, are considered to be partly completed machinery within the meaning of the Machine Directive 2006/42/EC. This means that it can not perform its purpose without the necessary components and as such shall not be CE marked.The manufacturer shall supply a Declaration of Incorporation with a partly completed machine as well as relevant safety and installation instructions. The GRAND air handling unit may only be put into operation when the installer has dedermined that it complies with Directive 2006/42/EC and has provided a Declaration of Conformity.

GRAND Air handling units supplied with controls are considered to be complete machines. these units are supplied with a Declaration of Confomity and are CE marked.

1.2.1.2 Use of a GRAND air handling unit for smoke extraction

GRAND air handling units are not generally designed for smoke extraction, do not comply with DIN 18232 and EN 12101-3 and have no construction product approval.

Ventilation systems are only suitable for smoke extraction if ventilation power, ductwork, components, fans, power supply and AHU plantroom are designed for use in case of fire and the ventilation ducts do not have any shut-off devices.

1.2.1.3 Explosion protection

GRAND air handling units with special explosion protection precautions according to ATEX Directive 2014/34/EU

Explosive atmosphere
In order to avoid an explosion, deflagration or fire, explosive atmospheres shall be prevented.

In general, Group II C gases (e.g. carbon sulphide, acetylene, hydrogen sulphide, ethylene oxide, etc.) are excluded as components of the supplied air. If the unit is suitable for zone 1, it guarantees a high degree of safety; in Zone 2, the safety is ensured in normal operation.

NOTE: Units with EX protection according to ATEX Directive 2014/34/EU must be explicitly marked as such. The unit may only be used in accordance with the unit labelling and in compliance with the instructions in this manual!

Air Handling units shall not be exposed to zone 0 under any circumstances.

1.2.1.3.1 Explosion protection labelling

ATEX rated GRAND air handling units may only be used in the zone defined by the category! The labelling can be found on the fan chamber of the GRAND air handling unit.

A distinction is made between the labelling of the "inside" (suppressed atmosphere) and "outside" (installation room) of the GRAND air handling unit. The labelling corresponds to the the table below, whereby the level of safety increases with the increasing variant number.

Variant 1 offers the lowest EX protection, while variant 4 offers the highest protection.

If no filters need to be used for GRAND air handling units with special explosion protection, because dust accumulation can be effectively prevented (e.g. pure exhaust air), gas group IIB can be conveyed in the GRAND air handling unit (inside).

Note the labelling of the GRAND air handling unit! The certificate number is: EPS 16 ATEX 2 061 X.

NOTE: The overall responsibility for explosion protection lies with the user or System installer! The GRAND air handling unit cannot guarantee complete explosion protection alone, as the protection concept must affect the entire system!

	Internal	**External**	**Comment**
Var. 1	Ex II 3G Ex h IIB T4 Gc	----------	Internal EX-protected (normal level of safety) +
Var. 2	Ex II 2G Ex h IIB T4 Gb	----------	EX-protected inside (high level of safety)
Var. 3	----------	Ex II 3G Ex h IIB T4 Gc	Exterior EX-protected (normal level of safety)
Var. 4	Ex II 2G Ex h IIB T4 Gb	Ex II 2G Ex h IIB T4 Gb	EX-protected inside and outside (high level of safety)

Where the EX protection requirements are lower the next possible level is used.

Temp. class max. surface temperature	
T (x)	
T 1	450°C
T 2	300°C
T 3	200°C (standard)
T 4	135°C (only with pressure-resistant encapsulated motor)

Example: EX-protective labelling

Variant 4
Ex II 2G Ex h IIB T4 Gb (internal)
Ex II 2G Ex h IIB T4 Gb(external)
The unit can promote an explosive atmosphere!
Only to be opened by qualified personnel with suitable work equipment and in the absence of the explosive atmosphere

1.2.1.4 Avoidance of ignition sources - Fan

Only fans with the correct approval and labeling may be used in explosive atmospheres.

Contact of the impeller with the inlet nozzle must be avoided to prevent mechanically generated sparks.

This is ensured by means of a corresponding material combination and through careful adjustment of the nozzle gap / see 3.1.5. Furthermore, the maximum permissible speed of the fan must never be exceeded since otherwise parts can come loose from the impeller, which can also generate mechanical sparks!

NOTE: In particular, electric motors must be protected accordingly (e. g. thermistor, temperature sensor, overcurrent protection etc.) so that in the event of damage (e.g. bearing damage, winding damage, etc.), the motor is immediately shut down.

Motor damage can lead to over heating and represent an ignition source.

Filters

Only components with a corresponding explosion protection classification may be used for air filtration.

NOTE: When assembling the individual filter bags, it must be ensured that the earthing lug is conductively connected to the filter frame. // see figure on page 9.

Electrical components

All electrical components (e.g. electric motors, lamps, contactors, etc.) must be certified for use in an explosive atmosphere with appropriate labelling and approval for the zone in which they are used.

The cabling must be carried out according to the relevant standards. Overall, for the entire GRAND air handling unit, an appropriate bonding must be observed so that static electricity can be excluded as an ignition source.

The frequency converter is generally not suitable for use in an explosive atmosphere, it is only supplied loose and may only be used in a non-hazardous atmosphere.

Lightning protection

In particular, for outdoor units with explosion protection, a professional lightning protection according local regulations must be installed / see 1.8.3 /.

Hot surfaces

Hot surfaces that could cause ignition in the specific atmosphere must be eliminated.

NOTE: Before opening the units, the system must be mechanically and electrically decommissioned and locked accordingly. Before opening the system, it may be necessary to purge the system with fresh air in order to remove the explosive atmosphere. In particular, when the system is at a standstill, the concentrations of the atmosphere change and thus increase the risk of explosion.

In any case, all types of ignition sources must be avoided.

ATTENTION:
GRAND air handling units have an unpreventable leakage according to leakage class L2 (EN 1886), which is maximum 0.44 l/m² s. This leakage can influence the explosive atmosphere!

ATTENTION:
Maintenance and repair may only be carried out by appropriately trained personnel!

Work may only be carried out in non-explosive atmospheres or if ignition sources are avoided. In particular, it must be ensured that all work equipment is authorised for the corresponding zone (see EN 1127-1 or local ATEX regulations and standards)!

ATTENTION:
Local or national electrical safety rules must be observed and complied with during all electrical work!

ATTENTION:
Any modification of air handling units built according to ATEX Directive will result in a loss of approval and the manufacturer will reject any responsibility.

ATTENTION:
Installation of ATEX marked equipment shall be in compliance with EN 60079-14.

ATTENTION:
When using tools in the hazardous area, EN 1127-1, Appendix A must be observed.

ATTENTION:
When working in ATEX areas IEC TS 60079-32-1 must be observed.

ATTENTION:
The fan must not grind on the inlet nozzle under any circumstances! This can lead to ignition.

ATTENTION:
The fan must be fitted with an intake guard to prevent the risk of sparks caused by foreign material.

NOTE: Fans may not be operated at more than 80% of the maximum speed of the impeller.

NOTE: In the case of units with special explosion protection precautions, a protective conductor test must be carried out before switching on.

ALL metallic components must be connected to the protective conductor system!

Before commissioning, check and mitigate all possible ignition sources , in particular:

Fan gap, Motor protection, Electrical components.

Overheated components at standstill (e.g. pipelines, wall panels), Dust deposits.

The fan must be permanently monitored for vibrations. This can be achieved by means of an rated vibration monitoring system, or by daily visual inspection.

If vibrations are visually or acoustically detectable, the unit must be immediately shut down and the manufacturer informed.

NOTE: When changing the filters, only filter media that are suitable for use in explosive air may be used. The filter material must not create a static electrical charge or if, it does, then it must be carefully earthed with a resistance < 10^9 Ohm.

The frame must be metallic and connected to the protective conductor system

NOTE: When assembling the individual filter bags, it is essential to ensure that the earthing lug is connected to the casing in a conductive manner, see image on the left.

1.2.1.5 Emergency

1.2.1.5.1 Fire on the unit and its components

In the event of a fire on or in the GRAND air handling unit, it must be taken out of operation immediately. To do so, disconnect the power supply to the entire GRAND air handling unit and close the control air and shut-off flaps immediately.

ATTENTION:
Fire-fighting (e.g. with water, extinguishing agent, CO_2, etc.) may only take place when the complete GRAND air handling unit is voltage-free!

NOTE: In the event of a fire, harmful gases and smoke can occur! Do not inhale under any circumstances.

1.2.1.5.2 Sabotage

Sabotage can occur, for example, as a result of an attack. The system must be protected as completely as possible against unauthorised access or unauthorised intervention. In particular, the area of the outdoor air intake up to the supply air intake must be secured. In the event of sabotage, the system must be shut down immediately and the dampers must be closed. The exhaust air can be used further for ventilation.

NOTE: The relevant safety and hazard information also apply to the decommissioning of the unit and its components.

Please read the operating and maintenance instructions before any work.

1.2.2 Special hazard and safety information

NOTE: In principle, air handling units must only be installed, commissioned, operated, maintained, and cleaned by trained and authorised personnel.

Mechanical hazards

During transport, assembly, operation, maintenance, cleaning and disassembly of the individual parts, the weight of the units can lead to crushing or similar injuries:

Warning: Squeezing injury on intake-side doors (negative pressure).

Opening of doors when arranged on the pressure side. Risk of shock.

Squeezing when control air and shut-off dampers close or open.

If dampers are closed when the system is running, especially if this occurs suddenly, the units and the installed components can be destroyed by positive or negative pressure. Risk for maintenance and operating personnel.

Warning of rotating parts, e.g. fan, belt drive, etc.

The floor load of the units of 100 kg/m^2 must not be exceeded.

Risk of injury from any projecting units and/or add-on parts.

ATTENTION:

Before opening doors, the fan must be isolated from the power supply and come to a complet stop. (Waiting time at least 5 minutes)

ATTENTION: Do not open or enter the unit during operation. Never reach into rotating parts (e.g. rotor) or moving parts (e.g. dampers)!

ATTENTION: Never operate rotating parts above their max. operating speed, parts can come loose from the rotor.

Hazards from electrical energy:

Risk of short circuits to the electrical parts or when connecting electrical parts, e.g. electric motor, Frequency converters, lamps, etc.

Danger of static charging of the casing. Observe grounding!

Caution:
After switching off the system, electrical voltages may still be present, e.g. due to charged capacitors in frequency converters. Prior to the start of work, the minimum waiting times must therefore be observed and complied with.

Electrostatic discharges can become ignitable when conveying explosive atmospheres.

Danger due to thermal influences:

Risk of burns from hot pipes (e.g. hot water or steam pipes) and from other hot components (e.g. heater, electrical components and installations, electric motor, etc.)

Chill-burns from cold parts (e.g. cold water pipes, refrigerant pipes) and cold components (e.g. cooler, suction chamber, etc.)

Risk of escaping steam, e.g. with steam air humidifier.

Noise hazards

Depending on operating conditions, high noise levels up to approx. 110 dB can occur on the air handling unit, e.g. when the unit is open.

Vibration hazards

Particularly during the operation of speed-controlled drives, it must be ensured that the system is not operated in the resonance range to prevent damage to the unit and the building structure.

Hazards from materials and working materials

Caution: The mineral fibre or hard foam insulation material may not be released or incorporated.

In the event of a fire, toxic vapours, smoke and fire gases (combustible materials) may occur should not be inhaled.

Where air handling units include direct expansion heating and/or cooling, the provisions made in the FGAS Regulation (EU) 2024/573 must be followed.

Heat exchangers may contain glycol, which must not be allowed to escape. This can lead to environmental hazards.

When cleaning the units, it must be ensured that no harmful substances (e.g. bacteria) from filters and components are inhaled in concentrated form, as they may contain allergens and bacteria.

Depending on the air supplied, substances that are radioactive or contaminated by other pollutants or can constitute a fire risk can also accumulate in the units and their components.

The condensate on heat exchangers may be contaminated.

ATTENTION: Fire and explosion hazard.

NOTE: Filters must only be changed with suitable protective equipment (PPE such as FFP2-Mask, gloves, if necessary additional protective clothing).

1.2.3 Maintenance and cleaning instructions

Maintenance intervals

The specified maintenance intervals refer to normally soiled air. For particularly soiled air the maintenance intervals must be shortened accordingly.

ATTENTION: When using disinfectants, use only those that are considered to be non-hazardous to health and that do not have a corrosive effect.

Cleaning and maintenance

Coarse fouling is removed dry with an industrial vacuum cleaner.

For other fouling: remove with damp cloth, if necessary with grease or oil-releasing cleaning agents.

Treat galvanised parts with corrosion inhibitor.

Treat all moving parts, such as door levers, hinges, from time to time with lubricating spray.

Treat seals, in particular door seals, from time to time (e.g. with talc).

1.2.4 Decommissioning, dismantling and disposal

1.2.4.1 Decommissioning

After use, the unit must be decommissioned. The following must be observed:

Stop the power supply (power lines and all media).

Water and all operating materials (brines, refrigerants, oils) must be removed.

Filter media must be removed and disposed of in accordance with the applicable regulations.

The unit must be protected against unauthorised access.

NOTE: The units may contain environmentally harmful substances (consumables such as water, oils, refrigerants, etc.)

NOTE: The relevant safety and hazard information also apply to the disassembly and dismantling of the units and components.

For the individual components, see chapter 3 for decommissioning instructions.

1.2.4.2 Dismantling the unit and disposal

The disassembly of the units is carried out in accordance with Chapter 2 (Assembly and connection of components). For the individual components, you will find special disposal instructions in Chapter 3.

Before disassembly, all energy lines (electricity and all media) shall be switched off and disconnected.
No line may be under pressure, hot or live.
Check that all operating materials have been removed from the system, i.e. no water, no oils or refrigerant in the system.

The system can be dismantled both destructively or non-destructively. The disposal of the materials must take place according to the regulations applicable at that time.

NOTE: During disassembly, the materials must be separated and recycled if possible.

ATTENTION: During disassembly, substances harmful to health can be released, particularly as a result of destructive dismantling, or a fire or explosion hazard may arise.

1.3 Equipment testings / quality marks / property rights

CE conformity	Conformity test on models according to EC Machinery Directive (98/37/EC) and (2006/42/EC), EC Directive on Electromagnetic Compatibility (2014/30/EU) and EC Pressure Equipment Directive (2014/68/EU)	TÜV SÜD Industrie Service 2006 and 2008
	Measurement of magn. induction on models for medically used areas according to VDE 0100-710 and VDE 0848 8	EMC Laboratory University of Applied Sciences Saarbrücken Prof. Langguth 2004
EX protection	Conformity type inspection according to ATEX 2014/34/EU	TÜV SÜD Product Service 04/2004, 09/2013, Bureau Veritas 10/2016
System HPWRG	Performance measurement according to SWKI Directive 89-1 and EN 308	Technikum Luzern, HTL 10/1997, 04/1998, RWTÜV 1998, TÜV SÜD 2011 / 2018
System HYDROplus	Performance data RWTÜV-tested	RWTÜV 1998
Fan (F)	Characteristic curve and power consumption test system KZG / system ETA®	RWTÜV 1992 / 1998
Heat exchanger (HE) type ETA®	Type-examination performance and head losses according to DIN/ EN 305	RWTÜV 1993 / 1998 / 2001
Droplet separator (DS)	Necessity-examinations – droplet entrainment	RWTÜV 1992 / 2004
Control air and shut-off flaps	Air tightness test according to DIN / EN 1751 and DIN 1946, part 4	RWTÜV 1990 / 1997 / 2004
Casing tests according to DIN EN 1886	– Air tightness test – Acoustic testing – Testing of the droplet entrainment factors – Testing of thermal insulation (U) – Testing of mechanical stability - Filter by-pass leakage test	RWTÜV 1994 and 2000 TÜV SÜD Industrie Service 2000 and 2004
Standards and Guidelines for conformity assessment	Type-examination according to DIN 1946, Part 4, VDI 6022, VDI 3803, DIN EN 1886, DIN EN 13779, DIN EN 13053	ILH, Institut für Lufthygiene Berlin 1999, 2002 Dekra Industrial GmbH 05/2012

Please do not hesitate to contact us at any time if you have any detailed questions about the equipment testings. Please call: +49 6782 9999 - 0.

1.4 Warranty

General information
Manufacturing defects or damage must be reported in writing without delay.

In the event that subcontractors or third-party companies are commissioned to repair faults and damage without the consent of Swegon, settlement and liability are excluded. The same applies to notifications of defects which are due to non-compliance with the operating and maintenance instructions.

The warranty is contingent upon the units being continuously serviced and professionally maintained in accordance with the operating and maintenance instructions

Control and monitoring books must be created for this purpose.

These operating and maintenance instructions should provide help and support for the technical personnel.

NOTE: The operating limits of the supplied air must be observed. / see 1.2 /

1.5 Delivery inspection

After the individual functional parts arrive at the construction site, an immediate check for possible transport damage must be undertaken (transfer of risk upon delivery to the construction site = unloaded truck). In the event of damage, the responsible transport companies and Swegon are immediately notified within the following deadlines:
Visible damage: immediately
Concealed damage: within one week (7 days)

The supplied units are subjected to a thorough final cleaning at the manufacturer's plant. Unavoidable residue swarf must be removed (risk of corrosion).

Likewise, all parts must be checked for completeness immediately upon delivery in accordance with the shipping documents and parts lists.

In the case of missing parts, the report must be made to Swegon.

NOTE: Complaints about visible damage or missing parts must be noted on the waybill. Liability for non-compliance is waived.

1.6 Customer service

SWEGON Service and Customer support is available to help you.

When ordering spare parts such as filters, seals, motors, bearings, etc., please provide the order and position numbers of the unit. You can find them on the name plate or on the device card.

1.7 Construction site transport

1.7.1 General transport instructions

The units are delivered in a closed truck. Only suitable and approved lifting equipment may be used for unloading and transport. Units may not be tipped on their side for transport.

Please do not climb on the units. However, if it is unavoidable, then protect the surfaces and frames accordingly from damage using scaffolding and supports.

During transport or interim storage, it must be ensured that the surfaces are weather-protected, dry and remain clean and protected from external influences. Protective films must be removed immediately after unloading.

If the units need to be protected on site then use a method that allows air circulation to prevent condensation.

NOTE: The updated and project-specific specifications of the Transport and Assembly Quick Guide must be observed.

NOTE: Lifting brackets are supplied in sufficient quantities and must be attached on-site to the base frame if necessary.

NOTE: The holes on the base frame must be closed on site using the screws supplied (avoiding sharp edges, if necessary).

1.7.2 Units without base frame

We supply the unit modules (e.g. for indoor installation) with transport timber that can be stored.

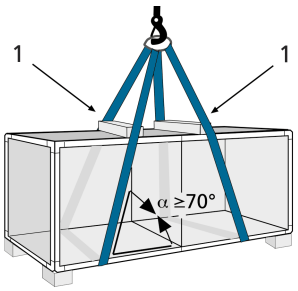
Please note the following information regarding transport on construction sites using pallet trucks/forklifts/carrying straps:

A smooth forklift transport must be ensured.

The forklift or lift truck support arms must also be connected to their end under the corner profile and may not be under the unprotected bottom of the unit. / see Fig. next page /

The lifting point must be directly above the center of gravity to prevent tipping.

The carrying straps must be kept apart with crossbars (1) when carrying loads exceeding 200 kg. Additional edge protection is required.



Construction site transport with crane for unit modules without base frame

1.7.3 Units with base frame

Notes on the transport of units to the construction site on base frames (e.g. outdoor installation) with removable crane hooks:

Unit modules weighing < 1,600 kg can be connected to the consoles (3) of the base frames. / see 2.1.3 /

Please note! The connecting consoles on the base frames are suitable as attachment points for loads of up to max. 400 kg.

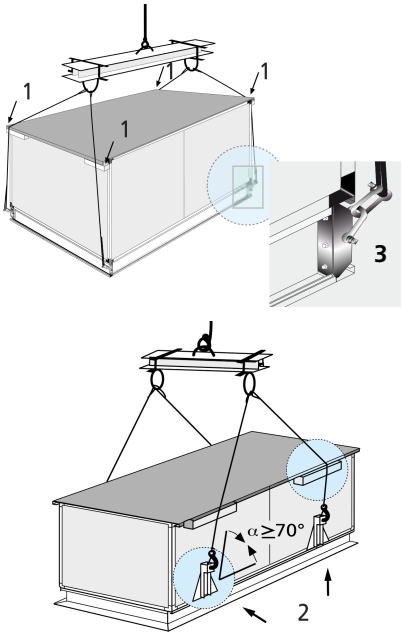
Unit modules weighing more than 1,600 kg may only be lifted on the appropriate base frame and on the supplied lifting brackets (2).

The lifting point must be directly above the center of gravity to prevent tipping.

The unit modules must be secured against tipping in all directions.

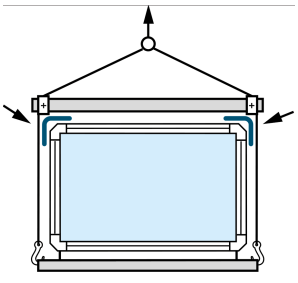
The crane must move smoothly and carefull to prevent swaying and potential damage.

When transporting by forklift ensure that the forks pass through to the other side of the unit to prevent damage to the floor panel of the unit.

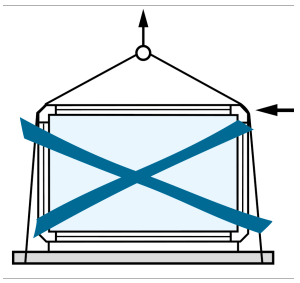


Construction site transport with crane for unit modules with base frame

NOTE: If no cross bars and no edge protection are used, this will damage the casing and panels.

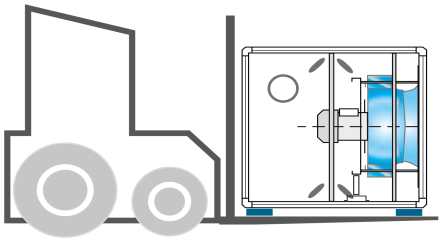


Correct crane with edge protection



Never lift the unit without edge protection!

NOTE: the forks pass through to the other side of the unit to prevent damage to the floor panel of the unit.



Transport by forklift

1.8 Setup of GRAND air handling units

1.8.1 Foundations

General
The units must be protected from construction dust and dirt as well as from damage before startup. For assembly and maintenance, a clearance of at least 600 mm must be provided on the back of the unit.

Please note that the design of the foundations must meet the on-site requirements for acoustics and proper water discharge from droplet separators and spray humidifiers (observe trap height!).

A smooth, horizontal foundation made of concrete or a flat steel substructure is a prerequisite for a proper assembly of the individual unit components. The maximum deflection may not exceed 1 mm per 1 m of edge length.

The casing sections must be correctly aligned and square to ensure correct function of the doors and seals. This applies even if the unit is mounted on vibration isolators.

When determining the height of the foundation, the required siphon height must be taken into account. / see 2.5.2 /

NOTE: The updated and project-specific specifications of the construction site Transport and Assembly Quick Guide must be taken into account.

NOTE: GRAND air handling units shall not form part of the building structure or be relied apon for the weather proofing of the building. The warrantee becomes void on any abuse of this rule.

NOTE: The units must stand level.

1.8.2 Structure-borne noise isolation

We recommend PU rubber strips placed between the unit baseframe and foundation to reduce structure borne noise and vibration. / see 2.1.4 and 2.1.5 /

1.8.3 Bonding, earthing and lightning protection

The GRAND air handling unit may only be put into operation when the unit and all electrical equipment have been correctly connected to the bonding rail of the building. / see 2.9 and 2.1.3 /

Before commissioning, a protective conductor test must be carried out in accordance with EN 60204-1.

Particularly in the case of EX rated GRAND air handling units in an explosive atmosphere, all metallic surfaces must be connected with the protective conductor system.

Professional lightning protection must be installed in accordance with local regulations.

NOTE: The equipotential bonding of separately supplied equipment (e.g. frequency converters) must be carried out professionally on-site in accordance with the manufacturer's instructions.

NOTE: Before commissioning, check grounding, bonding and protective conductor system for proper function and carry out measurement according to EN 60204-1.

1.8.3.1 Lightning protection for GRAND air handling units for outdoor installation (Exterior lightning protection - capture equipment, discharge and earthing)

GRAND air handling units for outdoor installation must be equipped with a professional lightning protection system and all metal parts of the construction (ladders, platforms, etc.) must be connected to the earthing conductors in accordance with local regulations.

However, GRAND air handling units can be considered continuous metal structures and may consequently be treated as their own lightning protection system.

Since the use of metallic fixtures with internal components (channels, pipes, etc.) for the discharge of lightning currents is not permitted, the metal fixtures in the roof area must be arranged within the protection area of interception devices (interception cables, interception rods) to prevent direct strikes.

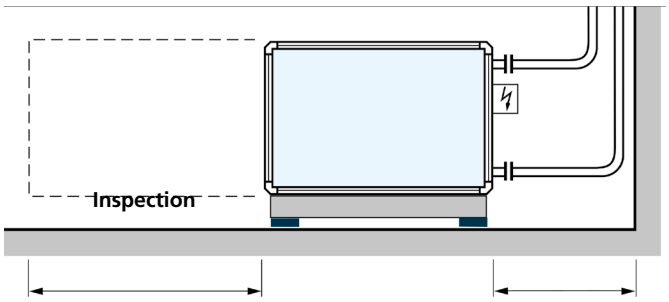
To prevent flashovers and sparking between the metal fixtures and the lightning protection system's interception device, the fixtures must be included in the lightning protection equipotential bonding in accordance with local regulations.

1.8.3.2 Lightning protection for GRAND air handling units for indoor installation (inner lightning protection - lightning protection equipotential bonding)

In the case of GRAND air handling units for indoor installation, all electrically conductive parts should be equipped with a professional earthing measure (bonding) so that lightning currents are discharged and do not lead to the ignition source (for EX units).

1.8.4 Minimum spacing

To remove the coils and disassembly of the fan, leave at least one unit width free as an operating and inspection area on the inspection side(s).



NOTE: If possible, separate the connection side and the inspection side.

Unit widhth **600 mm**

The piping of the coils then does not hinder either the inspection opening or the removal of the coil.

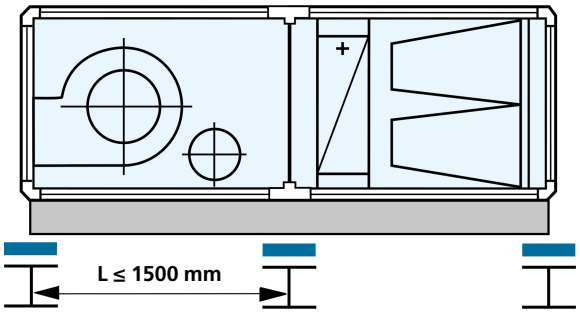
1.8.5 Foundation design for indoor installation

The installation of the units must either take place:
on a rigid full-area foundation or
on a substructure made of strip foundation or steel beams.

In general, sufficient support must be ensured, especially for units without a base frame.

In this case, support points must be maintained at least under each unit separation and under each cross-member of the base frame at a distance of max. 1500 mm in length and width, and the max. floor load of 100 kg/m² must be observed. The deflection may not exceed 1 mm per 1 metre unit length.

ATTENTION: Do not exceed the max. floor load of 100 kg/m²!



2. Assembly and connection of components

2.1 Individual assembly of the various components

2.1.1 General

Please read parts 1 and 2 before starting the assembly work.

2.1.2 Delivery form of the unit

GRAND units may be delivered in different ways:

Individual modules

Complete units on a common base.

Flat-packed GRAND air handling unit = Individual parts completely disassembled and not pre-assembled.

The base frame can be delivered fixed to the unit modules or separatly.

We deliver the assembly material separately packaged within a unit chamber. Follow the appropriate note on the unit chamber door.

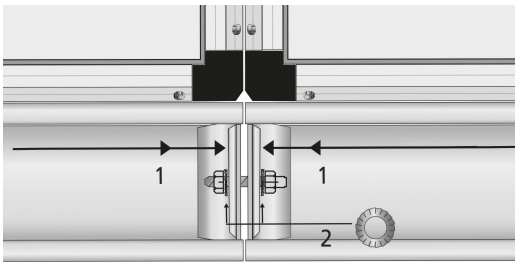
2.1.3 Assembly of the individual modules with different profile designs

Before the individual modules are connected to each other, the supplied self-adhesive seals are glued all the way around the profile frames / see variants shown below /. For this purpose the components are pushed together and aligned so that the flange holes match.

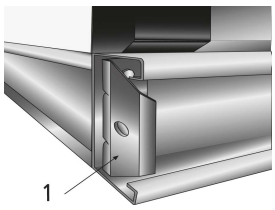
Then insert the bolts through the bolt holes provided and tighten the nuts until the airtight seal is achieved. In the floor area and in variant 2, cover plates must be mounted around the chamber coupling and seal with sealing compound.

After positioning the individual unit modules, they must be aligned flush and parallel to each other. For units with base frames, the connecting consoles (1) attached to the ends of the base frame can be used for support.

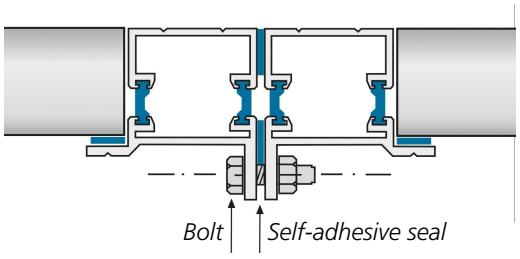
To establish a low-ohm connection between the individual modules, use the screws supplied and the contact washers (2) on both sides of the connecting consoles (1).



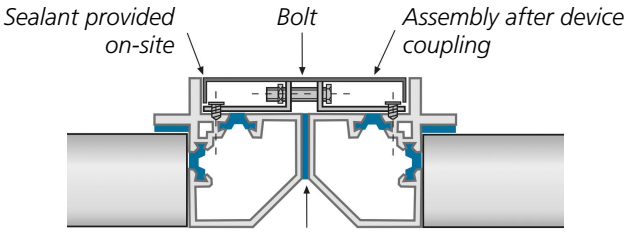
Join connecting consoles using nuts and bolts with contact washers



Connecting console



Connection of device blocks (variant 1)



Connection of blocks (variant 2)

2.1.3.1 Assembly of the individual modules with different profile designs

Depending on the design of the joint, a cover plate may be fitted. (4)

Attach the self-adhesive sealing tape (1) all the way around the casing module interface on one side.

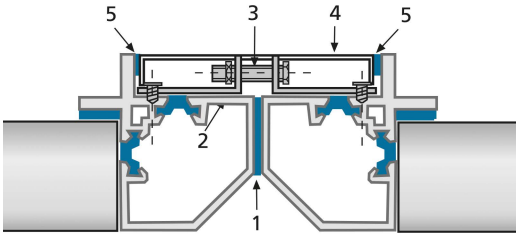
Set up the individual casing modules in the specified order

Align with the suitable flange holes (2)

Tighten the bolts (3) evenly for airtight closure

Insert the separately supplied cover plates (4) and seal them all around (5) with sealing compound

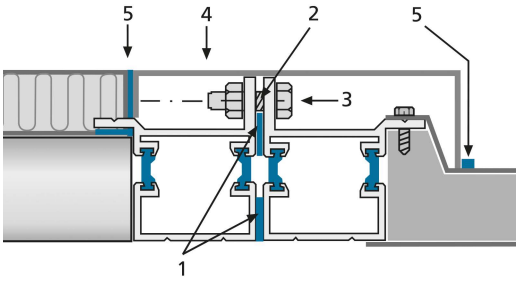
For piggyback units , fit at least two angle plates to each side of each casing module.



Profile I

A cover plate is required in the floor area when connecting condensate drip trays as well as hygienic casing modules.

For hygienic modules, cover plates all around the side walls and in the roof area are also necessary.



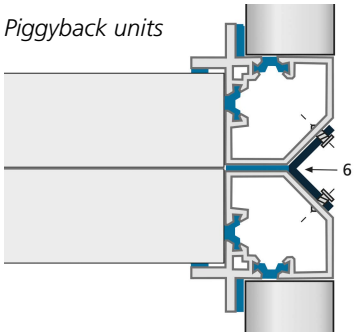
Profile II

A cover plate is required in the floor area when connecting condensate drip trays as well as hygienic units.

For hygienic units, cover plates all around the side walls and in the roof area are not necessary.

NOTE: When pulling the individual modules together using the bolts, provide support from the outside if necessary, as otherwise the frame profile may become deformed!

Piggyback units



2.1.3.2 Assembly of the individual modules in flat-pack design

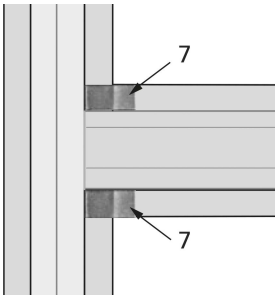
In order to avoid leakages, aluminium adhesive strips must be attached to all joints of the profiles.

The seams on the plastic corners are affixed in an overlapping manner with two aluminium corners rotated by 90°.

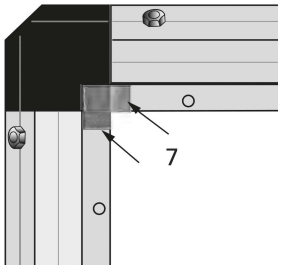
Then insert the side panels with the seal facing the inside of the unit into the casing and secure them.

NOTE: In the case of dismantled or partially dismantled, as well as "dry" pre-assembled units, it must be ensured that they are carefully sealed on site. The final tightness is not subject to the warranty obligation of the equipment supplier.

NOTE: Handle the panels with care, ensuring that the foam seal is not damaged.



Application of an aluminium adhesive strip (7) on a profile connection



Application of two aluminium adhesive strips (7) on a plastic corner

2.1.3.3 Weatherproof sealing of the individual modules for outdoor units

The components are assembled as follows:

Example: Design of roof foil with corner profile

Carefully clean the roof surfaces

Lay vibration-absorbing PU rubber strips taking into account the surface load

The joint strip (9) (100 mm wide) is to be warmed all around with hot air (420 - 470°C) and tightly welded

Press with heavy-duty roller

Allow to cool

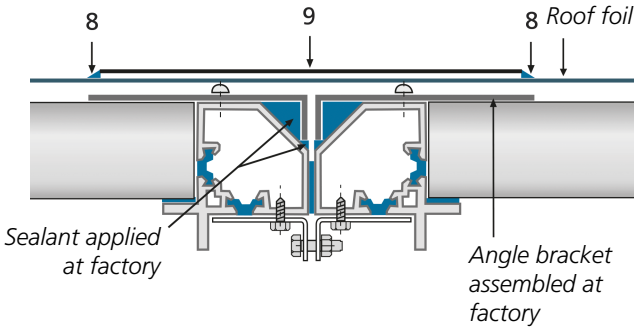
Seal with sealing compound (8)

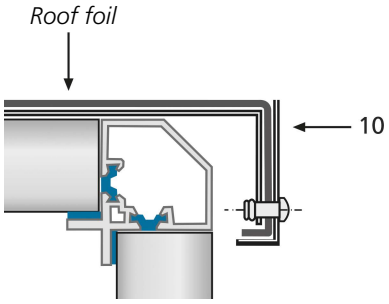
Attach edge protector (10) to the joints

NOTE: The individual modules should be sealed immediately after delivery.

NOTE: Ambient temperature should be 10-30°C. If necessary, the processing surfaces are to be pre-heated and the contact surfaces of the roof cladding roughened before welding.

ATTENTION: Fire hazard.





Example: Metal roof design with dome profile

Connect the unit roof sections with bolts (11) at the coupling points

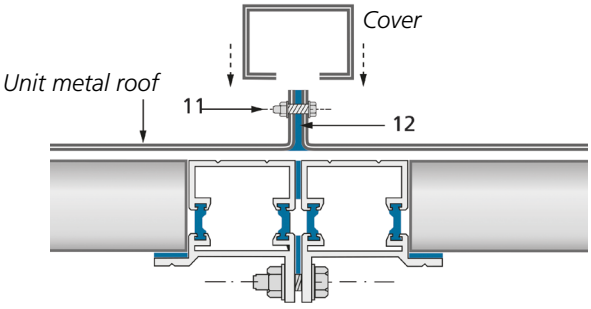
Seal the inspection and rear sides with sealing compound (12)

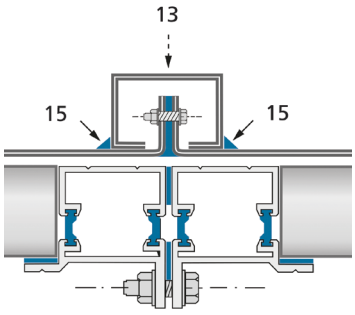
Install metal cover over the connection point (13)

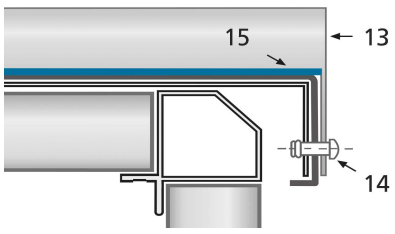
Rivet connecting tabs on the operating and rear side with the unit roof (14)

Seal on both sides with sealing compound (15)

NOTE: The sealing of the individual modules should be carried out immediately after delivery.







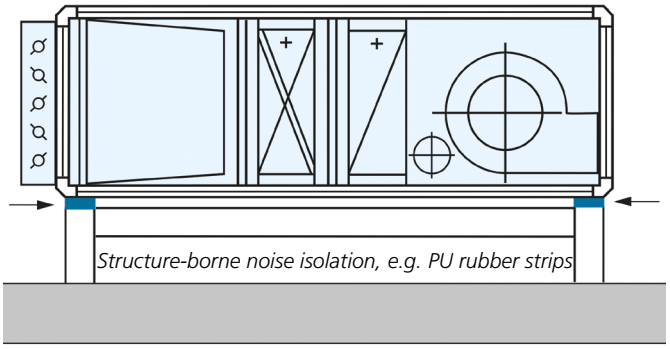
2.1.4 Assembly on foundation for indoor installation

Observe the following sketch during assembly:

NOTE: For units with hygienic design:
In order to ensure a residue-free cleaning by wiping, all grooves and depressions in the floor area, in particular the unit separation points, must be sealed after assembly with permanently elastic sealant.

NOTE: The load on the structure-borne noise elements must be uniform. Uneven loads lead to increased vibrations and deformation of the units.

NOTE: Remove any protective film.



2.1.5 Assembly on foundation for outdoor installation and mounting on roof frame for outdoor air handling units

In the case of outdoor installation, the units must fixed to the foundation.

The roof frame is sealed as described / see 2.1.3.3 /.

Floor drains must be connected on site (observe trap height!).

For roof units made of several casing parts, the individual modules are assembled like the indoor units.

NOTE: To prevent static discharge, ensure the unit's main frame is properly grounded through direct contact with the roof, mounting frame, or foundation. / see also 1.7.5 /

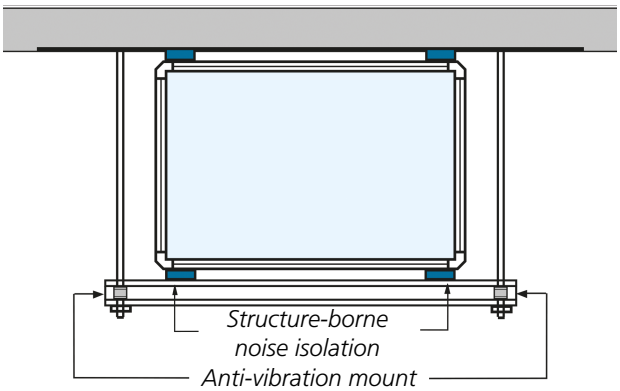
NOTE: For outdoor installation, it is recommended to firmly connect the units to the building structure, because in the event of gusts of wind, the unit can move!

NOTE: For installation at higher altitudes or in areas with heavy winds, the need for additional static measures must be checked by the customer and implemented if necessary (e.g. storm protection).

2.1.6 Ceiling assembly

Observe the diagram to the right during assembly:

Ceiling assembly with vibration and structure-borne noise isolation.



2.1.7 Floor load

The floor load must not exceed 100 kg/m^2.

2.2 Assembly duct connection

The following must be observed during assembly:

1. If flexible connections are used ensure that they are not stretched so that vibration is not transmitted.

2. The ducts must be supported separtly so that the duct connection is not put under load stress.

3. Increased tensile stress can cause a tear out of the guide groove.

4. To avoid condesation water in the area of the duct connections , components attached to the GRAND air handling unit, such as connecting pieces, flaps, etc., must be insulated accordingly on-site.

Support system
Frame for MPS connector SB 30, duct connection via four-hole screw connection, temperature-resistant from -30°C to +80°C.

NOTE: Connection must be stress-free.

NOTE: To prevent inadmissible stress, we recommend measuring the last piece of duct before assembly.

NOTE: During assembly of the ventilation ducts on the unit connections, ensure a properly executed equipotential bonding system to the GRAND air handling unit. / see 2.9 /

NOTE: The areas near duct connections must be insulated on-site.

2.2.1 Risk of condensation on casing components

Depending on the air conditions in the unit or outside the unit, the temperature may fall below the dew point on the surface of the central air conditioning unit. Then condensation on the casing is to be expected. When this will happen cannot be stated in general terms. A calculation based on the air conditions is necessary for this.

The thermal performance of the casing is given in accordance with EN 1886 in the table below.

KZG 40	kb = 0.51	TB3	U = 1.11 W/m2 K T3
KZG 40 T	kb = 0.61	TB2	U = 0.80 W/m2 K T2

The kb value can be used to reliably determine the surface temperature from which condensation is formed on the casing if necessary.

NOTE: The values according to EN 1886 were determined on models and may vary depending on the size of the unit in operation.

Calculation example:

Outdoor air intake chamber with -15°C outdoor air temperature (temperature in the intake chamber) and 25°C ambient with 30% rel. humidity.

The surface temperature is now calculated as follows:

tw = ti + kb x (ta - ti)

so at KZG 40 (k = 0.37):	(kb = 0,51)	bei KZG 40 T (kb = 0,61) ergibt sich:
tw = -15 + 0,37 x [25 - (-15)]	tw = -15 + 0,51 x [25 - (-15)]	tw = -15 + 0,61 x [25 - (-15)]
tw = - 0,2 °C	tw = 5,4 °C	tw = 9,4 °C

At 25°C ambient temperature and 30% rel. humidity results in a dew point of approx. 6°C.

In the GRAND TB3 series condensation would occur at -0.2°C (or 5.4°C), as the temperature would fall below the dew point. In the GRAND TB2 version with a wall temperature of 9.4°C, condensation would thus be excluded.

NOTE: In the event of system downtime, suitable measures must be taken to prevent condensation.

2.3 Assembly piping

Note during assembly that the connection must also be stress-free and decoupled.

The on-site pipe connections must be designed in such a way that no vibrations are transmitted from the unit to the pipe system or vice versa. The connection to the heat exchanger itself must also be stress-free.

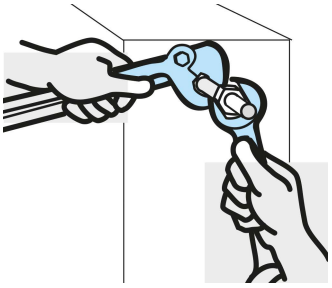
The pipe installation in terms of its routing, connection and valves should be arranged in such a way that the pipes can be removed for repairs or servicing without major dismantling work.

To ensure proper bleeding and draining, suitable valves must be provided in the immediate vicinity of the supply and return connections, which can also be used for measurement purposes.

We recommend additional R 1/2" connection sleeves for inserting immersion sleeves. Pipe sections are useful for inserting measuring orifices at suitable locations. When attaching the flanges (union nuts), use pliers to hold them in place.

NOTE: The piping must be designed in such a way that the heat exchangers can be easily removed and that unrestricted access to all maintenance and operating doors of the GRAND air handling unit.

NOTE: Factory-fitted screw connections and flange connections must be checked for leaks during assembly of the on-site piping and, if necessary, retightened or resealed.



2.4 Assembly heat transfer sections

The following must be observed during assembly:

Connect the heat exchanger so that it can be easily removed.

After filling with fluid, the heat exchanger must be bled of all air.

NOTE: Risk of overheating when fan is stopped. For overheating protection / see Commissioning heat exchangers 3.3 /

Connection diagram heat exchanger

The connection must be made according to the counter-flow principle (water flow direction in the heat exchanger opposite the air flow).

Water supply should be installed at the bottom, return at the top (for better bleeding). This applies to both horizontal and vertical air direction.

The heat transfer connecting pieces are mounted at the highest or lowest point of the coil.

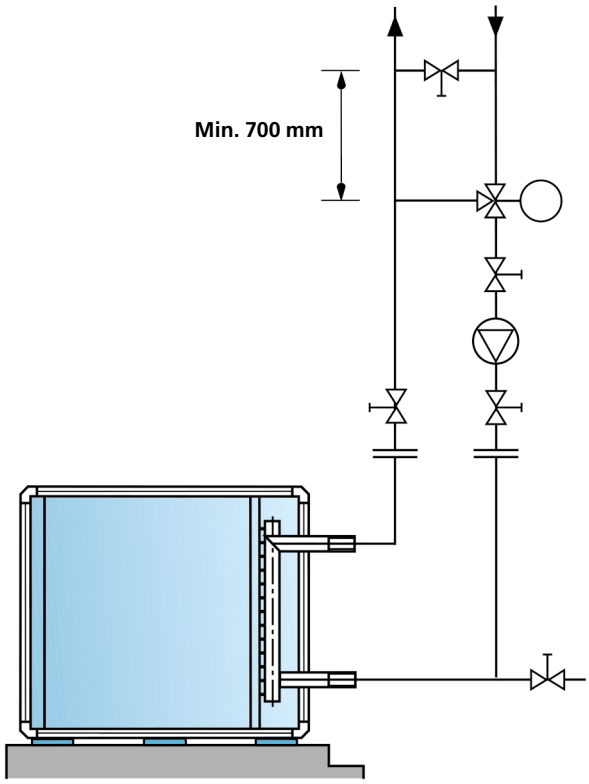
This enables draining and venting via the pipelines.

Venting and draining valves must be installed in the pipelines.

When connecting the heat exchangers, the coil connections must be held against with a pipe wrench in order to avoid damage.

The coil connections are threaded and flanges can be supplied on request.

NOTE: Risk of freezing the medium when the system is stationary.

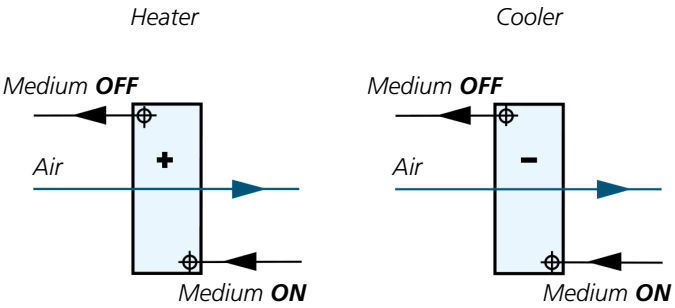


Example, connection of heat exchanger

2.5 Assembly cooler / heater

Connect all heat exchangers in counter-flow as shown in the diagrams to the right to ensure the correct heating or cooling power. The power is only guaranteed when the water is correctly connected.

NOTE: A droplet separator may be installed after cooling coils if the air velocity is high.



Heater connection *Cooler connection*

2.5.1 Connection of condensate trays

Make sure that the external connection pipes are connected with a siphon. The standing height of the respective siphons must be in accordance with the negative pressure or overpressure of the air in the unit, to prevent air leakage throught the drin connection. The diameter of the condensate connection is 28 mm.

NOTE: A ball siphon is recommended.

2.5.2 Functional representation of the siphons in the event of negative or positive pressure in the central air handling unit.

Calculation example:
for P = 1,000 Pa a = 20 mm

	Negative pressure	Overpressure
H 1	130 mm	30 mm
H 2	80 mm	130 mm
F	247 mm	197 mm

Negative pressure siphon

	minimum	maximum
H 1	AP + S	any, provided H 2 min. is observed
H 2	AP+ S 2	any, provided H 1 min. is observed
S	30 mm	
d	28 mm	
a	20 mm	
F	1.5 AP + 25 + d - a + 2S	

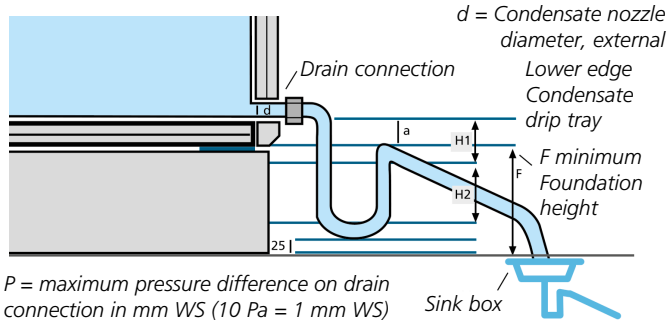
AP = Unit pressure in mm RS (always use positively)
S = Safety height

Overpressure trap

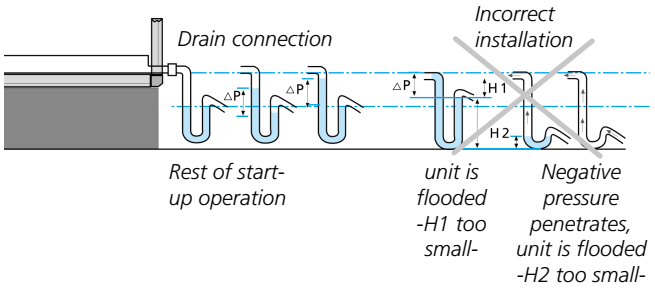
	minimum	maximum
H 1	S	any, provided H 2 min. is observed
H 2	S + AP	any, provided H 1 min. is observed
S	30 mm	
d	28 mm	
a	20 mm	
F	AP + 25 + d - a + 2S	

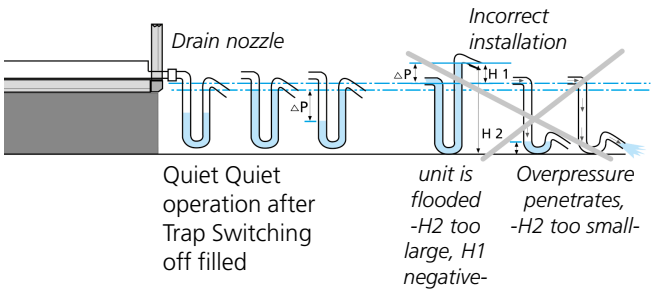
AP = Unit pressure in mm RS (always use positively)
S = Safety height

NOTE: Factory fittings or flange connections must be resealed after assembly of the pipe network, if necessary.

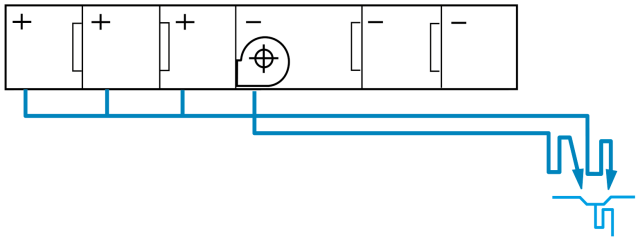


Negative pressure siphon

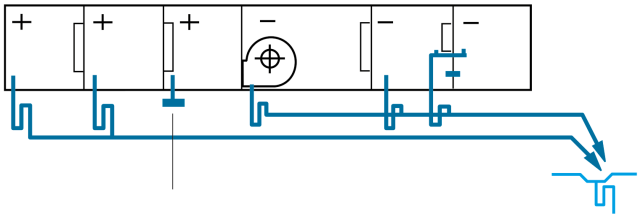




Incorrect installation
Transfer of water between chambers of different pressures possible



Correct installation
Summary of several processes in collection lines to the sink box



2.6 Assembly of run-around coil systems

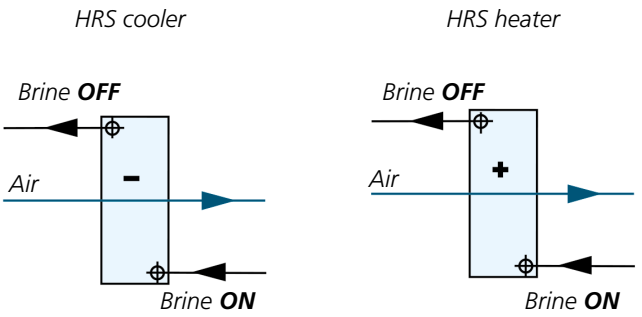
The heat recovery is regulated by means of a bypass on the liquid side.

ATTENTION:
After filling the system, set the pre-pressure on the expansion vessel according to the design data sheet.

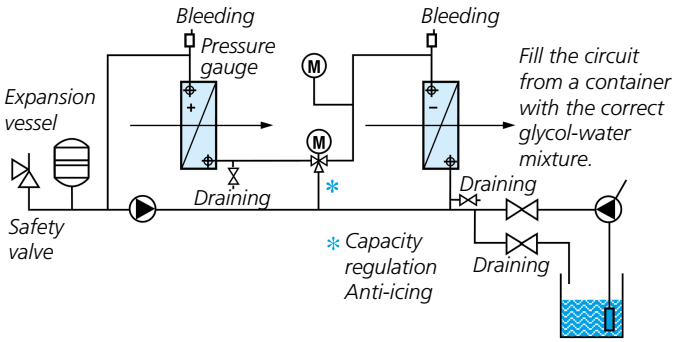
ATTENTION:
The on-site piping must be flushed through carefully before connecting the heat recovery components.

NOTE: Must connect in the counter-flow. This is the only way to ensure the calculated transmission.

NOTE: The maximum media temperature in the intermediate circuit must not exceed 50°.



Run-around coil connection



Recuperative heat recovery (brine circuit)

2.6.1 HPWRG
Description of the control characteristics of heat recovery (run-around system)

2.6.1.1 Efficiency optimisation

The efficiency of the heat recovery system with balanced airflow and without condensation is at a maximum when the thermal capacity rates (W) of the air and fluid are equal.

W = mass flow x coefficient of heat capacity

ATTENTION: Optimum is $W_{air} = W_{liquid} = 1$

Control characteristics (quantity control recommended):

The air mass flows of the exhaust air and the supply air are measured using the differential pressure measurement at the inlet nozzles of the fans to get the airflow rate.

The airflow rate is converted to mass flow rate using the density of the air which is determined from the temperature at the point where the airflow is measured.

The brine mass flow is obtained from the flow meter installed in the intermediate circuit.

The optimum heat recovery is reached when the two thermal capacity rates (air side / brine side) are equal.

The brine capacity rate is thus adjusted in the first sequence to the mean of the air capacity rate.

ATTENTION:
Run around systems normally need to be filled with a glycol and water mixture to prevent freezing. The glycol content depends on the outdoor design temperature. Check the actual selection for the unit for details. Note that an incorrect glycol content will affect the performance. R. 25 Vol.% Ethylene glycol (Glykol N). Observe the design data.

2.6.1.2 Anti-icing

In order to avoid freezing of the condensate on the exhaust air heat exchanger at low temperatures, it is necessary to reduce the recovered power to raise the temperature.

For this purpose, the three-way valve RV1 is gradually opened.

ATTENTION: Risk of freezing!

2.6.1.3 Freeze protection

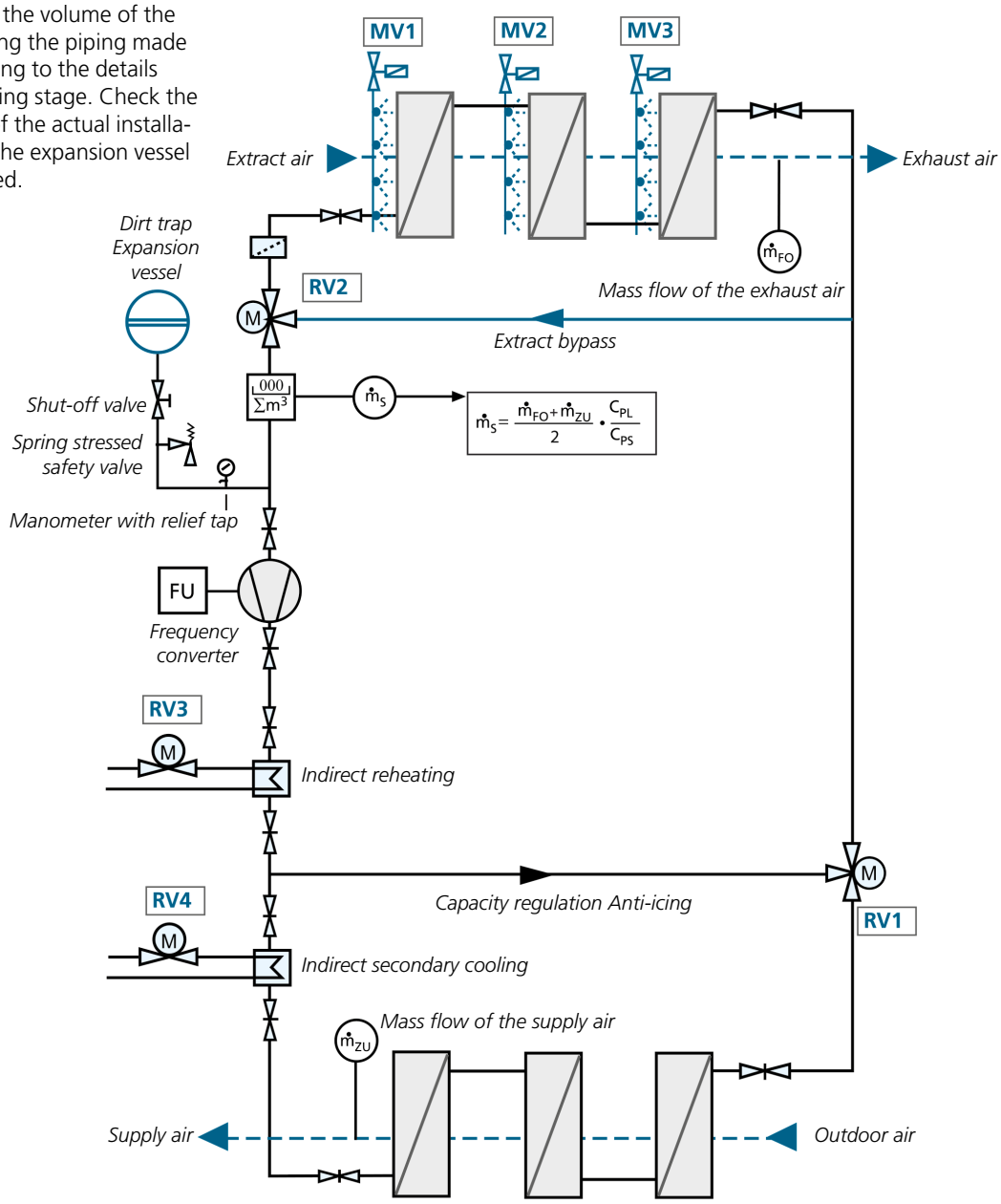
The freeze protection function is ensured by a freeze protection sensor and depends on the glycol content of the medium.

Function:

- Supply air off, outdoor air damper closed
- Do not turn pump off
- Exhaust air on reduced air flow to supply the system with heat to prevent freezing.

ATTENTION: Freeze protection must be ensured.

Note: The expansion vessel has been sized for the volume of the system including the piping made on site according to the details given at planning stage. Check the total volume of the actual installation and that the expansion vessel is correctly sized.



2.6.1.4 Capacity adjustment

During spring and autumn when full heat recovery is not needed the system is regulated using three way valve RV1 or RV2. Further details are provided separately for each project.

ATTENTION: Additional energies possible from efficiency or heat recovery factor > 70%!

2.6.2 Additional heating or cooling energy

The media flow (brine) of the heat recovery system can be used to supply or heating or cooling.

This can be done indirectly via water/brine heat exchangers (plate heat exchangers) or by direct feed of the required medium.

NOTE: Brine temperatures above 50°C are not permitted.

2.6.2.1 Indirect reheating

Heat from an external source is fed directly into the heat recovery system by means of a plate heat exchanger giving the advantage that no separate reheater is needed in the AHU. The external heat is regulated by valve RV3. Brine temperature must not exceed 50°C.

2.6.2.2 Adiabatic evaporative cooling system HYDROplus

When cooling is required the humidifier stages are controlled in sequence with varying cycle times depending on the actual system and current conditions. Settings are provided.

The performance adjustment takes place as described under / 2.6.1.4 /.

NOTE: Required pre-pressure of the humidifier nozzles = 2.5 bar in spray condition.

The individual stages of a multi-stage humidifier are switched on in sequence in the direction of airflow.

This adiabatic cooling function has priority over the heat recovery optimisation function.

ATTENTION: Adiabatic cooling must be locked out when operation is not economical.

With indirect evaporative cooling the extract air is cooled adiabatically by the evaporation of water. The cooled extract air is then used to cool the outdoor air using the heat recovery system so the outdoor air temperature must be significantly over the adiabatic saturation temperature.

2.6.2.3 Indirect secondary cooling

Cooling from an external source is fed directly into the heat recovery system by means of a plate heat exchanger giving the advantage that no separate cooler is needed in the AHU. The external cooling is regulated by valve RV 4.

2.6.2.4 Direct secondary cooling

If the liquid circulating in the refrigeration circuit is exactly the same as that in the heat recovery circuit then it can be fed directly via a three way valve.

ATTENTION: The concentration of the external brine must be equal to that in the run-around coil circuit!

2.6.2.5 Exhaust by-pass

When external cooling is used the extract side coils should be bypassed to avoid heating up the liquid with warm extract air. If, however, the outdoor air is very warm and the extract air is cool enough to cool the liquid then the bypass should be closed.

NOTE: Extraction of exhaust air necessary during uneconomic operation!

Another option is to calculate the adiabatic cooling and compare it with the outdoor air temperature. If the outdoor air temperature (e.g. 20°C) and the target value of the supply air is below (e.g. 16°C), the three-way valve´RV2 is opened so that economical cooling can be achieved by feeding in cold air without the heat recovery system "heating".

The adiabatic temperature is calculated from the humidification efficiency (approx. 90%) and the constant enthalpy of the exhaust air.

As long as the valve is open (bypass), the adiabatic humidification must be locked. The same applies to the heat supply if the heat recovery system "cools" due to the negative temperature difference.

2.7 Humidification

2.7.1 Water quality

Recommended limit values for the condition of humidifier operating water when using fresh and circulating water for contact, hybrid and spray humidifiers.

Recommended limit values for fresh water quality.

Appearance	clear, colourless,	without sediment
pH value	6.5 - 8.5	
electr. Conductivity	120 - 300	µS/cm
Total hardness	<4	°d
Chloride Cl-	<250	mg/l
Sulphate SO42-	<250	mg/l
Total microbial count	< 100	CFU/ml
Legionella spec.	< 100	CFU/100 ml
TSC (total salt content)	< 250	mg/l

Source: VDI 3803 Tables A1-A3

ATTENTION: For direct humidification systems (e.g. high-pressure humidifiers), different values apply / see Table A4 /.

ATTENTION: When installing water treatment, we recommend that you carry out a new water analysis after commissioning.

ATTENTION: When using water softening with ion exchangers there is an increased risk of contamination and salt precipitation.

See also VDI 3803 for further details.

NOTE: Risk of freezing! The humidifier must be secured against freezing.

NOTE: If water treatment is necessary, we recommend the use of reverse osmosis. In this case, ensure that the solenoid valves are made of stainless steel. The required water quality can then be adjusted by blending with fresh water.

NOTE: The humidifier operating water used must at least meet the microbiological quality requirements of the latest version of the Drinking Water Directive (EU) 2020/2184..

2.7.2 Connection diagram of contact humidifier system HYDROplus (indirect evaporation cooling)

NOTE: In the case of the design with a solenoid valve, the cycle intervals are specified by the on-site DDC control.

NOTE: In the case of execution with an additional control unit, the cycle specification is carried out via the time control supplied.

2.7.2.1 Assembly contact humidifier system HYDROplus

The following must be observed during assembly:

The contact humidifier must be connected in such a way that accessibility is guaranteed.

Connect the on-site pipe connections without voltage or vibration.

The drain pipe must be laid freely to the waste water network with a slight gradient.

For the drain lines, appropriate siphons must be provided / see 2.5.1 /.

Install the solenoid valves in accordance with the manufacturers instructions.

A drinking water filter must be installed in the water supply line to protect against contamination.

NOTE: Chemically demineralised water must not be used.

NOTE: The inspection and maintenance intervals according to VDI 6022 for humidifiers must be observed.

2.7.2.2 Measures for operational interruptions

For hygiene reasons, if the system is shut down for more than three days, the water must be completely replaced before put back into operation. This is ensured by suitable measures such as circulation lines or automatic draining (see EN 1717, Protection against polution of water).

2.7.3 Assembly spray humidifier

The spray humidifier must be assembled on a stepped foundation or frame. The spray humidifier tray must be fully supported by the foundation and shall be allowed to hang from the unit. To prevent structure-borne noise the spray humidifier must be installed with vibration isolation.

The building side piping must be connected without stressing the connections and in a way that avoids any vibration transfer.

In the case of GRP humidifiers with resin-coated connection sockets or threaded nozzles, it must be ensured that the resin-coated plastic parts are not damaged when sealing fittings. The drain and overflow fitting must be laid with a slight gradient so that it drains freely into the sewage system or drain. Set the float valves so that the water level is approx. 10 mm below the standpipe. If the circulation pump is installed separately, the suction and pressure lines may only be connected via compensators with length limitation.

The pump shall be connected to the electrical supply in accordance with local regulations.

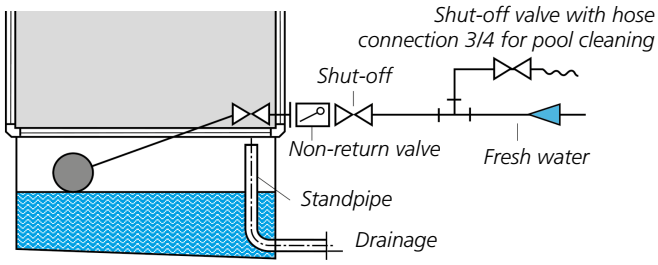
For the drain lines, appropriate traps are provided / For implementation, see 2.5.1 /. The fresh water pipe to the float valve must be equipped with a shut-off valve, non-return valve and a strainer.

A pressure reducing valve must be provided on-site if the water pressure is more than 3 bar. The spray humidifier pump must be electrically locked with the fan or a differential pressure switch so that no spray water can escape through the rectifier.

NOTE: A pre-pressure of 2.5 bar must be ensured during the spraying phase.

NOTE: Ensure that the pump is running in the correct direction.

NOTE: The humidifier unit must be locked during system downtime. Operation only when the system is running.



2.7.4 Assembly steam honeycomb humidifier

Refer to the manufacturer's instructions.

2.8 Assembly evaporator / condenser units

Condensing units and DX coils must be installed by a certified technician in accordance with Regulation (EU) 2024/573 (FGAS) and in accordance with the manufacturer's instructions.

2.9 Assembly electrical connection

The electrical connections of the parts installed in the unit, such as electric air heaters, frequency converters (FCs) and electric motors for fans and pumps, servo motors, etc. must be made according to the manufacturer's specifications and relevant electrical regulations.

The circuit diagrams of the electric air heaters, frequency converters (FCs) and electric motors are housed or installed in the terminal boxes. The equipotential bonding (earth bands) to the flexible the duct connections must be checked for proper mounting and retightened, if necessary.

In particular, for rooftop units with EX protection, a professional lightning protection according to local regulations must be installed.

NOTE: All electrical work may only be carried out by qualified personnel.

NOTE: The cross-sections of the electrical conductors must be designed in accordance with IEC 60364-5-52:2009.

NOTE: Care must be taken to lay electrical lines in the outside area in UV-resistant protective pipe.

NOTE: The equipotential bonding of separately supplied equipment (e.g. frequency converters) must be carried out professionally in accordance with the manufacturer's instructions.

NOTE: The on-site electrical installation including earthing, equipotential bonding and lightning protection must be made by certified professionsals in accordance with local regulations.

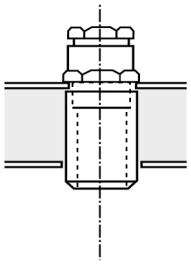
NOTE: During assembly, the GRAND air handling unit casings, the equipotential bonding between the individual modules must be ensured.

NOTE: Professional lightning protection must be ensured. / see chapters 1.8.3 /

NOTE: After complete assembly and connection of the GRAND air handling unit, the relevant electrical safety tests are to be carried out and logged by the installer in accordance with EN 60204-1.

2.9.1 Cable routing

Where cables pass through the casing or internal walls inside the unit a cable bushing shall be used. The cable bushing must provide an airtight seal and avoid thermal bridging.



2.9.2 Electrical cable routing

The thermister in the motor must be correctly connected so that the motor is shutdown in the event of overheating. The warantee does not cover damage to motors due to overheating if the thermistor is not connected.

If the three-phase motor is electrically connected to drive the fan according to the supplier's circuit diagram, it must be protected against overloading by means of a circuit breaker.

The mains voltage must correspond to the name plate.

2.9.3 Unit lighting

Light switches are usually mounted on the fan chamber. The lights are pre-wired to external junction boxes. The wiring of the light switch and the connections between the individual sections must be carried out and checked on site.

Lighting must be connected on a separate circuit.

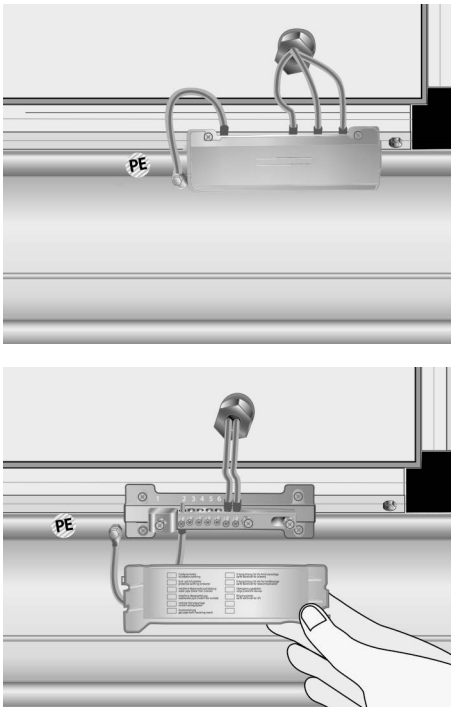
NOTE: Observe the supply voltage of the lighting fixtures used. The galvanic isolation from other electrical components must be carried out by the customer.

NOTE: The warantee does not cover over-voltage damage.

2.9.4 Bonding potential

The GRAND air handling unit casing must be connected to the local equipotential bonding system using the pre-installed connection points. To establish a conductive connection between the individual modules, the supplied bonding material is to be used.

NOTE: Hydraulic supply modules of the system HPWRG are also to be integrated using the pre-installed connection points into the local equipotential bonding.



Equipotential bonding bar

2.10 Assembly filter unit

2.10.1 Bag filter

Filter bags are normally delivered separately in their own original packaging to avoid damage.

The filter bags must be secured into the installation frame with clamps. It is important to ensure that the frame fits tightly into the mounting frame. The temperature resistance is approx. 80°C.

Where fitted in EX units the filter media must be ATEX rated.

NOTE: Do not fit damaged filters. Damaged filters can rupture during operation and the filter class is then not garanteed.

2.10.2 Extractable filter units

For extractable filter units, it must be ensured that the airtight seal between the filter frame and the unit casing is restored.

Install the bag filters in the mounting frames or guides according to the instructions supplied with the filters.

NOTE: The filters supplied are for initial installation.

Clean filters should be fitted after commissioning.

NOTE: When changing the filters in units with EX protection, use only EX rated filters, from non charge-accumulating materials or with a surface resistance below 10^9 Ohm. When assembling the individual filter bags,it is essential to ensure that the earthinglug is connected to the casing in a conductive manner.

NOTE: When replacing filters, wear suitable protective clothing. (PSA such as FFP2-Mask, gloves, additional protective clothing if necessary).

The unit shall never be operated without filters so we recommend that a spare set of filters is kept in stock.

Built-in frame with filter clamps

2.11 Assembly sound attenuator

The frame is made of galvanised, epoxy-coated or stainless steel.

Unless installed within the unit, silencers can be connected to the unit connection frame.

If the sound splitters are not installed at the factory, they are installed according to the supplied drawing.

Before the installation of the splitters, the planking of the operating side must be removed.

The individual sound splitters are attached to the shelf support frame with screws for transport, if necessary.

NOTE: The splitters consist of non-flammable absorption material according to EN 13501-1.

NOTE: Remove the transport safety device.

2.12 Assembly accessories

Valves, manometer, actuator, freeze protection sensor, etc.

Please install the accessories supplied as per the manufacturer's instructions.

NOTE: To avoid transport damage, the accessories are not installed in the factory. They are packed in with the unit (see external sticker).

We deliver the assembly material separately packaged within a unit chamber. Follow the appropriate note on the unit chamber door.

3. Description and list of individual works in commissioning and maintenance tables

General information

Ensure sufficient space for the execution of maintenance and repair work as well as for the removal of components.

The condition of both liquid and solid seals must be checked during maintenance.

In the event of damage, the seal must be repaired or replaced.

NOTE: Parameter changes deviating from the basic settings can lead to dangerous system states.

ATTENTION:
The cleaning and maintenance of EX rated units may only be carried out if it is ensured that that no explosive atmosphere can occur. If this is not possible, the occurrence of ignition sources must be avoided. In particular, EN 1127-1, Annexe A, must be observed.

ATTENTION:
For the cleaning and surface disinfection of hygiene units, we recommend the following procedure:

• Ensure that the disinfectants are suitable for use and compatible with the materials in the air handling unit.

• Care must be taken to ensure accurate dosing and exposure time according to the manufacturer's instructions.

NOTE: Regular hygiene checks must be carried out on all components as detailed below and in accordance with VDI 6022.

NOTE: Before switching on the system, a protective conductor test must be carried out.

3.1 Fan units

3.1.1 General information before commissioning the fan unit

NOTE: Excessive temperatures in the unit can lead to damage.

If the heater valve is open while the fan is stopped the air inside the unit will eventually reach the temperature of the heating water; which can lead to damage to plastic parts, bearings and electronics such as frequency inverters if the water temperature is high.

When commissioning the fan section:

Check freeze protection thermostat (air side), setting (+5°C to +8°C) and function.

Check for correct rotation direction of the fan.

Check the function of the air dampers in the event of a normal and malfunction (e.g. closing in the event of freeze protection).

Measure the current consumption of the motors.

Check overcurrent tripping for function and correctly set tripping values (name plate).

Check and record vibration speeds.

NOTE: Before commissioning, the parameterisation of the frequency converter and the function of the chiller must be checked.

3.1.2 Commissioning the fan unit system ETA

Check the fasteners on the fan, motor and carrying structure.

Check the seat of the vibration elements for slanting.

Any transport locks must be removed.

Check that the wheel mounting is tight with a torque wrench. / see 3.1.4 /

Check the electrical motor connection for voltage and circuit according to the name plate on the motor.

Electrical connection of the frequency converter in accordance with the manufacturer's operating instructions.

Check that thefan wheel is running smoothly before commissioning. The distance (gap s) and the overlap (e) must be consistently around 1% of the wheel diameter, e.g. g. 6.3 mm with an impeller diameter of 630 mm.

Any readjustment (due to transport shifts, uneven installation, etc.) is done by adjusting the nozzle, the spacer or the support.

Check power consumption after startup.

Check the direction of rotation of the fan. Check operation at operating speed/power consumption.

Logging of resonance points in the working area and under plant operating conditions.

Blocking resonance points according to Frequency Converter instructions.

ATTENTION: Use the factory setting parameterisation of the Frequency Converter only for trial operation.

Programming the Frequency Converter according to the Frequency Converter instructions and system requirements.

Measure and record the volume flow and pressure increase.

Adjust as necessary using the frequency inverter.

Secure the Frequency Converter against unauthorised access (programming lock).

Logg the frequency converter parameters.

NOTE: Do not start the motor direct-on-line. Use the soft start function of the frequency inverter to avoid overloading the bearings.

ATTENTION: Direct-on-line operation of the fan is not permitted.

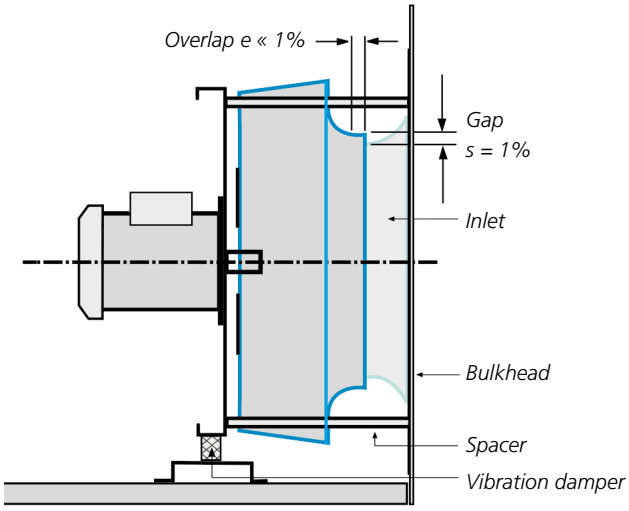
ATTENTION: Factory settings are only for test operation!

ATTENTION: Operation in the resonance range can result in mechanical damage.

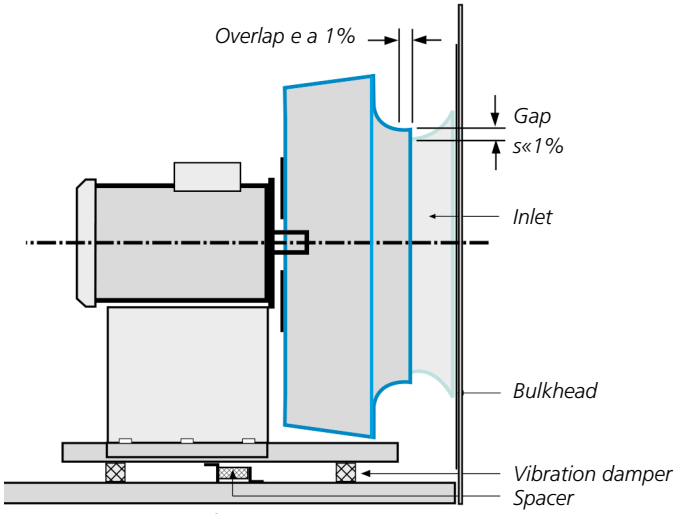
Before commissioning, check the function of the thermistor.

NOTE: All dampers in the system must be set to their normal operational state before starting fans. Running fans against closed dampers can cause damage.

ATTENTION: Observe the manufacturers operating instructions for EC Fans.



Up to fan size 315



From fan size 355

3.1.3 Maintenance fan unit system ETA

Maintenance must be carried out at 3-month intervals.

Check fans for fouling, damage, corrosion and attachment.

Check fan unit for imbalance.

Check the function of the anti-vibration mounts.

Check the function of the protective grille.

Clean.

Check electric motors for fouling, damage, corrosion, mounting and direction of rotation.

Check motor bearing for noise.

Lubricate the motor bearing (if possible).

Replace the motor bearing if damaged.

Check FCs for function according to manufacturer's specifications.

NOTE: Impeller fixing parts (e.g. collets) must be periodically checked using torque wrenches.

3.1.4 Assembly instructions tightening torques (collets)

Installation:

1. Clean and degrease all bare surfaces such as bores and cones of the collet as well as the tapered bore of the disc (or impeller). Insert collet into the hub and cover all bores (half threaded bores must be offset by half smooth bores).

2. Lightly oil the threaded pins or cylinder screws and screw them in. Do not tighten the screws yet.

3. Clean and degrease the shaft. Push the washer with collet onto the shaft to the desired position.

4. When using a key, it must first be inserted into the groove of the shaft. There must be clearance between the key and the bore groove.

5. Tighten evenly to the required torque using a screwdriver, threaded pins, or cylinder screws.

6. After a short operating time (1/2 to 1 hour), check tightening torque of the screws and correct if necessary.

7. To prevent foreign bodies from entering, fill empty holes with grease.

Expansion:

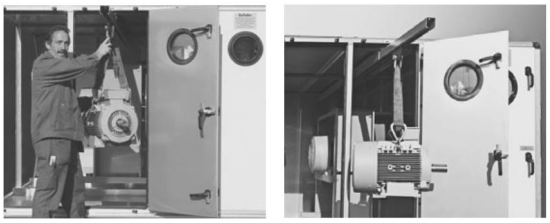
1. Loosen all screws. Depending on the socket size, unscrew one or two screws completely, oil them and screw them into the push-out holes.

2. Tighten the screw(s) evenly until the bushing comes loose from the hub and the impeller can move freely on the shaft.

3. Remove the washer with the socket from the shaft.

Bushing type	1008	1108	1210	1215	1310	1610	1615	2012	2517	3020	3030	3535	4040	4545	5050
Screw suit Torque in Nm	5.7	5.7	20	20	20	20	20	31	49	92	92	115	172	195	275

3.1.5 Motor removal aid / telpher beam



Telpher beam for motor servicing.

The telpher beam is designed as a telescopic rail. After loosening the fastener (wing nut), the rail can be pulled out of the GRAND air handling unit as far as it will go.

Before attaching a load, the telescopic rail must be secured with the wing nut.

A trolley can be freely moved in the rail. On the eyelet of the trolley, load belts and other approved load-carrying equipment can be hung.

The maximum load (see name plate of the telpher beam) must not be exceeded!

The lifting and extending of the load must be done gently. In addition, the load (e.g. motor) must not sway on the telpher beam.

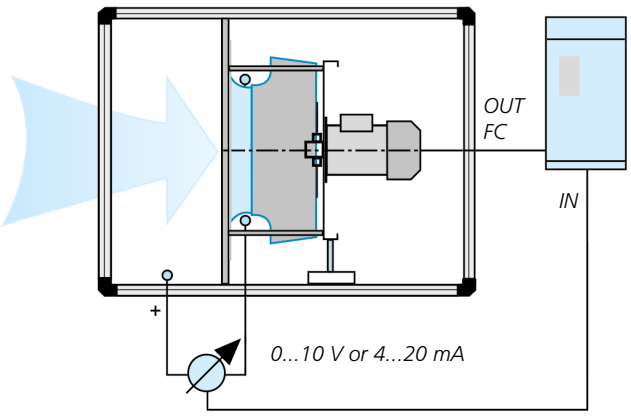
After use, loosen, push back and secure the telescopic rail so that the fan door can be closed again.

ATTENTION: The maximum permissible load of the telpher beam must never be exceeded!

NOTE: A load-free visual and functional test must be carried out before each use of the telpher beam.

ATTENTION: Lifting and extending the load must be done gently!

3.1.6 Commissioning the volume flow measuring device of the fan.



Check measuring hose connections for tight fit.

The pressure measurement holes on the fan inlet nozzle must be free of obstruction.

Check electric wiring.

Check the parameterisation of the frequency converter and the pressure transmitter according to the data sheet.

NOTE: Please ensure that the airflow measuring hoses are correctly installed without kinks and that the connections are air tight.

3.1.7 FC commissioning log and maintenance parameters

WORK ADJUSTMENT PARAMETERS

- Converter type	
- (00-02) Hz/rpm switchover	[1] Hz
- (00-20) Display line 1.1	[1602] TARGET VALUE %
- (00-21) Display line 1.2	[1614] MOTOR POWER
- (00-22) Display line 1.3	[1662] ANALOGUE INPUT 53
- (00-23) Display line 2	[1613] FREQUENZ
- (00-24) Display line 3	[1652] ACTUAL VALUE
- (01-03) Torque characteristic curve	[1] QUADRAT. TORQUE
- (14-03) Overmodulation	OFF
- (01-20) Motor power	kW
- (01-22) Motor voltage	400 V
- (01-23) Motor frequency	50 Hz
- (01-24) Motor current	A
- (01-25) Motor nominal speed	rpm
- (01-73) Catch gear	ACTIVATED
- (01-90) Thermal motor protection	[2] SWITCH OFF
- (01-93) Thermistor connection	[6] DIGITAL INPUT 33
- (03-03) Max target value	Hz
- (06-15) Terminal 53 scale. Max target value	Hz
- (03-41) Ramp Up	s
- (03-42) Ramp Down	s
- (04-12) Min frequency	Hz
- (04-14) max. Frequency	Hz
- Maximum speed	rpm mechanical

VOLUME FLOW MEASUREMENT SYSTEM

- (01-00) Controller behaviour	SPIN CONTROL
- (06-22/23) Terminal 54 scale Min/Max	0 - 10 V
- (06-25) Maximum actual value	
- (20-00) Actual value	[2] ANALOGUE INPUT 54
- (20-01) Actual value conversion	[1] SQUARE-ROOTED
- (20-12) Actual value unit	[25] m3/h
- (20-93) Proportional reinforcement	OFF
- (20-94) Integration time	OFF
- (06-50) Analogue output terminal 42	[102] Actual value ± 200% (0 - 20 mA
- (20-14) Max reference feedback	
- (06-51) min Scaling of terminal 42	50%
- (06-52) Max scaling of terminal 42	75%
- Pressure box (measurement range)	Pa

PROCESS AND TEST

- (04-61/04-63) Frequency hiding	Hz
- (04-64) Frequency blanking width	Hz
- veff. unit (max. value ramp)	mm/s
- veff. unit (operating point)	mm/s
- veff. motor (operating point)	mm/s
- veff. engine (max. value ramp)_	mm/s

Acceptance _____ Datum / Signature: _____

ATTENTION: Factory setting parameters only for trial operation – individual programming on-site.

3.1.8 Maintenance of the fan and motor bearings (without relubrication device)

The fans and motors of this version are equipped with noise-tested precision grooved bearings which are designed for a theoretical service life of approx. 20,000 operating hours.

Maintenance and renovation must be carried out as follows:

The grooved ball bearings, with a lifetime lubrication, are sealed on both sides and are completely maintenance-free.

Should a bearing change be made after a longer term due to normal wear and tear the manufacturer's instructions must be followed.

3.1.9 Bearing replacement

/ see manufacturer's instructions /

NOTE: Heating the bearings to 200°C makes disassembly much easier, but is not absolutely necessary.

NOTE: Bearings are subject to wear under normal operation and may need to be replaced

3.2 Filter unit

3.2.1 Commissioning filter part

We recommend the following checks before commissioning:

Check bag filter units for damage.

Check that the bag filter unit is correctly seated in the mounting frame and that the retaining springs are in the correct closing position.

If the filter unit can be pulled out, check the sealing fit between the filter frame and the unit casing.

Measures:

Clean the casing and all components

zero the filter pressure pressure gauges

Start up the fan and mark and log the initial pressure difference on the display device.

When the final resistance of the filters is reached, they must be replaced with new bags.

The filter media should be disposed of in accordance with the applicable environmental protection regulations (special waste).

Fully incinerable filter media are available on request.

For EX rated units, the filter media must be suitable for this. The filters must have a metallic frame and be connected to the protection system.

RECOMMENDATION: Always keep a set of spare filters in stock. We recommend never to operate the system without filters.

NOTE: Damage to the filter surface must be avoided as otherwise the filter may rupture during operation.

NOTE: All filter bags are supplied loose and must be fitted before the first commissioning of the unit.

NOTE: Filters must only be changed with suitable protective equipment (PPE such as FFP2 masks, gloves, if necessary, further protective clothing).

3.2.2 Filter guidelines

During periods of high humidity together with temperatures between about -5C and +5C there is a risk that filters can become wet. If the filters remain wet for long periods of time then it can lead to growth of bacteria and moulds etc with reduced air quality as a result. In sensitive applications we recommend that steps are taken to avoid this by preheating the air under such conditions.

The final pressure difference should be calculated in accordane with EN 13053 Table 9; which normally means adding 100Pa to the clean filter pressure drop.

3.2.3 Bag filter maintenance

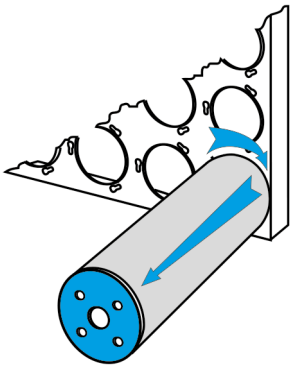
Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check bag filter and bag filter frame for fouling, corrosion and damage.	X
Check pressure difference.	X
Check filter support for tightness, visual inspection for damage.	X
Change filter medium.	X
Clean.	•

3.2.4 Maintenance of activated carbon filter

Replacing the cartridges:

The cartridge is fixed with a bayonette fitting. When replacing the filter, turn the cartridge in the direction of the arrow and take it out of the frame. Refer to the manufacturers instructions.



3.2.5 Maintenance and care of grease trap filter

Filter medium:

The filter cells are made of woven wire mesh. They are reinforced by stretch metal.

Maintenance must be carried out at 3-month intervals.

The filters should be cleaned on a three-nonthly basis in hot water with a commercially available degreasing agent.	X

NOTE: Metal filters must be serviced regularly to remain fully effective.

3.3 Heat exchangers (coils)

3.3.1 Basic principles for cleaning the coil fins

In order to maintain the full power of the coil, the finned pack must be cleaned. This can be done with a non-metalic brush or a vacuum cleaner. Hard or pointed cleaning equipment must not be used.

Copper or aluminium fins are also cleaned by blowing out with compressed air against the direction of airflow or by spraying with low-pressure water or cleaning with steam / see 3.3.4.1 /. For steel galvanised heat exchangers or for heat exchangers with reinforced slats, cleaning can be carried out by steam jet devices.

3.3.2 Commissioning heating coil with warm and hot water operation

We recommend the following checks and measures before commissioning:

Checks:

Check that the flow and return water pipes are connected correctly giving counterflow between air and water.

Check that valves and other fittings are correctly installed.

Measures:

Fully open all shut-off and control valves.

Open the bleed valves, unless automatic venting is provided.

Slowly fill system from the lowest point to avoid air pockets and water hammers. These lead to a reduction in performance.

If different levels are at different heights, gradually close vent valves when water is released airless.

Switch on the primary and secondary pump, check the direction of rotation and operate the system for a period of time.

Move control valves to the opposite position (three-way valves).

Follow-up inspection by reopening the ventilation valves.

Check system for leaks.

Operate freeze protection circuit in a controlled manner to avoid overheating, max. temperature!

NOTE: When stationary, heat formation must be observed!

NOTE: Damage caused by freezing is not covered by our warranty obligations.

NOTE: When rinsing the pipe system, the heat exchanger must be closed with shut off valves.
The heat exchanger must not be flushed! Risk of blockage!

NOTE: Ensure effective bleeding of air when filling the heat exchangers.

3.3.3 Maintenance heating coil with warm and hot water operation

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check for leak tightness and any air-side fouling.	X
In the event of a risk of frost, the safety devices must also be checked periodically or measures such as draining or freeze protection safeguard must be taken.	•
Check pipe connections and fastenings for tightness.	X
Clean.	•

3.3.4 Decommissioning heating coil

In the event of prolonged downtime, especially if there is a risk of freezing, the coil should be drained down to avoid damage caused by freezing unless the water contains glycol. Open the drains and vents to allow the water to flow out of the coil. Each heat exchanger must then be blown through with compressed air to ensure that it is completely drained. Heat exchangers are accessible from both sides for cleaning or can be removed for cleaning with reasonable effort. High-pressure cleaning on both sides is recommended.

To check for any fouling, a cleaning fleece (e.g. as a wick) with a thickness corresponding to the fin spacing can be pulled through the heat exchanger. Based on the discolouration and adhesions to the cleaning fleece, the degree of fouling can be visually estimated.

NOTE: Unavoidable machine oil residues can still be present in the first weeks of operation!

ATTENTION: When using high-pressure water, ensure that the heat exchanger fins are not deformed.

NOTE: When draining the heat exchanger, blow them out with compressed air to ensure all water is removed.

3.3.5 Commissioning electric air heater

We recommend the following checks before commissioning:

Check electrical connections for correct circuit.

Check necessary safety devices for installation position and electrical function.

Measures:

Air-side commissioning of the system. / see 3.1 /

Activate the power supply of the electric air heater.

Power control depending on the individual switching stages.

Check the following safety measures:
- Temperature limiting switch
- Temperature cutout switch
- Airflow interlock
- Fan stop delay

Attention: Electric air heater may only be operated when the fan is running.

NOTE: Operation only for functional safety devices.

3.3.6 Maintenance electric air heaters

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check the electrical connections.	X
Periodic functional check of safety devices.	X
Check for possible air-side fouling.	X
Clean.	X

3.3.7 Commissioning heat exchangers for run-around heat recovery systems

Filling the system:

The system must be flushed out to remove impurities in the pipeline system.

Attention: Risk of blockage! Rinse without heat exchanger and valves.

If the system is not put into operation immediately, it must be filled with antifreeze to prevent the heat exchangers and pipes from freezing.

The system must be filled with the heat transfer fluid specified by us in the appropriate concentration.

The system must be filled in accordance with a heating system. It is advisable to fill the system with a ready-made mixture of water and antifreeze.

The system pressure should be approx. 2.5 - 6 bar.

The heat transfer medium must be checked for freeze protection effectiveness before each winter period and replaced if necessary (every 2 years).

NOTE: No water may remain in the pipes due to the risk of frost and corrosion, if necessary blow through the heat exchanger with compressed air.

ATTENTION: For controllable systems, the motor three-way valve must be in the middle position so that both heat exchangers are filled.

NOTE: When filling the heat exchangers, use the adequate filling pressure to avoid air pockets.

NOTE: When draining heat exchangers, blow them out with compressed air to ensure no residue liquid.

NOTE: Observe project-specific information and design data sheets.

3.3.8 Commissioning and efficiency optimisation in run around coils systems

To optimise efficiency, the brine flow rate is regulated. The actual flow rate is read on the integrated flow sensor.

The airflow rates are measured on the fans. Use the mean airflow rate in the calculation of the liquid flow rate.

NOTE: The maximum media temperature in the intermediate circuit must not exceed 50°C.

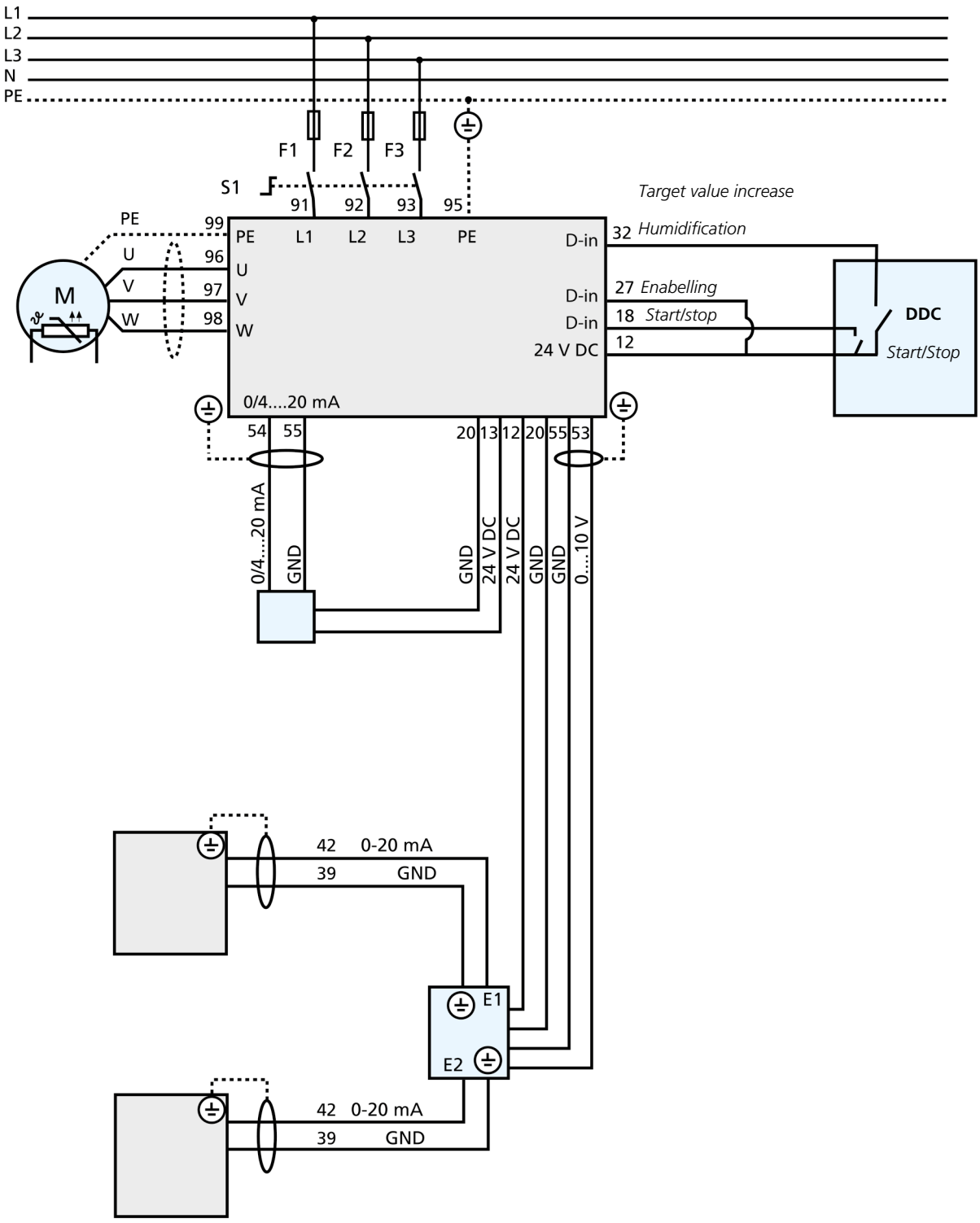
NOTE: Expansion vessel: Set the filling pressure.

The pre-pressure in the expansion vessel must be adjusted to the actual system pressure.

RECOMMENDATION: Set the inlet pressure to approx. 0.5 bar below the system pressure!

3.3.8.1 Efficiency optimisation system

Efficiency optimisation as an example in the system HPWRG.
The specification is made according to the data sheets available during assembly.



3.3.9 Maintenance of heat exchangers and run-around heat recovery systems

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check tightness and system pressure.	X
Heating unit and connections for air-side fouling, damage and corrosion.	X
Check the HE for fouling (calcified and dusty slats deliver less power).	X
Blow through copper-aluminium HE with compressed air or low-pressure water, high-pressure cleaners can also be used.	X
Check freeze protection thermostat for correct setting and function, possibly drain the cooling register before the start of winter.	X
Clean condensate drain in cooling register, clean and refill the siphon at the start of the cooling period.	X
Check the function of the flow and return lines.	X
Ventilate	X
Clean air side.	X
Check the circulation pump.	X
System HPWRG:Check optimisation device.	X
applies to dry operation.	

3.4 Air cooler

3.4.1 Commissioning air cooler with droplet separator

A siphon must be arranged outside the unit on site.

Ensure counter-flow connection.

The air cooler must be carefully ventilated when filling the system with water to avoid air pockets, which lead to a reduction in performance.

Flanges and screw connections must be carefully checked after commissioning and tightened if necessary.

The droplet separator that may be downstream on the air outlet side of the air cooler usually has slats made of PTV, which is temperature-resistant up to max. +95°C.

Droplet separators are only necessary if the maximum air velocity is exceeded.

Cleaning droplet separators:
The droplet separator only has its full effect after a start-up phase of approx. four weeks.

If necessary, the droplet separator must be cleaned by rinsing with water. In the case of coarse fouling, cleaning can be carried out with a steam jet unit.

ATTENTION: The droplet separator needs to be clean to be effective.

3.4.2 Maintenance air cooler with droplet separator

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check air cooler unit and connections for air-side fouling, damage and corrosion.	X
Check the air coolers for fouling.	X
Blow through the heat exchanger with compressed air, steam or low-pressure water, high-pressure cleaners can also be used.	X
Check the available freeze protection thermostat for correct setting and function.	X
If necessary, drain cooling coil before the start of winter.	X
Clean condensate drain in cooling coil, Clean and refill the siphon at the start of the cooling period.	X
Wash the droplet separator and condensate drip tray with warm water and natrium carbonate solution (max. 50°C) if necessary and rinse well, the fins should be free of grease.	X
Check the function of the flow and return lines.	X
Ventilate.	X
Clean the circulation pump.	X
Check water drain and odour trap for function.	X
Clean the water drain and odour trap.	

3.5 Evaporator / condenser

Attention!
DX coils must be installed by a certified refrigeration engineer in accordance with the manufacturers instructions and relevant Regulations.

3.5.1 Evaporator / condenser maintenance

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check heat transfer unit and connections for air-side fouling, damage and corrosion.	X
Check the heat exchanger for fouling	X
Blow through copper-aluminium heat exchanger with compressed air, low-pressure water.	X
Clean condensate drain at cooling coil, siphon at start of the cooling period.	X
check the condition of the flow and return pipes.	X
Cleaning.	•

3.6 Plate heat exchanger

3.6.1 Commissioning plate heat exchanger

Before commissioning, the measures with regard to the control air and shut-off dampers (bypass) must be observed / see 3.10.1 / .

NOTE: To avoid permanent deformation or damage to the plate heat exchanger due to increased pressure load (permanent or sudden), pressure relief must be provided on-site.

NOTE: Plate heat exchangers cannot be walked upon!

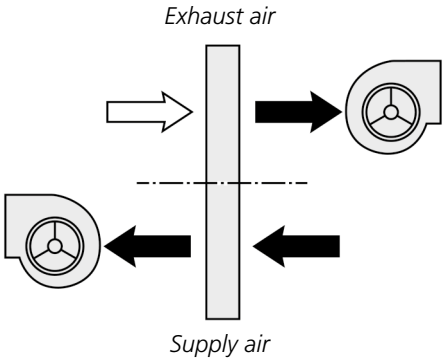
3.6.2 Maintenance plate heat exchangers

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

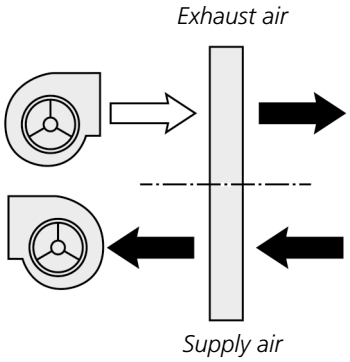
Clean condensate drain, check siphon and refill if necessary.	X
In the case of plate heat exchangers with bypass, the control air and shut-off dampers must be checked according to the maintenance instructions.	X
Cleaning must be performed depending on the type of fouling the plate package.	X
Remove dry dust and fibres at the transfer inlet with a soft brush.	X
Oils and fats (kitchen exhaust) Remove oil and fat deposits with hot water and appropriate degreasing agent.	X

3.7 Rotary heat exchangers

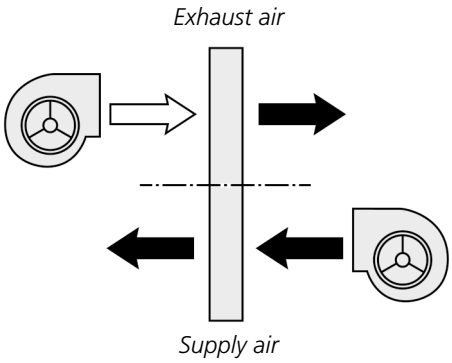
3.7.1 Installation arrangement of rotary heat exchangers in GRAND air handling units



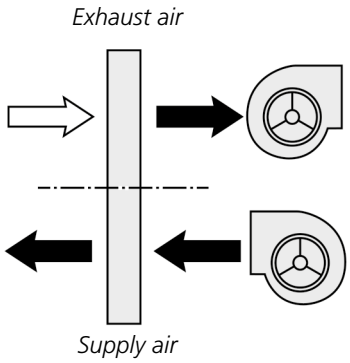
Both fans are sucking
The negative pressure of the exhaust air should be greater than that of the supply air.
The use of a purging sector recommended.



Supply air fan sucking / extract fan blowing
Due to the high pressure differences, there will be high leakage from extract to supply. This arrangement should only be used if continuous recirculation is permitted.
A purging sector is not needed in this case.



Supply air fan and extractor fan blowing
The pressure of the supply air should be greater than that of the exhaust air. This arrangement is generally not practical because the unit will much longer.
The use of a purging sector is advisable.



Supply air fan blowing / extractor fan sucking
There is no risk of transmission from the exhaust air to the supply air but the leakage from supply to exhaust will be large so it should be avoided.

NOTE: When using a rotary heat exchanger, unavoidable leakage occurs that, depending on differential pressure. The leakages are termed OACF and EATR as defined in EN 308. See technical data sheet for the actual values for the unit.

3.7.2 Commissioning rotary heat exchangers

Commissioning shall be carried out in accordance with the manufacturer's instructions.

3.7.3 Maintenance rotary heat exchangers

The rotary heat exchanger is almost self cleaning because the air switches direction twice in every revolution.

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Control of the drive unit and control unit.	X
Rotary heat exchangers can be cleaned with compressed air, water, steam or with grease-releasing cleaning agents.	X

3.8 Humidifier

3.8.1 Commissioning spray humidifier

Check spray humidifier installations for proper condition as well as visible damage (transport, assembly damage)

Check the nozzle carrier tubes and nozzles for firm seating and direction (with or against air flow).

Clean spray humidifier tray from foreign objects (construction dust).

Check spray humidifier pump sieve.

Fill up to approx. 1-2 cm below the overflow nozzle.

Set float valve to specified level and check for function and tightness.

The electrical connection must be established in accordance with the applicable guidelines and standards.

Start up the unit on the air side first and then switch on the spray humidifier pump.

Check the direction of rotation of the pump again. Check all pipe connections for tightness, tighten if necessary.

The elutriation filter valve must be adjusted depending on the water quality. As a guideline, the same user water flow must be drained off as is supplied for air humidification.

Humidification G (kg/h) = air quantity V (kg/h) x absolute humidity x 2 - x 1 (g/kg) (see design data sheet).

Water quality guideline table / see VDI 3803.

Operate spray humidifier for approx. 2 to 3 hours and check for function and tightness.

Set the overcurrent trigger of the pump motor to nominal current, measure current consumption and log.

NOTE: The circulation pump must not be operated without water as it is damaged by the drying cycle.

No warranty can be assumed for such damage. Fully demineralised water (VE) must only be used if the spray humidifier is designed for this!

Special notes:

It is strongly recommended that the spray humidifier pump operation is interlocked with the AHU operation.

The manual automatic switch of the spray humidifier pump must always be set to the >>auto<< position during normal operation (manual setting only for service purposes).

In the case of the freeze protection circuit, even during the adjustment period, care must be taken to ensure that, when the fan and spray humidifier pump are switched off and the heating media is above 90°C, warming up due to accumulated heat is limited in terms of time or temperature.

This precaution applies especially to spray humidifiers with plastic components.

Drain and discharge device: The local water conditions are decisive for the installation of one or other facility or both facilities at the same time.

Under certain circumstances, suitable water treatment may also be required / see VDI 3803/.

In order to make optimum use of effective, economical and spray-humidifier functions, a water analysis is a precondition. The measures to be taken and the setting values must always be correct.

The basic connections for the installation of such devices allow for adaptation to the special operating case.

3.8.2 Maintenance spray humidifier

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Descaling of the entire spray humidifier as needed.	X
Switch off the ventilation system, add limescale remover (according to the manufacturer's instructions) to the circulating water and run the circulation pump until the limescale has dissolved. Then rinse the entire spray humidifier well and neutralise and clean the suction basket.	X
Descaling of the humidifier nozzles and the nozzle rods; under no circumstances should the nozzle holes be cleaned with hard objects.	X
Clean the droplet separator and rectifier with Natrium carbonate -water solution (max 50°C) or dilute formic acid and descale and rinse well with water or Clean with high-pressure cleaner. / see 3.4.2 /	•
Regular check of water quality.	X
Check the float valve.	X
Clean siphon and refill.	X
During operational downtime, the tub, pump and fittings must be completely drained.	X
The spray humidifier pump is equipped with maintenance-free bearings and must therefore only be checked at regular intervals.	X

NOTE: Please note that damage to the units caused by improper handling of solvents or mechanical impact is not covered by the equipment warranty.

NOTE: Descaling (demineralisation):
Please note the note / 3.9.4 /.

NOTE: Do not use acids or corrosive cleaning and softening agents.

3.8.3 Commissioning contact humidifier system HYDROplus

Before commissioning, the following measures must be observed:

The pressure reducing valve must be set to 2.5 bar (in the spraying phase).

The solenoid valves must be electrically interlocked with the AHU operation so that no spray water is released when the fan is stopped.

Water quality: The contact humidifier is operated only with fresh water.

See also VDI 3803; suitable water treatment may be necessary.

Check the nozzle carrier tubes and nozzles for a firm fit and direction (with the air flow).

The solenoid valves must be controlled depending on the desired humidity. Here, the individual humidifier nozzle groups are switched on in sequences. The order of the groups runs from bottom to top.
1. Sequence = lowest nozzle group
2. Sequence = next upper nozzle group
3. Sequence = next upper nozzle group, etc.

The solenoid valves are operated in cycles, i.e. after a moistening spraying process, e.g. approx. 5-10 seconds, an evaporation phase of approx. 30-60 sec. takes place. Valves are programmed according to the manufacturer's instructions. In order to keep the connection diameters for fresh water as small as possible, the individual nozzle groups are to be operated alternately.

Spraying phases

3. Sequence			■			■
2. Sequence		■			■	
1. Sequence	■			■		

The exact specification of the spraying and evaporation phases must be empirically determined during the system adjustment depending on required degree of humidification. To avoid unnecessary water consumption and to ensure the operation of the humidification system, the adjustment of the humidifier must be carried out with the utmost care.

The user water flow should be adjusted in such a way that it corresponds to approximately 2-3 times the amount of evaporation (can be less in the case of permeate). Please refer to the device card for reference values.

With the HYDROplus system, an additional cooling capacity of 1-3 K can be achieved by dosing an additive.

This is controlled via the DDC or via an optional controller.

As soon as the cooling capacity of the adiabatic humidifier is no longer sufficient, the additive is continuously dosed at outdoor air temperatures above e.g. 26°C from 0.1 to max. 0.3%.

The corresponding safety data sheets of the additive and the operating instructions of the dosing station must be observed.

NOTE: The humidifier unit must be locked during system downtime. Operation only when the system is running.

NOTE: The TSC (total salt content) must not exceed 250 g/m3. The electrical conductivity must not exceed 300 µS/cm

NOTE: Chemically demineralised water must not be used. Please observe the manufacturer's instructions.

NOTE: Risk of calcification! When determining the spraying and evaporation phases and the control function, care must be taken to ensure that the fins do not dry out. (Continuous control via three-way valve).

3.8.4 Maintenance contact humidifier system HYDROplus

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Cleaning the entire contact humidifier with warm low-pressure water with the addition of a calcifying agent. Then rinse with clear water.	X
Descaling of the humidifier nozzles and the nozzle sticks (do not use hard objects).	X
Regular checking of water quality.	X
Clean siphon and refill.	X

RECOMMENDATION:
For cleaning the humidifier contact body

The cleaning and descaling (demineralisation) of the humidifier must not be carried out with acids.

Exception: with warm diluted acetic acid (1:10 to 1:20) The cleaning fluid can be circulated. To do this, collect the outflowing liquid via the drain tray connection and use a suitable low pressure pump to spray it.

3.8.5 Honeycomb humidifier

For commissioning and maintenance, see manufacturer's instructions.

NOTE: Do not use acids or corrosive cleaning and softening agents (demineralising agents), as the hydrophilic coating of the contact body can be destroyed!

3.9 Control and shut-off dampers

3.9.1 Commissioning control and shut-off dampers

Before commissioning, the following measures must be observed:

If several dampers are coupled with each other, the connecting rod must be correctly positioned and ease of movement must be checked.

All screw connections and joints must be checked for sufficient fastening.

If the drive is carried out using a actuator, the linkage must be adjusted so that the angle of rotation of 90° is guaranteed and the dampers reach their end position when closing. Observe torque. / see unit data sheet /

The actuator can be mounted either on the inside or the outside of the casing. For outdoor installation, it should be installed inside the unit.

ATTENTION: Operation of the AHU against closed dampers can cause damage to the unit.

3.9.2 Maintenance control air and shut-off dampers

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check control and shut-off dampers for function, fouling, damage and corrosion.	X
Ease of movement and tightness of the control air and shut-off dampers is determined after assembly.	X
The servo motors must be checked for the correct end position and readjusted.	X

3.10 Sound attenuator

No commissioning needed.

3.10.1. Maintenance sound attenuator

The sound attenuator unit – including splitters made of mineral fibre with glass fleece or glass fibre cover or splitters made of melamine resin - is basically maintenance-free. After longer operating intervals (at least annually), we recommend carefull cleaning with a vacuum cleaner.

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check sound attenuator for fouling, damage and corrosion.	X
Cleaning.	•

Sound attenuator system HYGIENE:

The splitters can be removed from the side through the operating door.

Clean the splitters.	•

3.11 Casing general

3.11.1 Commissioning casing

Before commissioning, check that the casing and all its fittings are free from damage, are fitted correctly and are working as intended

Any existing protective film must be removed.

Sealing materials must be examined for contamination and fungus and, if necessary, to be cleaned or replaced.

NOTE: Pipe and cable guides must be designed correctly to prevent leakage. Any modification not provided for by the manufacturer is subject to personal liability. Clean more carefully and frequently if the air is laden with oil or fat. The sealing materials are only temporarily oil-resistant.

3.11.2 Commissioning for indoor units

Before commissioning, the following measures must be observed:

Check units for air tightness.

Check doors and inspection openings for function and tolerances. If necessary, doors must be readjusted using the adjustment options on the 3D hinges (see fig. on the right).

The seal compression can be adjusted on the door handle.

NOTE: Do not attach brackets or fastenings that were not originally designed for this purpose to the walls and frames, as this could cause the units to leak!

3.11.3 Maintenance for indoor units

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check doors and removable panels

Check rubber seal, replace if necessary.	X
Check the function of the quick-release locks, if necessary retighten them in the event of leaking doors.	X
Possibly replace seals.	X
Check panels for damage and corrosion.	X
Possibly replace or apply corrosion protection (painting), oiling, etc.	X
Check the function of the door catch device (pressure side).	X

System HYGIENE according to DIN 1946, Part 4:

After acceptance of the doors, remove all built-in components on stainless steel rails for maintenance and cleaning.	X
Carry out wipe disinfection (Disinfectants must not attack the materials used).	X

3.11.4 Commissioning units for outdoor installation (roof units, weatherproof)

Before commissioning, the following measures must be observed:

Check for air tightness.

Check weatherproof seals.

Check the function of the doors and inspection openings.

Check the function of the weather protection device.

Doors may need to be readjusted via the adjustment options of the hinges and door handles.

ATTENTION: Do not exceed the maximum floor load of 100 kg/m^2.

3.11.5 Maintenance units for outdoor units

Maintenance must be carried out at intervals of at least 1 year / X /.

Leak test of the unit roof.	X
Inspection of side walls and cover strips if necessary, seal with one-component sealing material.	X
Check base frame.	X
Clean and refill existing siphons, check materials for corrosion, if necessary apply corrosion protection (painting, oil, etc.)	X
Check the function of the weather protection device.	X

System HYGIENE according to DIN 1946, Part 4:

After removing the operating doors, all built-in components on stainless steel rails can be pulled out for maintenance and cleaning.

Carry out wipe disinfection (disinfectant may not attack materials used).	X

NOTE: Clean more carefully and frequently if the air is laden with oil or fat.

The sealing materials are only temporarily oil-resistant.

3.12 Control Systems

3.12.1 Commissioning control systems

Prerequisites:

For commissioning, all mechanical requirements such as accessibility, completion of the units and duct assembly and the uninterrupted availability of all supply media must be fulfilled. It must be possible to operate the system at the required operating points. Commissioning must be carried out exclusively by a qualified specialist company.

At the start of commissioning work, the commissioning engineer must be familiar with the plant-specific locations by a person to be designated by the client.

The following work must be carried out in detail at the start and during commissioning:

Inspection of the field devices for proper installation.

Inspection of the electrical devices in the electrical control cabinet and the field devices.

Functional testing of the sensors, transducers and actuators included in the scope of delivery.

Check of the cabling with data point test.

Configuration of the controllers, loading project-specific control and PLC programs.

Commissioning with all connected data points.

Adaptation of the parameters to the operating conditions of the technical plant, setting and adjustment according to the specified target values and guide variables.

Checking the control programs.

Training the clients personnel.

NOTE: Commissioning work may only be carried out by qualified specialist personnel.

3.12.2 Maintenance of control systems

Maintenance contract:
It is recommended to conclude a maintenance contract with a qualified specialist company.

3.12.3 Maintenance electrical control cabinets, control panels, controls

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check for professional and functional installation and environmental conditions.	X
Check for fouling, corrosion and damage.	X
Check protective covers for completeness	X
Cleaning that preserves function.	•
Check connection connections for electrical / mechanical functions.	X
Check functional elements (e.g. operating and display devices).	X
Set, adjust and tighten functional elements (e.g. operating and display devices).	•
Check that setpoints are correct.	X
Compare signals.	•
Check the optical and acoustic control equipment.	X
Check contactors and relays for wear and damage (e.g. contact burn).	X

ATTENTION: Observe safety information.

Check switching and control processes (e.g. freeze protection function).	X
Check safety devices (e.g. thermal triggers).	X
Check setting of electrical control cabinet components (e.g. time relay).	X
Check manual, automatic and remote control functions.	X
Readjust.	•

3.12.4 Maintenance measuring transducers / safety and monitoring device

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check for professional and functional installation and environmental conditions.	X
Check for fouling, corrosion and damage.	X
Cleaning that preserves function.	•
Check connection connections for electrical / mechanical function.	X
Measure and record physical measured values at the measuring location.	X
Check all analogue and digital control signals	X
Readjustment, regeneration.	•

3.12.5 Maintenance controllers / additional modules

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check for professional and functional installation and environmental conditions.	X
Check for fouling, corrosion and damage.	X
Check the self-voltage supply (e.g. backup batteries, rechargeable batteries).	X
Replace rechargeable batteries.	•
Cleaning that preserves function.	•
Check connection connections for electrical / mechanical function.	X
Check functional elements (e.g. operating and display devices).	X
Set, adjust, tighten functional elements (e.g. operating and display devices).	•
Electrical, electronic and pneumatic input signals (e.g. sensors, remote adjusters, reference variables).	X
Compare signals.	•
Check controller function and control signal.	X
Adjust controller function and control signal.	•
Check control loop according to setting parameters, taking all additional functions into account.	X
Adjust the control loop according to the setting parameters, taking all additional functions into account.	•

3.12.6 Maintenance control devices

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check for professional and functional installation and environmental conditions.	X
Check for fouling, corrosion and damage.	X
Check for external leak tightness (e.g. valve plugs).	X
Lubricate (e.g. valve spindle).	•
Check connection connections for electrical / mechanical function.	X
Check electrical, electronic and pneumatic input signals and operating range.	X
Check position, limit value sensor and end position switch for function.	X
Readjust.	•

3.12.7 Maintenance of control software

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Perform data backup.	X
Storage of the last created programme and data copies.	X
Importing the last created programme and data copies.	•

3.13 Hydraulic control group / hydraulic supply module (HVM)

3.13.1 Commissioning hydraulic control group

Filling and venting:

For hot medium: Risk of scalding.

Avoid skin contact. Risk of chemical burns (observe manufacturer information!).

Cooler or heater piping: see design data sheet.

Heat recovery system piping: see design data sheet.

Heat recovery system rule groups:
The amount of antifreeze (water-glycol mixture) is to be chosen depending on the lowest outdoor temperature. See unit data sheets.

Inspection of the hydraulic control group:

Proper installation of all parts.

Correct connection of the flow and return pipes.

Check the fittings and plug sockets for tightness, remove insulation if necessary and tighten.

Check the functionality of all valves, gate valves, dampers.

Filling of hydraulic control groups:
The system must be filled with the heat transfer fluid specified in the data sheets in the corresponding concentration. This filling process of the control group can also be carried out together with the filling of the pipeline system. Check for leakage during filling; if necessary, tighten screw connections and plug sockets.

Bleeding of hydraulic control groups:
When filling the system, the control group must be carefully bled at the highest point of the system. Open the bleed valve.

In the case of incorrectly ventilated control groups, air pockets form, which lead to a performance reduction.

Direction of rotation:
Check pumps for correct direction of rotation and correct if necessary.

3.13.2 Maintenance hydraulic control group

Maintenance must be carried out at 3-month intervals /X/ or as requested by /•/.

Check control group for fouling, damage, corrosion and tightness.	X
Bleed control group.	X
Clean control group.	•
Retighten screw connections and plug sockets.	•
Check filter equipment, clean if necessary.	X
Check all valves, gate valves and dampers for smooth operation; if necessary, lubricate spindle according to manufacturer's information.	X
Check overpressure devices for release pressure.	X
Maintain pumps, control valves and actuators according to manufacturer's information.	X

3.13.3 Decommissioning hydraulic control groups

In the event of prolonged downtime, especially in the event of a risk of freezing, the control unit must be completely drained.

For this purpose, open all ventilation and draining devices. Then blow through the control unit with air (compressed air, fan, etc.) to empty it completely.

4. Appendices

4.1 Construction site checklist

ASSEMBLY, OPERATION AND MAINTENANCE INSTRUCTIONS

Please complete the list below in full
and return by fax by _____ to - FAX +49 6782 9999-7208

Construction project .....
.....
Client .....
Address .....
Email .....
End customer contact: .....
Responsible Construction Manager .....
Otherwise authorised person .....
Authorised signatory for acceptance .....
Local safety officer .....
.....
Work permit required ..... ☐ Yes ☐ No
Safety instruction required ..... ☐ Yes ☐ No
Special conditions of protection ..... ☐ Yes ☐ No
Permitted to use own tools? ..... ☐ Yes ☐ No
Location of units .....
Weather-protected material storage location ..... ☐ Yes ☐ No

Order number .....
Unit position number .....
.....
.....
Phone ..... Fax .....
Phone ..... Fax .....
Phone .....
Phone .....
Phone .....
Phone .....
Email .....
.....
If yes, approx. duration ..... minutes
.....
.....
☐ Inside ☐ Outside ☐ Ceiling height in m .....
Special difficulties .....

Times

Local working hours to be observed ..... From ..... Until .....
..... o'clock
Start of assembly ..... Date ..... Time .....
End of assembly ..... Date ..... Time .....

Distances and construction site comfort

To 230 V power supply ..... m
To 400 V power supply ..... m
Heating available ..... ☐ Yes ☐ No
Access options up to ..... m in front of the installation site

To water connection ..... m
To compressed air connection ..... m
Sanitary facilities available ..... ☐ Yes ☐ No
.....

Existing lifting equipment

Crane ..... ☐ Yes ☐ No
Forklift ..... ☐ Yes ☐ No
Elevator ..... ☐ Yes ☐ No

Assembly aids

Ladders ..... ☐ Yes ☐ No
Platforms ..... ☐ Yes ☐ No
Other ..... ☐ Yes ☐ No

Personnel

Persons authorised to switch the systems on and off
.....
.....
.....
Assembly assistant available ..... ☐ Yes ☐ No
..... Phone
..... Phone
..... Phone

.....
.....
.....
..... E-Mail .....
..... E-Mail .....
..... E-Mail .....

4.2 Mollier diagram