AL-KO

QUALITY FOR LIFE

EN

CENTRAL VENTILATION AND AIR HANDLING UNITS

OPERATING AND ASSEMBLY INSTRUCTIONS FOR CENTRAL VENTILATION UNITS

AT4F SERIES

Legal

AL-KO THERM GMBH
Hauptstraße 248 - 250
89343 Jettingen-Scheppach
Germany
Phone: +49 8225 39 - 0
Fax: +49 8225 39 - 2113
E-mail: klima.technik@alko-air.com

Revision history

Version	Description	Date
1.0	3082370/October 2014	October 2014
_b	3082370_b/December 2016	December 2016
2.0	3082370_2.0/July 2021	July 2021
3.0	3082370_BA-AT4F_de-V3.0_03-2024	March 2024
3.1	Revision	December 2024

Table of contents

1 About this manual

- The German version is the original operating instructions. All further language versions are translations of the original operating instructions.
- Read these operating and assembly instructions carefully before assembly, commissioning and maintenance. This is the prerequisite for safe work and trouble-free handling.
- Observe the safety instructions and warnings in this documentation and on the product.
- This documentation is a permanent part of the described product, and must be handed over to the buyer if the product is sold.

1.1 Explanation of symbols

1.1.1 Safety instructions

⚠ DANGER

This signal word is used to indicate an imminently dangerous situation which, if not avoided, will result in death or severe injury.

⚠ WARNING

This signal word is used to indicate a potentially dangerous situation which, if not avoided, could result in death or severe injury.

⚠ CAUTION

This signal word is used to indicate a potentially dangerous situation which, if not avoided, could result in a minor injury.

ATTENTION

This signal word is used to indicate a potential risk of property damage.

NOTE

Special instructions for ease of understanding and handling.

1.2 Safety signs

Meaning	Symbol
GENERAL DANGER SIGNS If the required safety instructions are not observed, this can lead to death, severe injuries and serious property damage.	
IMPORTANT NOTICE If you do not heed this notice, this can lead to problems with the unit.	
OBSERVE THE OPERATING AND ASSEMBLY INSTRUCTIONS If you do not heed the notices in the operating and assembly instructions, this can lead to problems with the unit.	
INFORMATION Heeding this information makes working with the machine easier.	

Warning sign

The warning signs used in these operating and assembly instructions draw attention to specific hazards.

Meaning	Warning sign
Warning of danger of falling If the required safety instructions are not observed, this can lead to death or severe injuries due to falling.	
Warning of danger of slipping If the required safety instructions are not observed, this can lead to death or severe injuries due to slipping.	
Warning of electrical voltage If the required safety instructions are not observed, this can lead to death or severe injuries due to dangerous electrical voltage.	
Warning against suspended loads If the required safety instructions are not observed, this can lead to death or severe injuries due to a suspended load.	
Warning of falling objects If the required safety instructions are not observed, this can lead to death or severe injuries due to falling objects.	
Warning of hot surfaces If the required safety instructions are not observed, this can lead to death or severe injuries due to hot surfaces.	

Meaning	Warning sign
Warning of danger of crushing If the required safety instructions are not observed, this can lead to death or severe injuries due to crushing.	
Warning of sharp objects If the required safety instructions are not observed, this can lead to death or severe injuries due to sharp objects.	
Warning of hand injuries If the required safety instructions are not observed, this can lead to death or severe injuries.	
Warning of poisonous substances If the required safety instructions are not observed, this can lead to death or severe injuries due to poisonous substances.	

Mandatory signs

The mandatory signs in these operating and assembly instructions draw attention to instructions to be observed.

Meaning	Mandatory signs
Wear eye protection If you do not wear eye protection, there is a risk of eye injuries.	
Wear foot protection If you do not wear foot protection, there is a risk of foot injuries.	
Wear hand protection If you do not wear hand protection, there is a risk of hand injuries.	
Wear head protection If you do not wear head protection, there is a risk of head injuries.	
Wear a mask If you do not wear respiratory protection, this can lead to poisoning and chemical burns to the lungs.	
Isolate before maintenance or repair If you do not isolate the unit before maintenance or repair from all energy sources, this can result in serious injuries.	

1.2.1 Abbreviations

Abbreviation	Meaning
EHA	Outgoing exhaust air
ETA	Extract air
ODA	Outdoor air
PPE	Personal protective equipment, such as cut-proof gloves, safety goggles, work gloves, ear protection, safety helmet, breathing mask
AC unit	Air handling unit
SUP	Supply air
TA	Droplet eliminator
WRD	Heat recovery, diagonal (plate heat exchanger)
WC	Water column

1.3 Legal notices

All specified data serve solely to describe the product. No statement on a specific characteristic or suitability for a specific purpose can be derived from these data. The data do not exempt the user from his own judgement and checks.

2 Safety instructions

2.1 Intended use

The AT4F unit is intended only for processing and conveying respirable air, i.e. for ventilation and extraction of rooms and buildings or for maintaining the necessary room climate. The AT4F unit is suitable for operation in the temperature range from -20°C to +40°C.

The range of application of the AT4F unit is documented in the design data sheet and on the type plates. Deviating ranges of application must be coordinated with the manufacturer's plant in order not to affect the function of the installation.

For the intended use, the unit must be professionally installed and operated as intended. To do this, observe the “5 Assembly” on page 25 chapter and other relevant information. Furthermore, the intended use also includes compliance with the operating and maintenance conditions listed in these operating and assembly instructions (see chapters “6 Commissioning” on page 74 and “7 Servicing and maintenance” on page 85). The risk is borne solely by the user.

- The unit is an air handling unit for air conditioning.
- Only operate the AT4F unit when fully assembled.
- Set up the unit horizontally. Otherwise there is a risk that puddles may form, among other things.
- Use only original spare parts.
- Children and people who are not familiar with the unit may not use it.
- Observe the accident prevention regulations and fire protection regulations.
- The ladders, steps, scaffolding and platforms required for operating and accessing the installation are not included in the scope of delivery of AL-KO THERM and must be provided by the customer.

2.2 Foreseeable misuse

The AT4F unit may only be operated within the scope of the technical data specified by AL-KO THERM. Any use other or more extensive than that described in the section “2.1 Intended use” on page 11 is regarded as not in accordance with the intended use. The manufacturer cannot be held liable for damage resulting from this.

Possible misuse includes:

- Non-horizontal setup of the unit.
- Conveying media with impermissibly high or low temperatures.
- Conveying aggressive or heavily dust-containing media.
- Installation in an environment with aggressive media (e.g. sea air) or heavily dust-containing media (coast).
- Use in an explosive atmosphere.
- Installation of a non-permissible joint seal.
- Non-compliance with the static limits (customer supplied).

2.3 General safety instructions

⚠ WARNING

Risk of serious injury or death due to working without personal protective equipment!

Working on the AT4F unit without personal protective equipment can result in serious injury or death.

- Observe the safety instructions in this operating and assembly instructions.
- Use personal protective equipment at all times when working on the installation.
- Use other protective equipment according to the work carried out.

⚠ WARNING

Risk of severe injuries or death!

Working on the AT4F unit can result in serious injury or death.

- Only allow assembly, installation, commissioning, repair, maintenance and servicing work to be carried out by qualified staff.
- Disconnect the AT4F unit from the mains power supply on all poles and secure it to prevent restart before starting repair or maintenance work.
- Integrate weatherproof units into the lightning protection concept when installed outdoors.
- Avoid sparks and flying sparks in the intake area of the installation.
- Observe the working instructions and these operating and assembly instructions.
- Work with care.
- Use personal protective equipment at all times when working on the installation.
- Use other protective equipment according to the work carried out.

⚠ WARNING

Risk of injury due to falling, and falling modules.

When installing the modules or installing them on platforms or on the roof, persons may fall off and/or modules may fall down.

- Only allow assembly, installation, commissioning, repair, maintenance and servicing work to be carried out by qualified staff.
- Observe the assembly instructions in these operating and assembly instructions.
- Use only tested ladders, scaffolding or suitable platforms.
- Only use suitable lifting equipment.
- Only use approved fasteners when assembling the AT4F unit.
- Use personal protective equipment at all times when working on the installation.

⚠ WARNING

Risk of injury due to unauthorised opening.

- Keep the inspection doors/inspection covers closed during operation.
- Never open the unit during operation.
- Open the inspection doors/inspection covers using the relevant tool if necessary.
- Observe the hazard warnings on the inspection doors/inspection covers.

⚠ WARNING

Risk of poisoning when working with sealants, adhesives and pre-treatment agents.

- Do not touch the sealant, adhesive or pre-treatment agent.
- Work with care.
- Do not swallow the sealant, adhesive or pre-treatment agent.
- Ensure that there is adequate ventilation at the workplace.
- Observe the safety data sheets and operating procedures in accordance with the Ordinance on Hazardous Substances.
- Use personal protective equipment at all times when working on the installation.

⚠ WARNING

Risk of injury from falling from ladders, scaffolding or work platforms.

- Only use suitable and tested ladders, steps, scaffolding and work platforms.
- Work with care.

Observe the safety instructions in these operating and assembly instructions to avoid injuries, fires and other hazards due to improper use and improper operation of the unit:

- The design and construction of the AT4F unit complies with the standards listed in the Declaration of Conformity or Declaration of Incorporation. A potential hazard can only be extensively ruled out if the other applicable standards for the overall system to be completed and installed by the plant manufacturer are adhered to.
- If installation is performed contrary to AL-KO THERM regulations, and the defect/damage which has occurred is attributable to improperly modification, processing or any other treatment, all damage compensation or warranty claims are ruled out. The orderer must prove that improper installation did not cause the defect which has occurred.
- Safety and monitoring equipment must not be removed, bridged or disabled in any other way.
- All authorised persons must have read and understood the operating and assembly instructions in full before starting work on the unit and must observe them at all times.
- To avoid dangers during operation, all of the user's plant, operating and working instructions apply in addition to these operating and assembly instructions.

2.3.1 Safety instructions for operation

- The AT4F unit must only be operated with completely closed inspection doors/inspection covers.
- No unauthorised persons are permitted to have access to the AT4F unit during operation.
- The AT4F unit may only be operated in the performance range specified in the AL-KO THERM technical documents.
- The AT4F unit must be installed properly and used subject to precise observation the AL-KO THERM operating and assembly instructions.
- Only operate the AT4F unit when it is fully assembled and with correctly fitted contact protection (optional).
- The AT4F unit may only be operated in a technically flawless condition. Malfunctions and damage that can affect safety must be rectified immediately and professionally. The design and construction of the AT4F unit complies with the standards listed in the Declaration of Conformity or Declaration of Incorporation.
- Avoid spark formation in the vicinity of the AT4F unit.
- Wear personal protective equipment (e.g. ear protection) during operation of the AT4F unit.

2.3.2 Safety instructions for maintenance

- Damaged parts are only permitted to be replaced with original spare parts.
- During repair and maintenance work, the AT4F unit is to be disconnected from the mains on all poles and secured against restart.
- General maintenance instructions in the operating and assembly instructions from AL-KO THERM must be observed under all circumstances.
- Observe the delay time of the fans. Observe a waiting time of at least 3 minutes, until the fan impellers are stationary, before opening the inspection doors.

2.3.3 Personal safety instructions

- The AT4F unit may only be operated by qualified technical personnel who are trained in operating it, trained in its use and expressly authorised to do so.
- Personal protective equipment is required for work on the AT4F unit.
- To avoid dangers during operation, all of the operator's plant, operating and working instructions apply in addition to these operating and assembly instructions.
- The operating and assembly instructions must be kept at a suitable, known place in the workplace.
- The operator of the AT4F unit must draw up operating procedures in an understandable form and in the language of the employees, taking the operating and assembly instructions and the operating conditions into consideration.

2.4 Residual dangers

The AT4F unit may present a danger if it is not operated by trained personnel and/or is used improperly or not according to its intended use.

Residual dangers are potential hazards that are not immediately apparent, such as:

- Injuries due to failure to observe the safety instructions, standards, directives or regulations.
- Injuries caused by uncoordinated work.
- Danger caused by working on the electrical installation, cables and connections.
- Transporting, unpacking and setting up the unit; these may result in crushing, cutting, puncture or impact injuries.
- Tipping of the unit; uneven and loose surfaces promote unit tipping.
- There is a risk of stumbling, slipping, falling and falling down when setting up the unit and the accessory parts.
- There is a danger of electric shock due to damaged and defective electrical components.
- Electrical connection cable: Danger due to stumbling, falling and slipping.
- Noise (hearing damage).
- Human misconduct: Non-observance of safety instructions, standards and regulations.
- Operation or transport without suitable safety measures.

2.5 Training

The operator of the AT4F unit must regularly train their personnel on the following topics:

- Observance of the operating and assembly instructions as well as the legal regulations.
- Intended use of the AT4F unit.
- Observance of all company, operating and working instructions at the operator's installation site.
- What to do in an emergency.
- Compliance with VDI 6022.

3 Product description

- The exact type designation can be found on the type plates. The type plates are usually affixed to the housing. When ordering spare parts or in case of other queries, please specify the type designation of the AT4F unit, the year of manufacture and the serial number, see chapter “3.3 Sample AT4F type plates” on page 17.
- The AT4F unit is suitable for operation in the temperature range from -20°C to +40°C.
- Depending on the requirements, all known air handling units are used in the AT4F Series for filtration, heating, cooling, silencing, humidification and dehumidification, heat recovery (rotary heat exchangers, plate heat exchangers, circulating coil systems or layered storage modules), etc.
- AT4F units are available as a weatherproof version or for indoor installation.
- The customer-specific unit version can be found in the respective data sheets and drawings.

NOTE

AL-KO THERM products are subject to continuous quality control, and comply with the applicable regulations.

3.1 Functional description

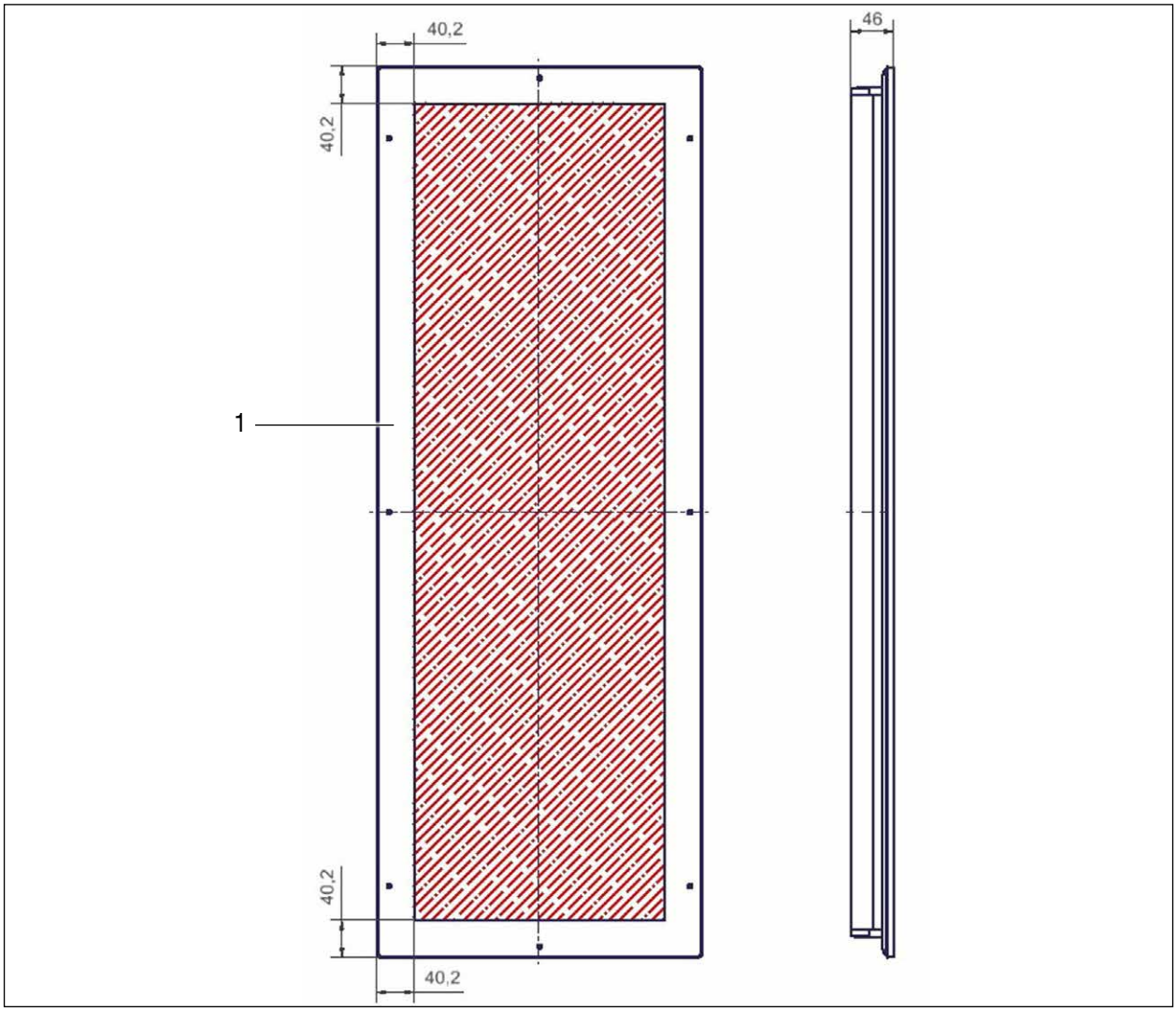
- Central ventilation and air handling units in the AT4F Series are highly efficient air handling units.
- The AT4F Series is used in many areas of human air conditioning, industrial applications, chemicals/pharmaceuticals, marine, hygiene, swimming pools, recreational facilities and many other sectors, as well as in the modernisation of old existing installations using highly efficient, state-of-the-art heat recovery and energy saving technologies.
- The sound emissions from the AT4F Series are minimised by an ingenious housing design and an optimised component layout tailored to the respective, intended use, and through the use of fan and drive units with highly efficient vibration isolation.
- The internally smooth housing design guarantees easy and fast unit cleaning of the units and compliance with the hygiene requirements.
- On request, the air handling units can also be supplied with integrated control and/or cooling technology, incl. wiring and installation of the field devices and sensors.

3.2 Technical data

ATTENTION

Read the documentation supplied with the unit. Information on the technical and electrical data can be found there.

3.2.1 Area for on-site connections/bushings



1	External view

ATTENTION

Holes for connections/bushings may only be inserted in the cross-hatched area. Non-compliance leads to constructional damage to the panel!

3.3 Sample AT4F type plates

Each functional unit is assigned a separate type plate. The type plates contain the order number, position details, year of manufacture, manufacturer's data as well as the design data. These type plates are attached to the outside of the unit.

Type plate

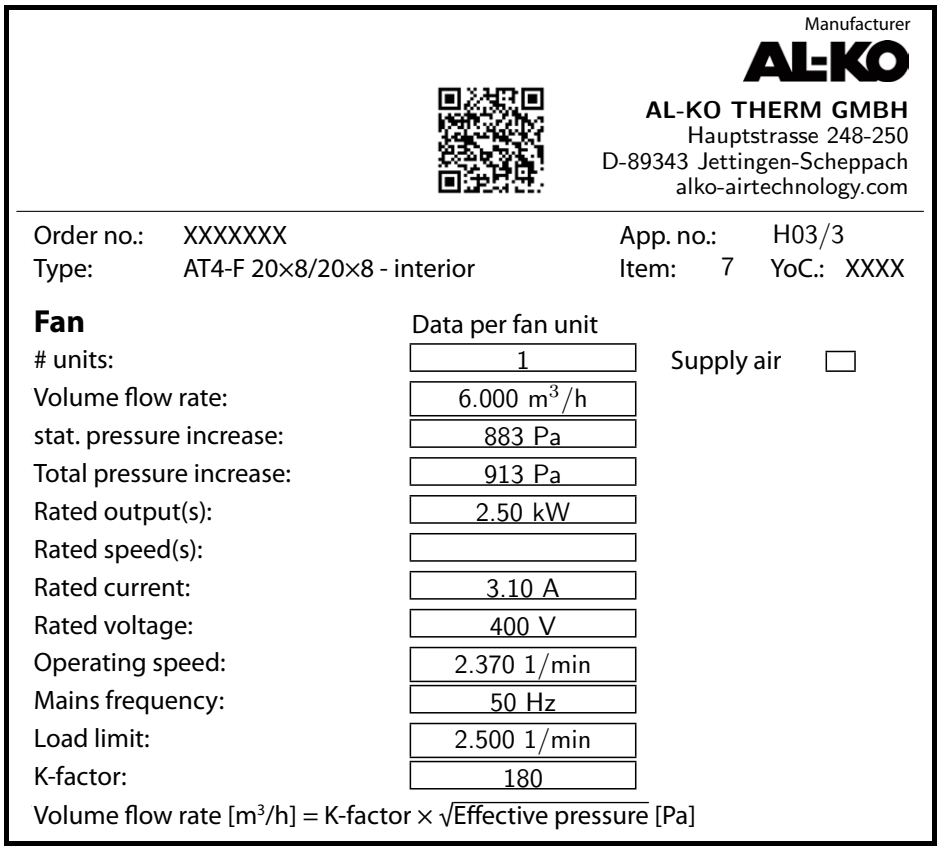


Fig. 1 Example of a type plate

4 Delivery, transport, storage

4.1 Delivery

- The unit dimensions are given in mm. Measurements such as AT4F 12x12 or AT4F 16x12 etc. are grid dimensions. 1 grid = 76.5 mm.
- The breakdown of the scope of supply is shown in the unit drawing.
- Depending on their size, the AT4F Series central ventilation and air handling units are delivered either partially disassembled, fully disassembled or fully assembled or as components bolted to square transport timbers according to the breakdown of the scope of supply.

4.2 Transport

⚠ WARNING

Danger of death - Suspended loads.

For crane transport, all valid safety conditions according to DGUV regulation 52 Cranes and DGUV Control unit 100-500 chapter 2.8 must be observed.

- Do not walk under suspended loads.
- Use the specified attachment and mounting points.
- Observe the weight specifications.
- Only use suitable lifting equipment.

⚠ CAUTION

Risk of injury due to the module tilting or tipping over.

Failure to observe the safety instructions, standards, directives and regulations leads to a risk of injury due to the unit tipping over.

- Observe the relevant standards, directives and regulations.
- Observe the instructions in these operating and assembly instructions.
- Use the specified attachment and mounting points.
- Observe the weight specifications.
- Only work on on-site surfaces that are suitable for installation preparations and lifting.

NOTE

Any paint damage that occurs during transport can be rectified with a touch-up pen.

A touch-up pen can be ordered from AL-KO THERM if necessary.

ATTENTION

- Uniform lifting of the unit components must be ensured.
- Transport is only permitted using the attachment points given below.
- Only approved lifting equipment with a sufficient load capacity may be used.
- The lifting equipment must be in perfect condition.
- The lifting gear must be checked for load-bearing capacity and damage before use.
- The protruding drip edges of AT4F units of weatherproof version must be protected by additional measures (e.g. spreader beams or spacers) during crane transport.
- Secure the load during transport.
- Use only suitable transport locks.
- If the maximum weights to be lifted are exceeded (per person), plan for a second person to help.
- The individual components of the installation may only be moved with the transport equipment provided for this purpose.
- Use only suitable transport devices and suitable industrial trucks.
- Maintenance doors must be kept closed at all times during transport.

- Ensure sufficient visibility during transport (accompanying persons, if necessary).
- No persons must be allowed to remain in the transport area.
- The unit must only be transported by trained and qualified personnel and in observance of the safety aspects.
- If transport devices are used that require a driving licence, the personnel operating these devices must have a valid driving licence for this.
- During transport, observe the instructions in these operating and assembly instructions and the relevant regulations on occupational safety and environmental protection.
- Only transport the unit upright and secure the unit against tipping and slipping.
- Avoid distorting the housing or other damage.
- Damage that results from improper packaging and transport are at the expense of the initiator.
- As described in chapter “4.2.2 Fork-lift truck / pallet truck” on page 20, the unit can be transported using a fork-lift or a crane.
- The AT4F unit is only to be transported, lifted and set up within the temperature usage limits (-20°C to +40°C).

4.2.1 Transport under aggravated conditions

When transporting under aggravated conditions (e.g. on open vehicles, under unusual vibration stresses, transport by sea or in subtropical countries), additional packaging must be used that will protect the unit from these particular influences.

4.2.2 Fork-lift truck / pallet truck

The AT4F unit is supplied on squared timbers.

ATTENTION

- Always place the lifting forks of the forklift on the squared timbers.
- Pay attention to any protrusions (e.g. floor drains).

- Before lifting the units, close the inspection doors/inspection covers.
- Suitable fork lengths must be used to prevent damaging the unit.
- Use suitable wood intermediate layers.

4.2.3 Crane transport

All AT4F units have a crane transport option as standard. A distinction is drawn here between transport tube, shackle, base frame bracket or crane eyelet. The transport openings are sealed with covering caps when the units are delivered.

⚠ WARNING

Danger of death - Suspended loads and crane transport!

Observe the local and legal regulations and the rules of the professional associations.

- Do not walk under suspended loads.
- Do not work under suspended loads.
- Use the specified attachment and mounting points.
- Observe the weight specifications.
- Use suitable lifting equipment.
- Only use suitable industrial trucks and lifting equipment (crane).
- Only use suitable positioning tools.
- Attach suitable load securing equipment before lifting the load.
- Wear personal protective equipment.

4.2.3.1 Crane transport using shackle

Max. width for unit transport with shackle	Max. permissible weight of the individual components
49 grid	2500 kg

- On AT4F units, the shackle is screwed into the borehole in the base frame.
- Transport is only permitted using a spreader beam to protect the unit.
- On AT4F units in a weatherproof version, a tension plate is fitted on the fronts of the units to protect the drip edges. The shackle is then screwed into the hole in this plate. The projecting drip edges must be protected during crane transport with additional measures (e.g. on-site spreader beams or spacers).

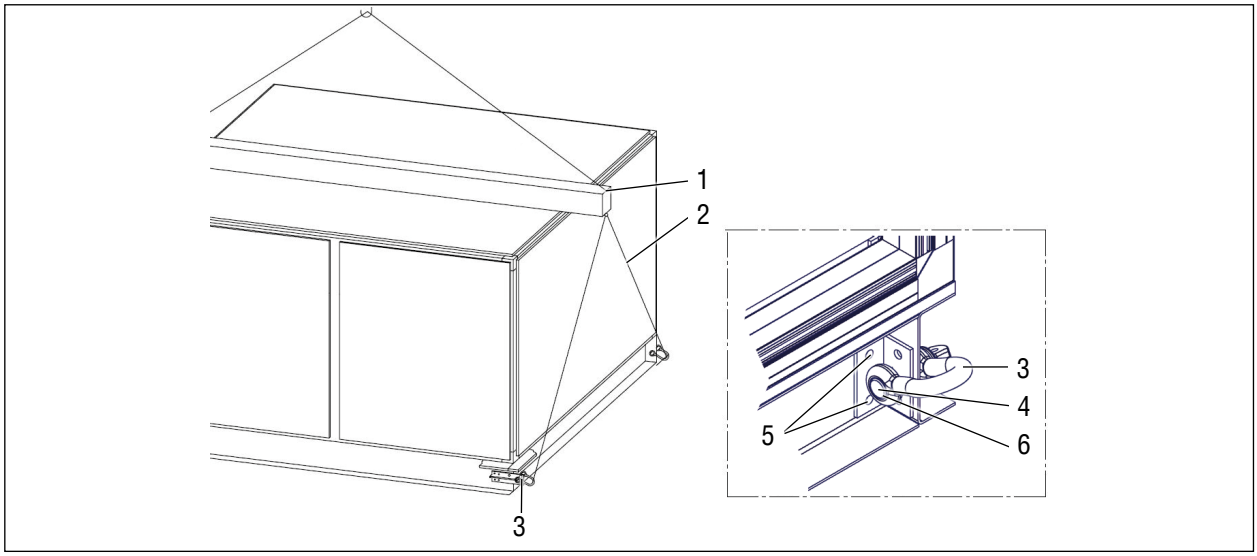


Fig. 2 Transport using shackle

1	Spreader beam (on-site)	4	Screw M12 x 30
2	Traction ropes (on-site)	5	Drilling screw 6.3 x 25
3	Shackle	6	Bore for shackle

4.2.3.2 Crane transport using a base frame bracket

The AL-KO AT4F is supplied with a base frame that is suitable for crane transport. Transporting the unit using the base frame bracket is permissible up to an overall weight of max. 4500 kg!

All AT4F units are equipped as standard with a base frame with prefabricated mounting holes for the base frame bracket. Crane transport is also possible in the case of subsequent assembly of these base frame brackets.

⚠ WARNING

Danger of death - Suspended loads and crane transport!

Observe the local and legal regulations and the rules of the professional associations.

- Do not walk under suspended loads.
- Do not work under suspended loads.
- Use the specified attachment and mounting points.
- Observe the weight specifications.
- Only use suitable lifting equipment.
- Only use suitable industrial trucks and lifting equipment (crane).
- Only use suitable positioning tools.
- Attach suitable load securing equipment before lifting the load.
- Wear personal protective equipment.

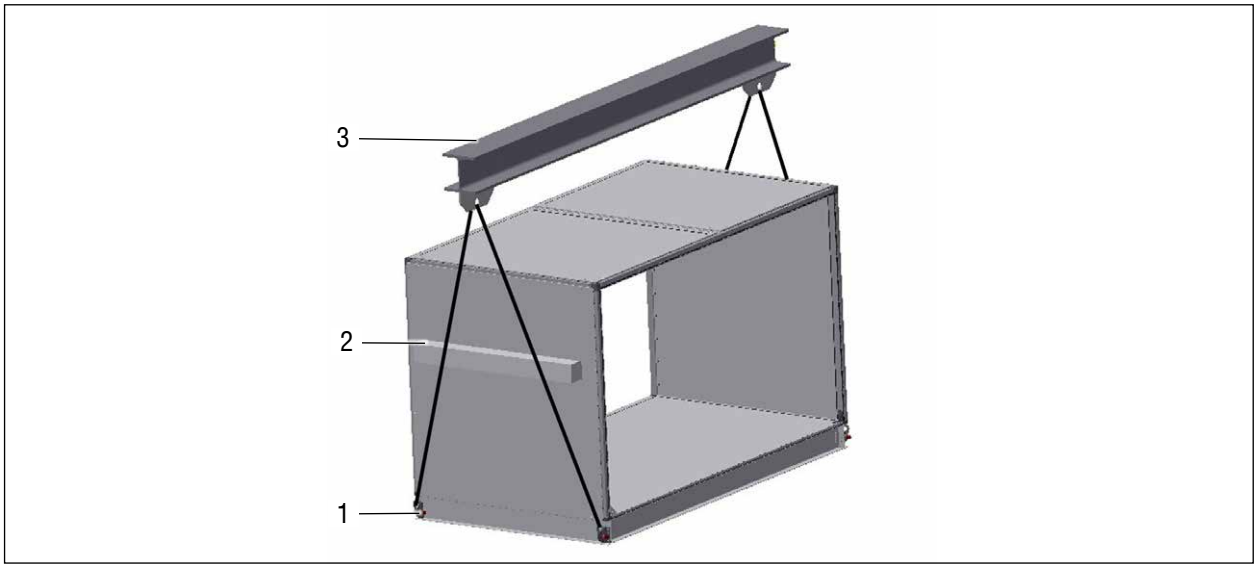


Fig. 3 Transport using a base frame bracket

1	Base frame bracket	3	Spreader beam, chains or slings (on-site)
2	Spacer (on-site)		

- Use lifting equipment that complies with the regulations.
- Secure attachment equipment (ropes, chains, lifting slings) to the base frame brackets protruding from the sides.
- In the case of narrow and high unit components, it is important to ensure that the component is not tilted during transport (additional protection).
- The angle between the two traction ropes, chains or lifting slings may not exceed 60° and the angle between the vertical frame profile and the traction rope, chain or lifting sling may not exceed 30°.

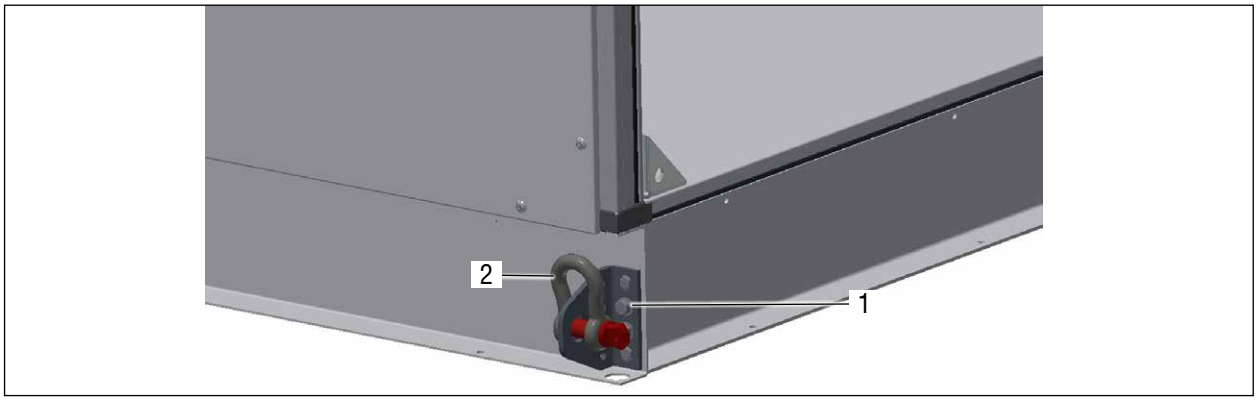


Fig. 4 Base frame bracket with shackle

1	Base frame bracket	2	Shackle (on-site)

Step	Action
1	Before lifting the units, seal the inspection doors/inspection covers. All clamp closures must be screwed tightly using tools.
2	Use only approved and tested transport harnesses to attach them to the intended mounting points.
3	For subsequent crane transport, you must attach the base frame brackets (1) to the base frame. Only use the fastening material supplied by us.

4.2.3.3 Crane transport using crane eyelets

Transporting the unit using crane eyelets is permissible up to a width of 49 grids!

Suspension on crane eyelets	Max. permissible weight of the individual components
Suspension via 4 crane eyelets	1900 kg

Transport with crane eyelets:

- The attached crane and centre eyelets must be used for the transport of all components.
- All crane eyelets on the unit must be used and **evenly** loaded! A crane harness (spreader beam and chain hoist) is to be used for 6 suspension options and above!
- An **angle of more than 45° and less than 80°** must be maintained between rope and unit roof.
- On the crane and centre eyelets, a shackle (not supplied) must be attached on-site. To do this, a hole diameter of 22 mm is provided for.
- The crane and centre eyelets must be removed before beginning the unit connection assembly work.
- After removing the crane eyelets, the openings are to be sealed airtight with sealing plugs d = 12 mm (included as accessories).

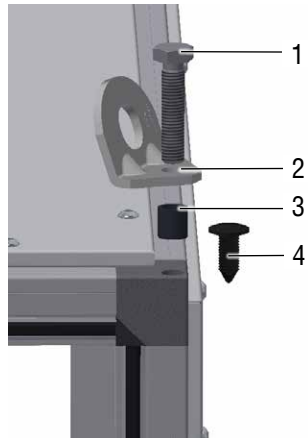


Fig. 5 Crane eyelets

1	Hexagon head bolt M12x80 (min. strength class 10.9)	3	Bushing
2	Crane eyelet	4	Sealing plug (insert after removing the crane eyelets)

4.3 Storage prior to assembly

- Store the individual functional parts in a dry and weatherproof location in their original packaging.
- Store the functional parts in the temperature range of -20°C to +40°C.
- Cover open pallets with tarpaulins, and protect the functional parts from dirt (e.g. chips, stones, wire, etc.).
- Constant and, above all, abrupt temperature changes must be prevented during storage. This is especially harmful if moisture is able to form condensation.
- To avoid bearing damage, the fan must be rotated monthly if at a standstill for more than one month.
- For storage periods of more than 1 year, check the ease of movement of the bearings on the fans and rotary heat exchangers (by turning by hand) before assembly.
- Avoid distorting the housing and other damage during storage.
- Damage resulting from improper packaging and storage is at the expense of the initiator.

4.4 Disposal of packaging

When disposing of the packaging, comply with the relevant local environmental and recycling regulations in your country and community that are applicable at the time when the activity is undertaken.

5 Assembly

5.1 Safety instructions for assembly

⚠ WARNING

Risk of injury due to impact, cutting or stabbing during assembly/installation of the modules.

- Have installation, commissioning, servicing and maintenance work carried out only by qualified staff.
- Electrical connections must only be undertaken by a certified electrician under consideration of the valid DIN and VDE regulations as well as the directives of the local energy supply company.
- Observe the working instructions and these operating and assembly instructions.
- Work with care.
- Use personal protective equipment at all times when working on the installation.
- Use other protective equipment according to the work carried out (cut-proof gloves).

⚠ WARNING

Risk of injury when installing the unit modules on platforms or on the roof.

When assembling the unit modules, the tool/housing material can fall off in the event of careless operation.

Due to the working height, there is a risk of falling.

- Use only suitable industrial trucks and lifting equipment (crane) and suitable positioning aids.
- Only use suitable and tested ladders, steps, scaffolding and work platforms.
- Work with care.
- Wear personal protective equipment.

⚠ CAUTION

Risk of crushing the limbs and cutting injuries on sharp edges during assembly/installation of the modules.

- Have installation, commissioning, servicing and maintenance work carried out only by qualified staff.
- Use assembly aids when installing the modules and components.
- Work with care.
- Wear personal protective equipment (cut-proof gloves).

ATTENTION

Before installation and commissioning, it is essential to read and observe the operating and assembly instructions.

- The AT4F unit is delivered with its components pre-assembled. Depending on the size and design of the AT4F unit, this can be supplied in different disassembly conditions.
- The unit must be vibration-decoupled on-site with suitable means.

5.2 Preparations

- Observe the condition of the substrate at the installation site.
- Check the individual components for transport damage.
- Select the installation site with regard to good accessibility for servicing and maintenance work.
- Ensure that the components and the connection cables at the installation site cannot be either damaged or contaminated by oil or other materials.
- Check that fuses, contactors and circuit boards are securely in place in the switch cabinet (optional).
- Secure any loosened assemblies.
- The fresh air intake must be designed in accordance with the applicable standards and should be located away from exhaust air outlets or exhaust openings (kitchen, laundry, etc.).
- If possible, the exhaust air must be discharged via a roof hood away from fresh air inlets, windows, balconies, etc.
- Connect the AC unit and the unit-attached equipotential bonding (Fig. 6) to the duct system.

Fig. 6 Potential equalisation mounted on the unit

ATTENTION

Components that come loose during transport can lead to malfunctions or damage.

5.2.1 Space requirements

- Sufficient space must be available to operate and maintain the AT4F unit (see VDI 2050 “Requirements on central technical systems”).
- In general, it must be ensured during assembly that the AT4F unit remains freely accessible for maintenance purposes.
- During and installation, in particular of the connecting pipework, it must be ensured that the inspection doors can always be opened and that the swivel range is kept clear.
- According to VDI 6022, the extensibility of system components such as heat exchangers, droplet eliminators, etc., must be guaranteed.
- The installation height of the siphon for condensate drain lines (optional) must be taken into account when setting up the unit, see chapter “5.12.3 Condensate drain connection via siphon” on page 61.

5.2.2 Foundation

ATTENTION

The installation site must be designed for the loads of the entire AC unit.

A check by a structural engineer may be necessary.

- The units must be set up on flexurally rigid, horizontal foundations (DIN 18202) or substructures. The foundation can be designed as a full foundation or a strip foundation.
- Unevenness of the substrate must be compensated using appropriate measures (e.g. documents, etc.).
- Particularly in the case of the rotary heat exchanger and the dampers, attention must be paid to a horizontal and distortion-free setup.
- In the case of strip foundations, cross beams must additionally be installed for support at the beginning and end of the unit and at the component separating points that are over 2 m wide.
- The implementation of the foundations must meet the on-site requirements for the acoustics (structure-borne sound insulation underlay) and the professional water drainage of the condensate.
- The unit must be professionally connected to the foundation in accordance with the on-site conditions. Points to be considered here include the wind loads, in particular for weatherproof units.

5.3 Assembly of separated housing

ATTENTION

Before installation and commissioning, it is essential to read and observe the operating and assembly instructions.

- The assembly instructions of the modules can be found in the supplied unit drawing.
- Installation of the AT4F units starts with the unit component containing the air outlet (duct connection).
- The duct connection must be distortion-free and free of load on the AC unit.

ATTENTION

The installation sequence of the individual unit components can be seen from the order-related drawing and must be adhered to under all circumstances.

ATTENTION

On delivery, the accessories are in the correspondingly marked unit component.

- For vibration absorption, AL-KO THERM recommends that the AT4F units are underlaid with suitable insulation strips (not included). Observe the specifications from the insulation strip manufacturer.
- Ceiling-mounted units must be installed on-site with appropriate ceiling decouplers (not supplied).
- Make sure that the natural frequency of the sub-construction is sufficiently far away from the excitation frequency of certain components such as e.g. fans, motors, etc.
- AL-KO THERM recommends placing insulation strips underneath the unit face ends, component separating points and in the longitudinal direction above a component length of approx. 1200 mm.
- To avoid structure-borne noise transmission, AL-KO THERM recommends using elastic nozzles as a connection between the unit and the air duct.

NOTE

To meet the requirements of VDI 6022, all unit separation points must be sealed with microbially inert sealing material in the base area.

ATTENTION

AT4F units must be levelled to ensure proper function.

The unit frames must be parallel and horizontal to each other under all circumstances.

Do not walk on the upper side of the unit without protection against damage (scaffolding or covers).

Before and after assembly, carefully cover units up to commissioning to avoid damage and soiling.

ATTENTION

When installing downwards (roof opening), all details must be clarified with the factory in advance.

With a weatherproof version, the lightning protection is to be ensured on-site.

According to VDI 3803-1, units for weatherproof installation must not take on any static loading or replace the function of the building roof.

5.3.1 Housing separation point seal for indoor installation

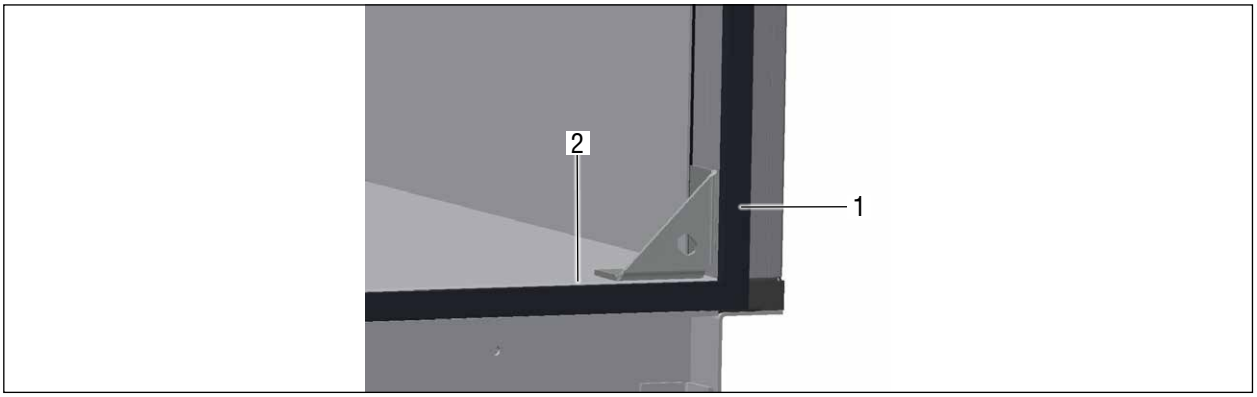


Fig. 7 Sealing of separation points

1	Sealing tape 8 x 15 mm	2	Unit inside edge

Step	Action
1	Stick the supplied sealing tapes (1) to the face ends of the unit components flush with the inner edge of the unit (2).

5.3.2 Housing separation point sealing for outdoor installation (weather-proof)

- With outdoor installation, an additional sealing strip (3 x 15) must be applied to the housing frame.

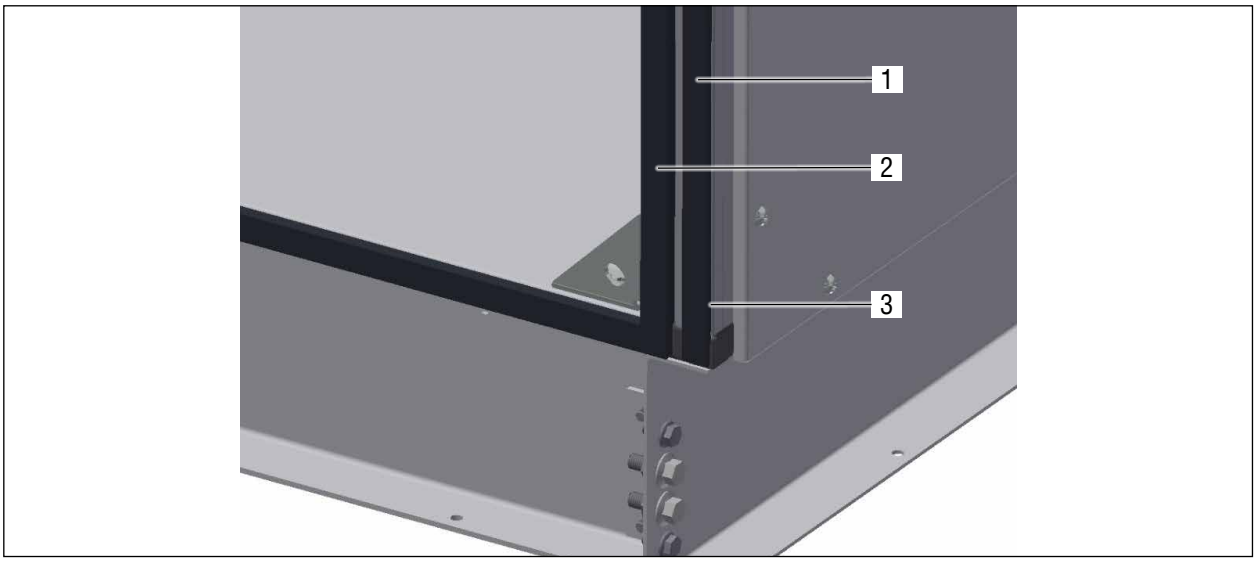


Fig. 8 Separation point sealing with outdoor installation

1	Additional sealing tape 3 x 15	3	Unit outer edge
2	Sealing tape 8 x 15		

Step	Action
1	Attach the additional sealing strip (1) to the left and right of the housing frame, flush with the outer edge of the housing (3).

5.3.3 Inside unit connections with split housing

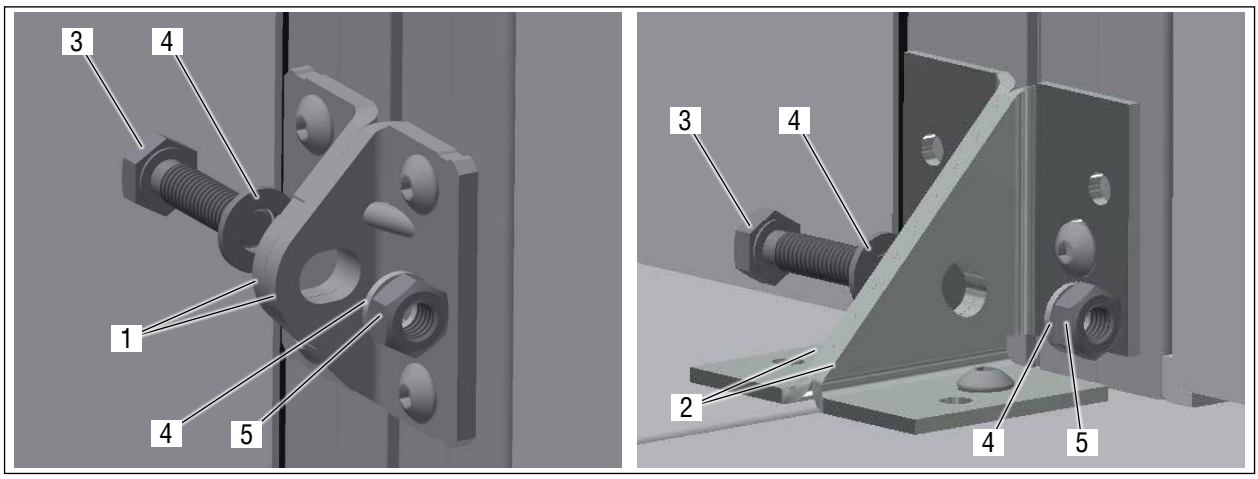


Fig. 9 Unit connections with split housing

1	Unit connections, horizontal/vertical centre	4	Washer
2	Gusset plates	5	Hexagon nut
3	Hexagon head bolt		

ATTENTION

The unit connections are used exclusively to fix the unit in its final position. They must not be used to draw the individual components together.

In the case of units with several housings, the individual housings must be assembled on-site. To do this, proceed as follows:

Step	Action
1	Position the unit modules as close to each other as possible.
2	Align the unit modules in the final housing position.
3	Draw the aligned unit modules together using suitable equipment (e.g. belts). NOTE: The unit connections are used exclusively to fix the final housing position!
4	After pulling the units together, connect them via the unit connections: Insert the hexagon head bolt (3) with washer (4) into unit connections (1) or gusset plates (2) and fix using a washer (4) and hexagon nut (5).
5	With unit versions conforming to VDI 6022, unit separation points are additionally equipped on the inside with microbially inert sealing material.

5.4 Unit connection with unit arrangement one above the other

5.4.1 Units for indoor installation

ATTENTION

The unit base frame must be additionally sealed all round with a microbially inert sealing material in the area of the mixing chambers (air-side connection) between upper and lower unit.

ATTENTION

With a length offset between the upper and lower unit components, the base frame cross profile must be screwed onto the housing cover.

With AT4F units in a weatherproof version, the base frame cross profile must also be properly sealed with a microbially inert sealing material.

Unit arrangement one above the other without length offset

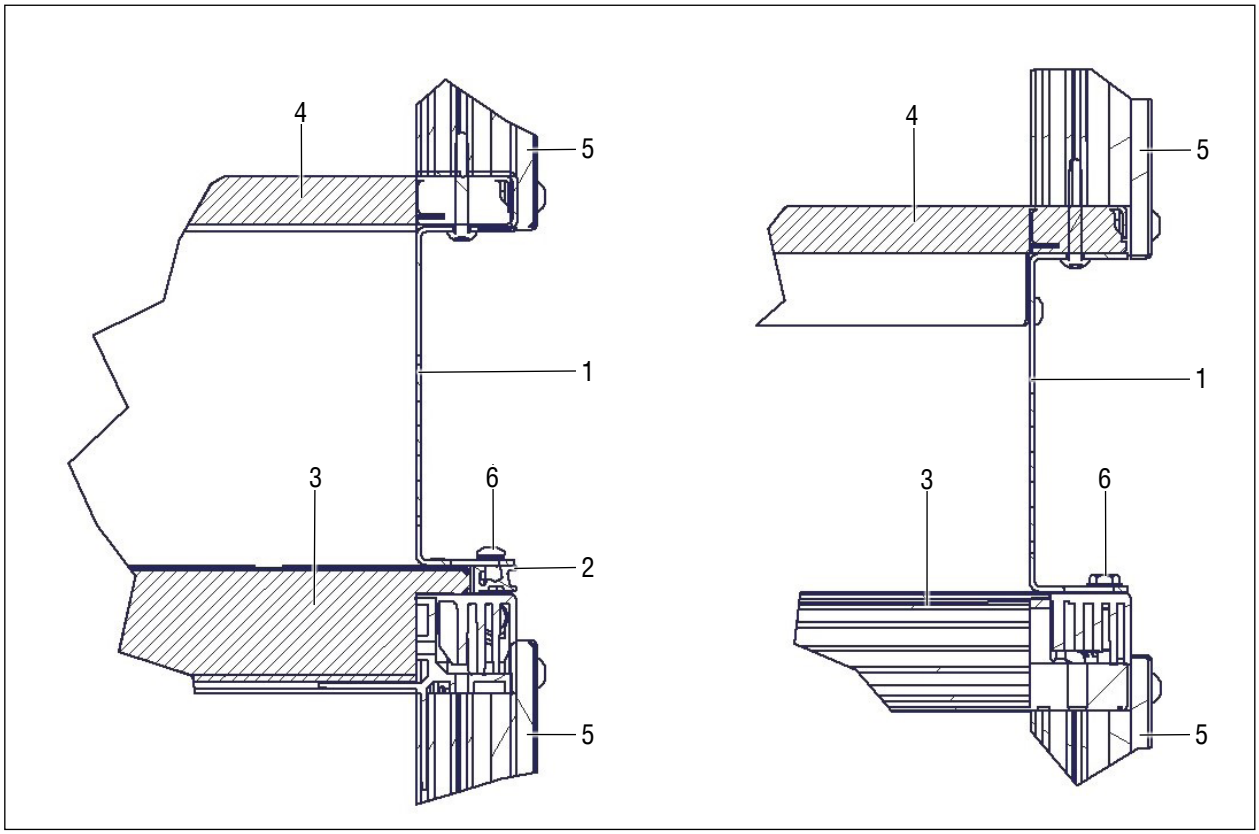


Fig. 10 Unit arrangement roof assembly with unit frame profile (left) and without unit frame profile (right)

1	Base frame	4	Floor (top unit)
2	Base frame compensation profile	5	Panel
3	Roof (lower unit)	6	Screw

Step	Action
1	On the entire unit, fit a screw (6) into each hole on the longitudinal and front sides.

Unit arrangement one above the other with length offset

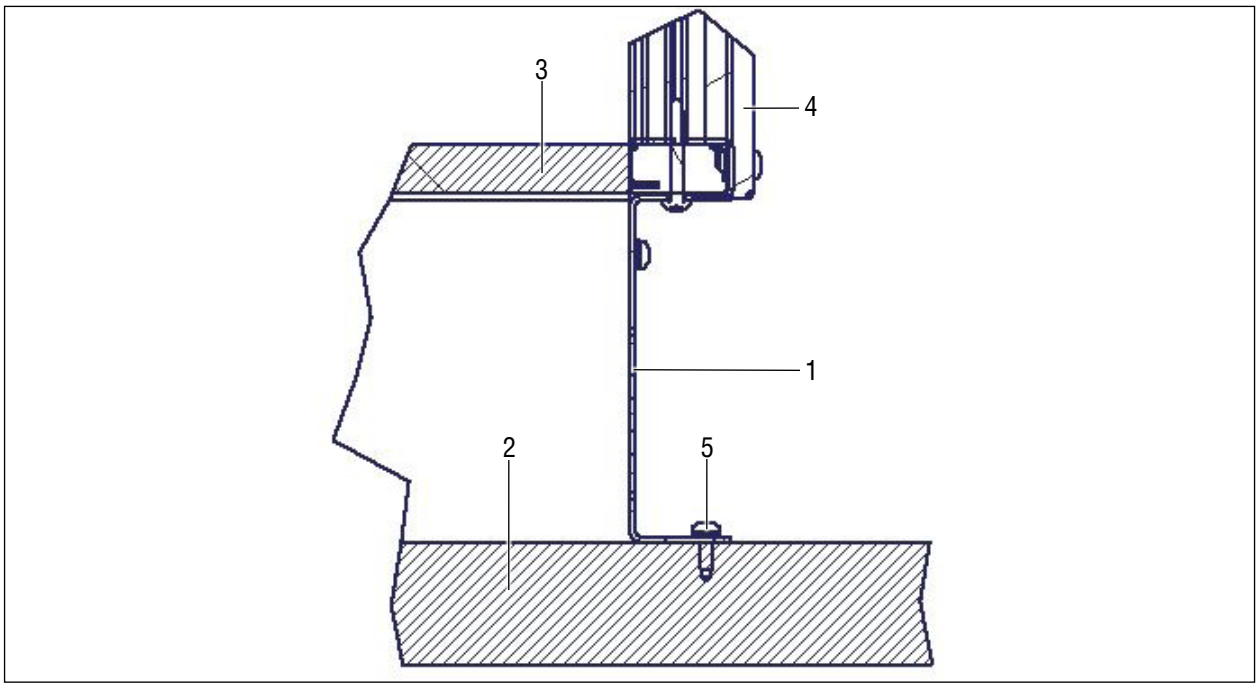


Fig. 11 Unit arrangement one above the other with length offset

1	Base frame	4	Panel
2	Roof (lower unit)	5	Screw
3	Floor (top unit)		

Step	Action
1	Place the top unit (3) on the roof of the lower unit (2) using crane transport.
2	Screw the base frame (1) to the roof of the lower unit (2) using drilling screws.
3	On the entire device, fit a screw (5) into each hole on the longitudinal and front sides.

5.4.2 Units for outdoor installation

ATTENTION

The unit base frame must be additionally sealed all round with a microbially inert sealing material in the area of the mixing chambers (air-side connection) between upper and lower unit.

ATTENTION

With a length offset between the upper and lower unit components, the base frame cross profile must be screwed onto the housing cover.

With AT4F units in a weatherproof version, the base frame cross profile must also be properly sealed with a microbially inert sealing material.

Unit arrangement one above the other without length offset

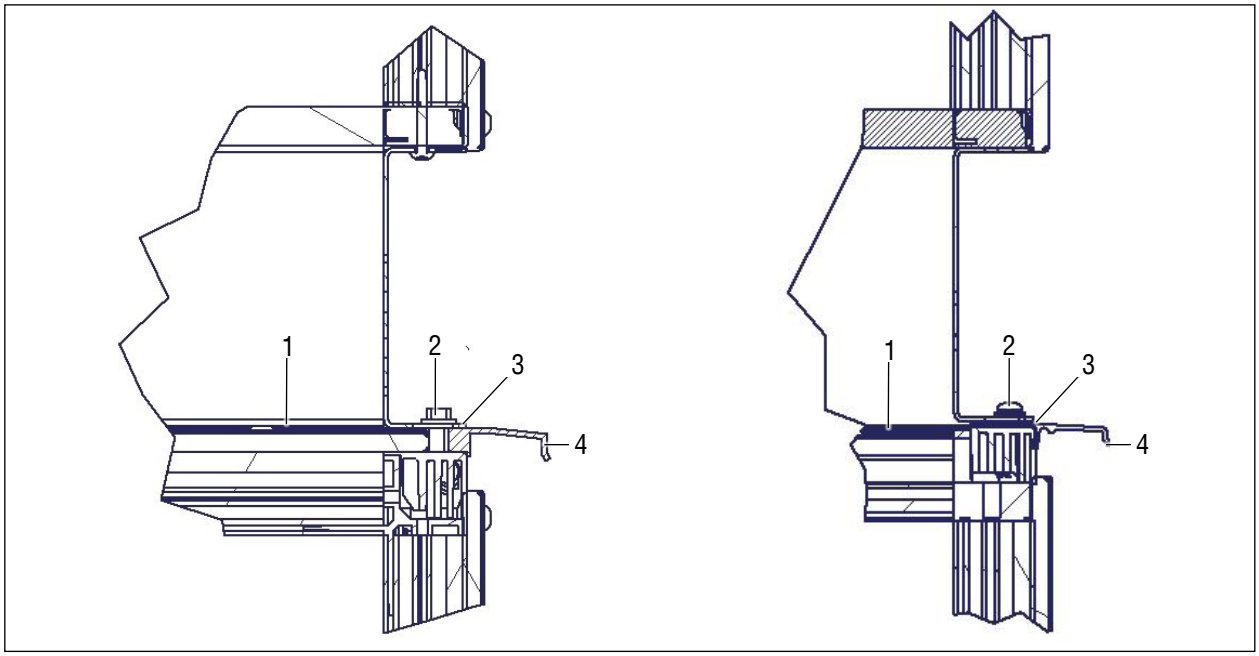


Fig. 12 Unit arrangement roof assembly with unit frame profile (left) and without unit frame profile (right)

1	Roof cladding	3	Microbially inert sealing material Sealing material (with weatherproof units)
2	Drilling screw with EPDM washer	4	Drip edge

Step	Action
1	On the entire unit, fit a screw (2) into each hole on the longitudinal and front sides.

Unit arrangement one above the other with length offset

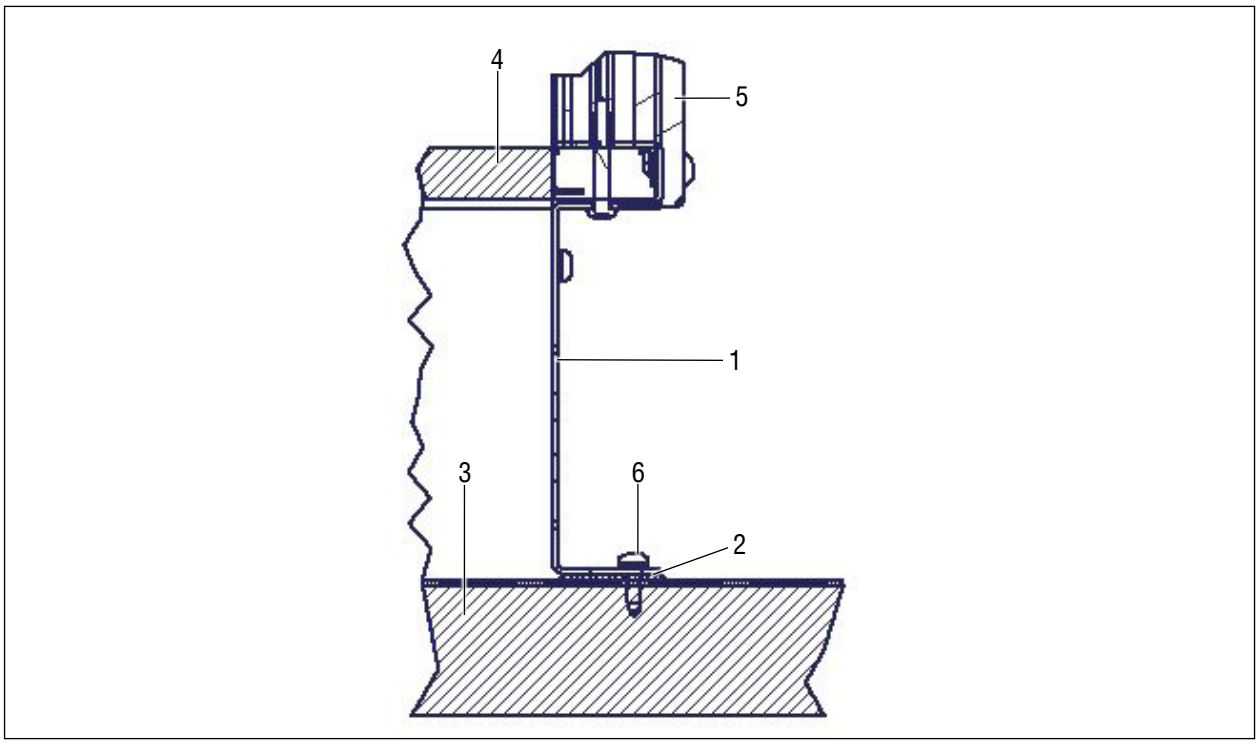


Fig. 13 Unit arrangement one above the other with length offset

1	Base frame	4	Floor (top unit)
2	Microbially inert sealing material Sealing material (with weatherproof units)	5	Panel
3	Roof (lower unit)	6	Screw

Step	Action
1	With weatherproof units, install the microbially inert sealing material (2) around the circumference before installing the top unit (4).
2	Place the top unit (4) on the roof of the lower unit (3) using crane transport.
3	Screw the base frame (1) to the roof of the lower unit (3) using drilling screws.
4	On the entire unit, fit a screw (6) into each hole on the longitudinal and front sides.

5.5 Unit connection with unit arrangement next to one another

5.5.1 Version of floor/roof assembly with unit frame profile

Unit arrangement next to one another without mixing chamber

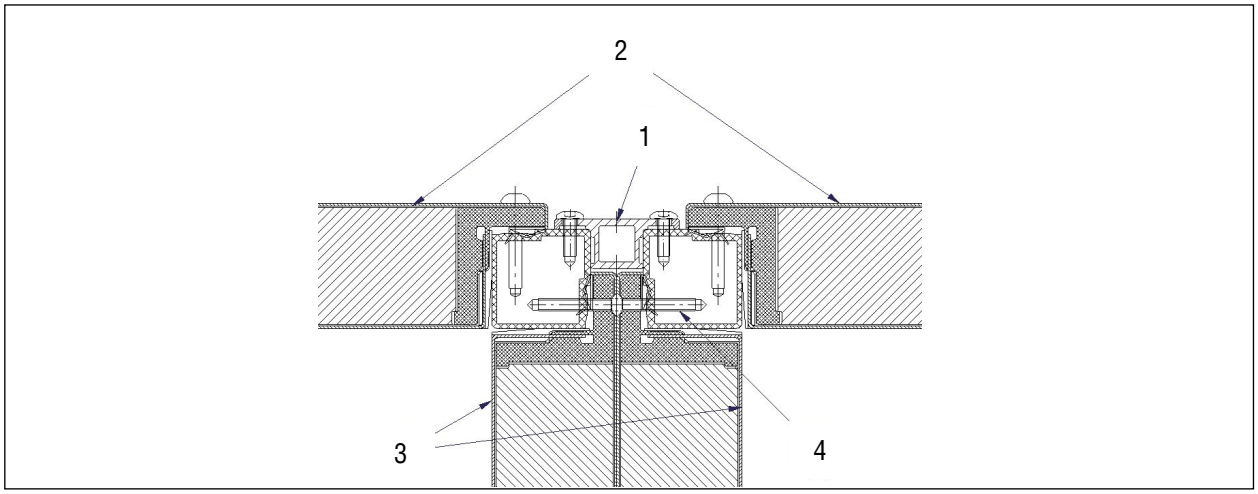


Fig. 14 Unit arrangement next to one another without mixing chamber

1	Spacer rail	3	Panel (side)
2	Panel (roof)	4	Countersunk drilling screw

Unit arrangement next to one another with mixing chamber

ATTENTION

A sealing strip (3) must be adhered around the circumference in addition to the spacer rail in the area of the mixing chambers (air-side connection). This must be tested for leakage following installation.

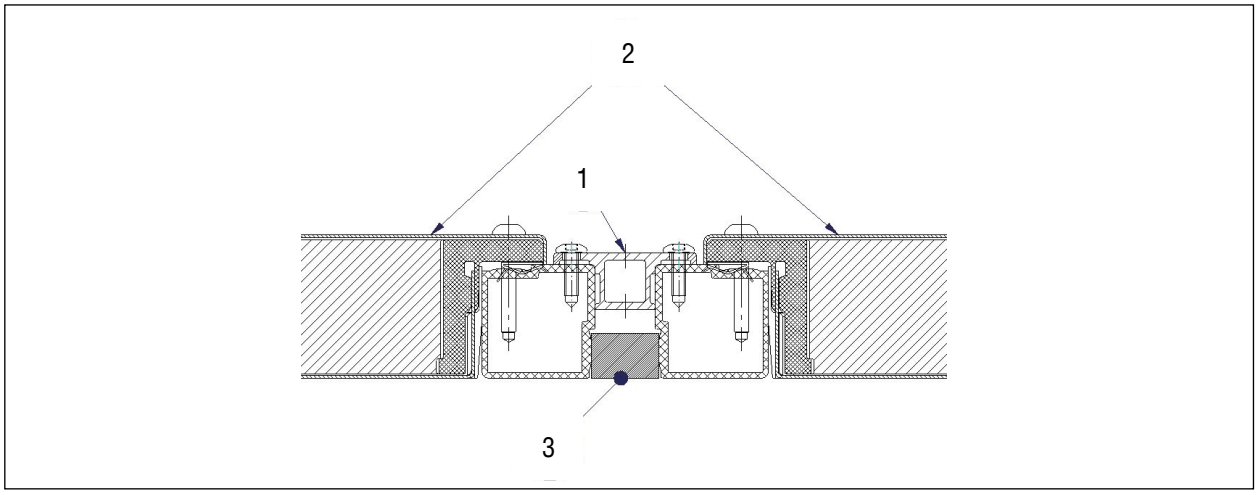


Fig. 15 Unit arrangement next to one another with mixing chamber

1	Spacer rail	3	Sealing strips
2	Panel (roof)		

Step	Action
1	Loosen the screws on the factory-fitted spacer rail (1).
2	Fit sealing strips (3) to the upper and lower inner frame edges.
3	Set down the unit components next to it using a forklift or crane.
4	Fix the spacer rail (1) using the countersunk drilling screws.

5.5.2 Version of floor/roof assembly without unit frame profile

Unit arrangement next to one another without mixing chamber

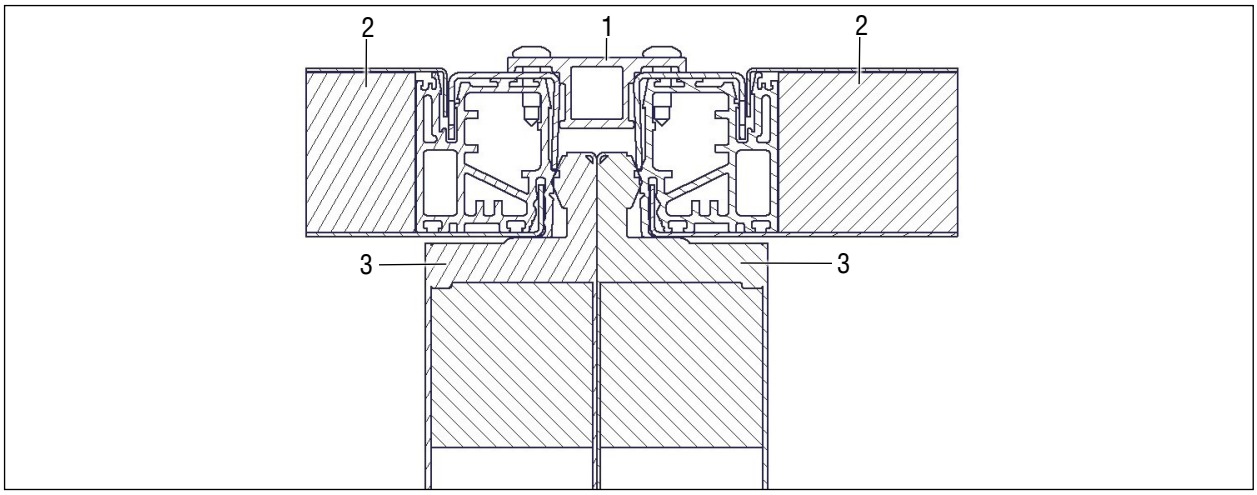


Fig. 16 Unit arrangement next to one another without mixing chamber

1	Spacer rail	3	Panel (side)
2	Panel (roof)		

Unit arrangement next to one another with mixing chamber

ATTENTION

A sealing strip (3) must be adhered around the circumference in addition to the spacer rail in the area of the mixing chambers (air-side connection). This must be tested for leakage following installation.

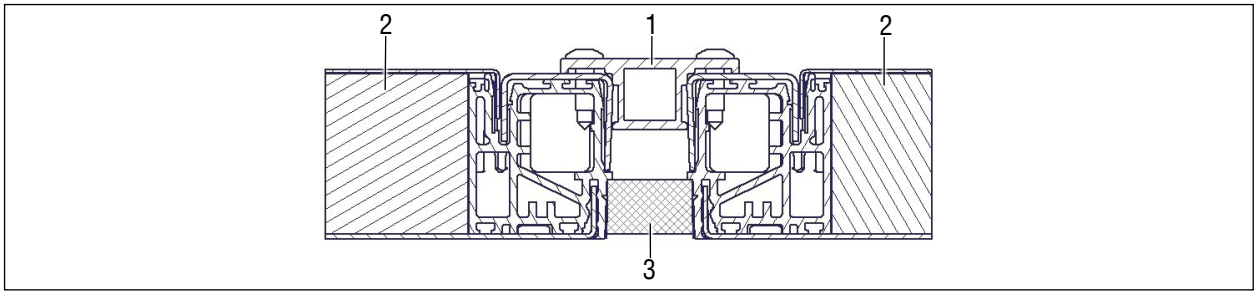


Fig. 17 Unit arrangement next to one another with mixing chamber

1	Spacer rail	3	Sealing strips
2	Panel (roof)		

Step	Action
1	Loosen the screws on the factory-fitted spacer rail (1).
2	Fit sealing strips (3) to the upper and lower inner frame edges.
3	Set down the unit components next to it using a forklift or crane.
4	Fix the spacer rail (1) using the countersunk drilling screws.

ATTENTION

With a length offset between the left and right unit components, the facing bracket must be screwed onto the housing cover.

With AT4F units in a weatherproof version, the facing bracket must also be sealed with a microbially inert sealing material.

With AT4F units in a weatherproof version, the supplied screws are additionally equipped with an EPDM sealing washer.

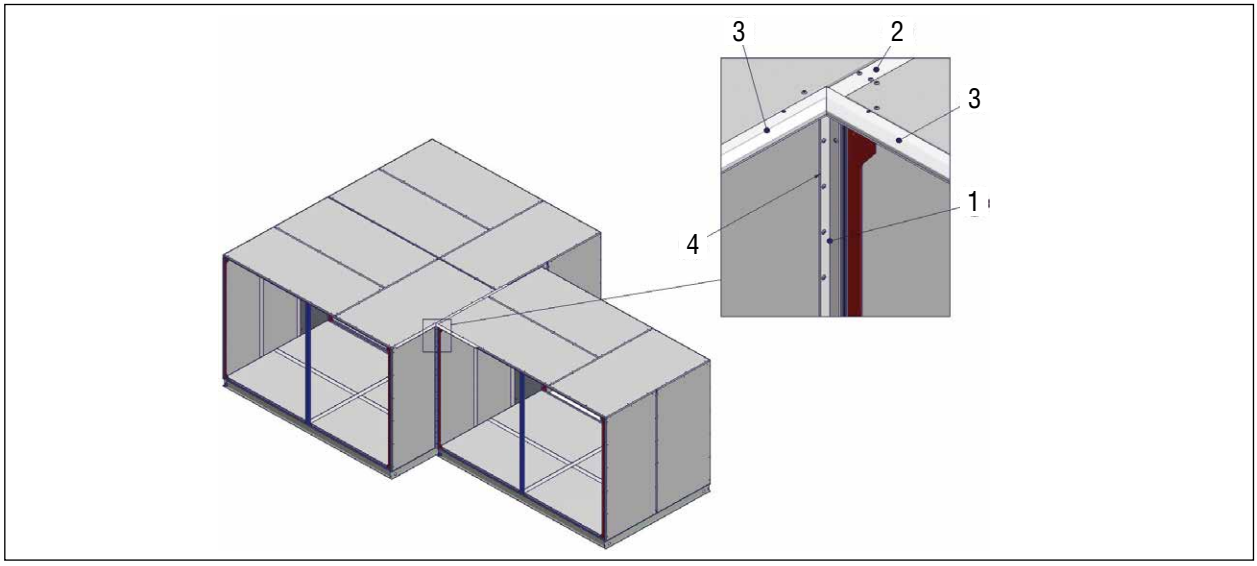


Fig. 18 Unit arrangement next to one another

1	Facing bracket	3	Drip edge (with weatherproof units)
2	Spacer rail	4	Microbially inert sealing material (with weatherproof units)

ATTENTION

If a humidifier is installed, recessed foundations are required on-site to compensate for the height difference between the humidifier tray and the base frame of the adjoining unit components.

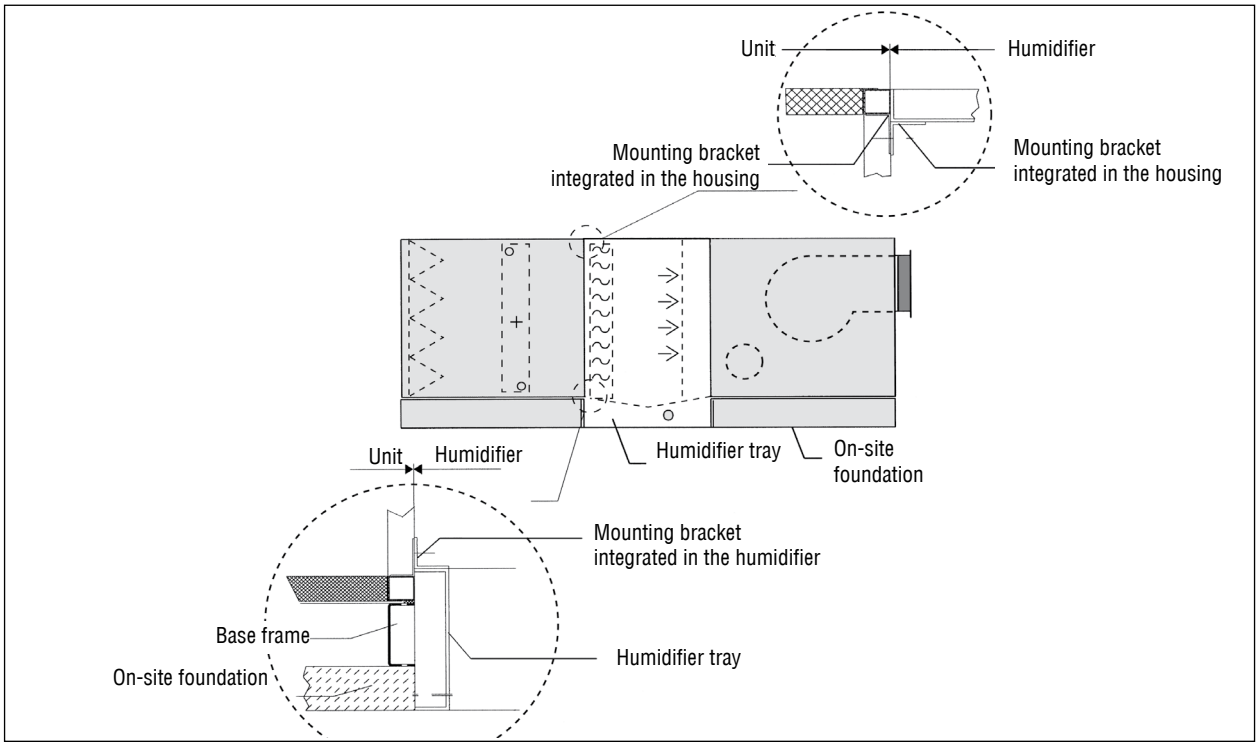


Fig. 19 Unit arrangement next to one another with humidifier

5.6 Additional measures for units for outdoor installation

ATTENTION

The sub-construction/roof must be completely closed and leak-tight before installing the unit.

5.6.1 Roof frame - floor assembly version without unit frame profile

5.6.1.1 Roof frame preassembled on-site

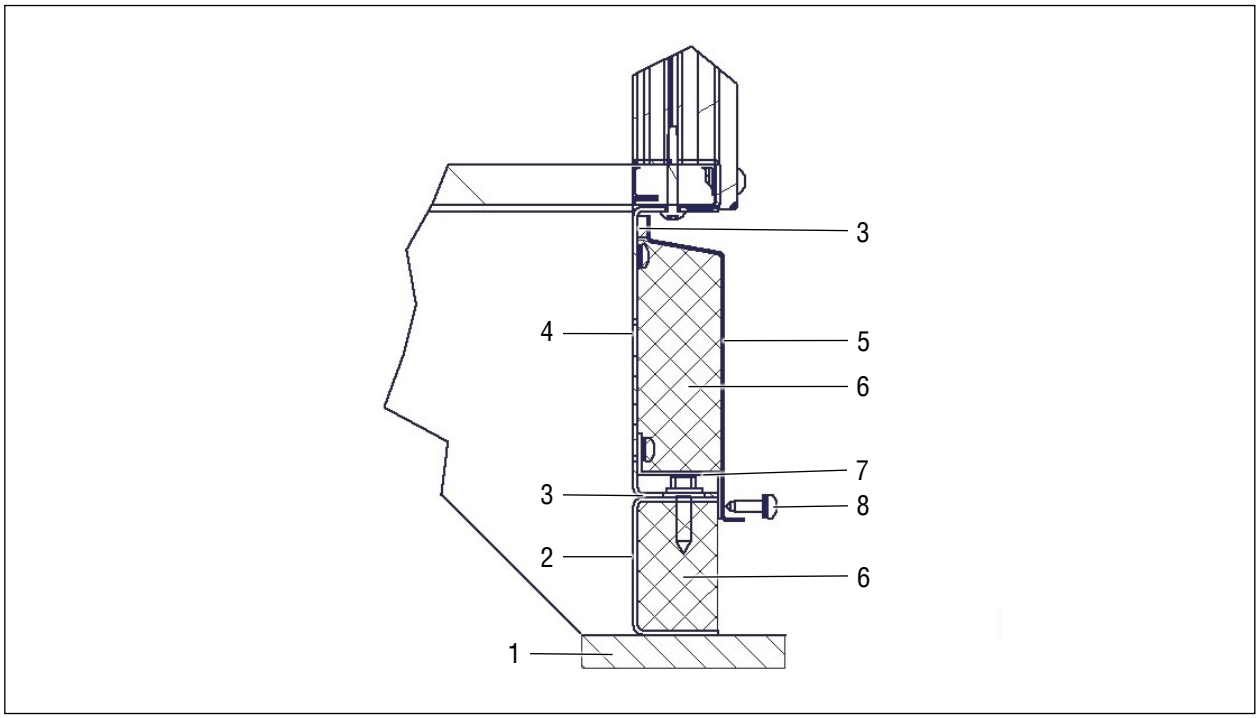


Fig. 20 Roof frame preassembled on-site

1	Foundation	5	Sheet metal apron (on-site installation)
2	Roof frame	6	On-site insulation
3	Sealing compound	7	Z-bracket (on-site installation)
4	Base frame	8	Drilling screw with EPDM washer

Step	Action
1	Place the roof frame (2) onto the foundation (1).
2	Screw the roof frame (2) onto the foundation(1).
3	Apply the sealing compound (3) to the roof frame (2).
4	Place the units onto the roof frame (2) via crane transport.
5	Screw the unit base frame (4) to the roof frame.
6	Screw the supplied Z bracket (7) to the base frame (4).
7	Attach the on-site insulation (6) in the area of the roof frame (2) and base frame (4).
8	Pull up the on-site roof membrane for sealing on the roof frame (2) and glue the raised roofing membrane onto the Z bracket (7). NOTE: If no sheet metal apron (5) is used, the roof membrane must be pulled up to below the upper base frame member (4) and glued to it.
9	For the installation of the sheet metal apron (5, optional accessories), apply the sealing compound (3) in advance to the corners of the upper base frame member (4). Then press the upper flange of the sheet metal apron (5) into the sealing compound (3).
10	Screw the sheet metal apron (5) onto the Z bracket (7). To do this, use the drilling screws with the EPDM washer (8). The openings for this are pre-punched.

5.6.1.2 Factory-mounted base frame

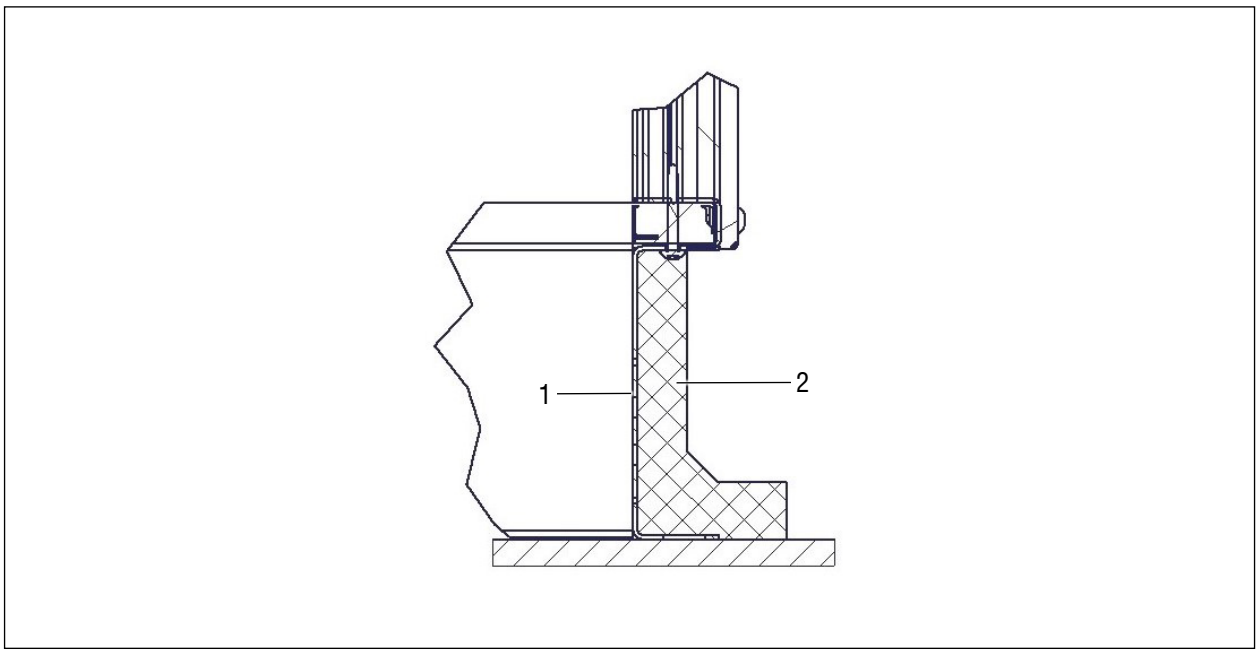


Fig. 21 Factory-mounted base frame

1	Base frame	4	Drilling screw with EPDM washer
2	On-site insulation	5	Drip edge
3	Roof cladding		

Step	Action
1	With separated modules, position the unit modules as close to each other as possible.
2	Align the unit modules in the final housing position.
3	Draw the aligned unit modules together using suitable equipment (e.g. belts). NOTE: The unit connections are used exclusively to fix the final housing position!
4	Screw the units to one another after pulling together.
5	Seal the unit separation points with microbially inert sealing material.
6	Pull up the on-site roof membrane for sealing into the base frame (1) and glue the raised roofing membrane onto the upper member of the base frame (1).

5.6.1.3 Sealing of the unit separation points with solvent welding agent for weatherproof units

The source welding agent is not included in the scope of equipment delivery of the unit, it can be purchased in the AL-KO THERM After Sales.

⚠ WARNING

Ignition hazard due to highly flammable solvent welding agent.

Liquid and vapour of the solvent welding agent are highly flammable.

- Keep ignition sources and naked flame away from the solvent welding agent.
- Observe the safety instructions on the containers. For further information, you can request the current EC safety data sheets from AL-KO THERM.

⚠ WARNING

Danger to health from inhalation of toxic fumes of the solvent welding agent.

Fumes and liquid of the solvent welding agent cause severe eye irritation.

Inhalation of the fumes may cause drowsiness and light-headedness.

- Use suitable respiratory protection and safety goggles when working with the solvent welding agent.
- Observe the safety instructions on the containers. For further information, you can request the current EC safety data sheets from AL-KO THERM.

⚠ WARNING

Risk of serious injury or death due to working without personal protective equipment!

Working on the AT4F unit without personal protective equipment can result in serious injury or death.

- Observe the safety instructions in this operating and assembly instructions.
- Use personal protective equipment at all times when working on the installation.
- Use other protective equipment according to the work carried out.

ATTENTION

Welding of the roof membrane must be started immediately after the unit installation to avoid damage.

NOTE

For outside temperatures > 10°C, the solvent welding agent or hot air dryer can be used. At lower outside temperatures, welding with the hot air dryer is to be used to seal the unit separation points.

Check the housing seal carefully.

Sealing of the roof membrane at the unit separation points

⚠ WARNING

Danger to health from inhalation of toxic fumes of the solvent welding agent.

Fumes and liquid of the solvent welding agent cause severe eye irritation.

Inhalation of the fumes may cause drowsiness and light-headedness.

- Use suitable respiratory protection and safety goggles when working with the solvent welding agent.
- Observe the safety instructions on the containers. For further information, you can request the current EC safety data sheets from AL-KO THERM.

ATTENTION

Welding of the roof membrane must be started immediately after the unit installation to avoid damage.

Unit separation point, straight

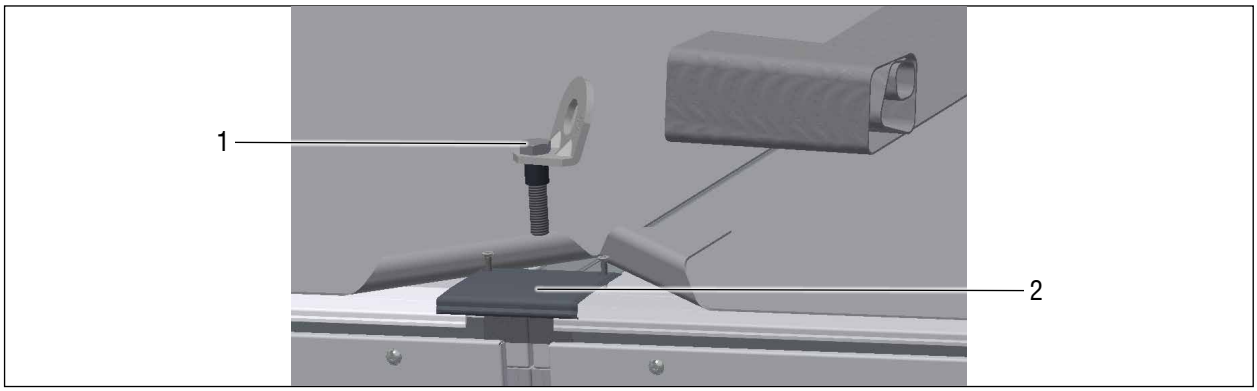


Fig. 22 Unit separation point, straight

1	Crane eyelet	2	Coupling piece fastened with screws 4.2 x 22

Step	Action
1	Check that the seal is correctly attached. See chapter “5.3.2 Housing separation point sealing for outdoor installation (weather-proof)” on page 29.
2	Remove the crane eyelet, if present (1).
3	Clean the unit roof in the unit separation area. The unit separation area must be dust-free and dry.
4	Screw on the coupling piece (2) above the drip edge.

Unit separation point, lateral offset

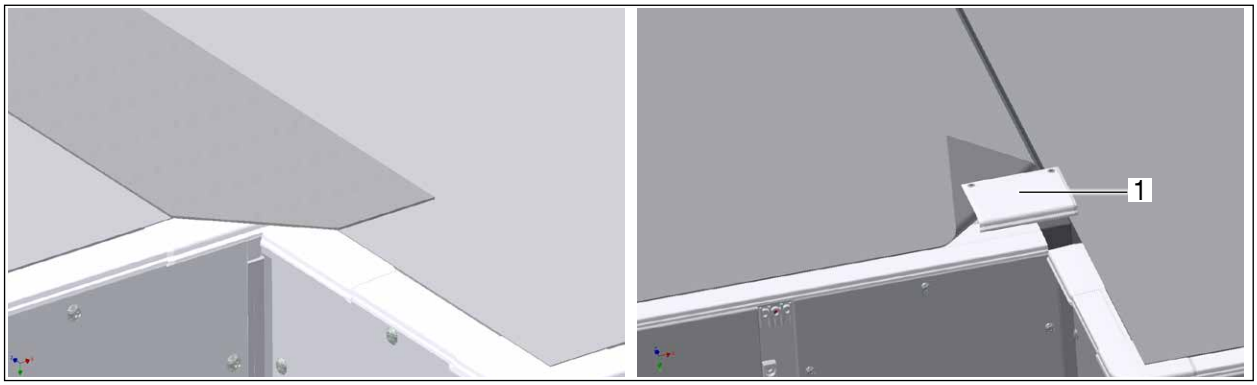


Fig. 23 Unit separation point, lateral offset

1	Coupling piece fastened with screws 4.2 x 22		

Step	Action
1	Screw on the coupling piece (1) above the drip edge.

Sealing of the unit separation points with foil strips

⚠ WARNING

Danger to health from inhalation of toxic fumes of the solvent welding agent.

Fumes and liquid of the solvent welding agent cause severe eye irritation.

Inhalation of the fumes may cause drowsiness and light-headedness.

- Use suitable respiratory protection and safety goggles when working with the solvent welding agent.
- Observe the safety instructions on the containers. For further information, you can request the current EC safety data sheets from AL-KO THERM.

ATTENTION

Welding of the foil strips must be started immediately after the unit installation to avoid damage.

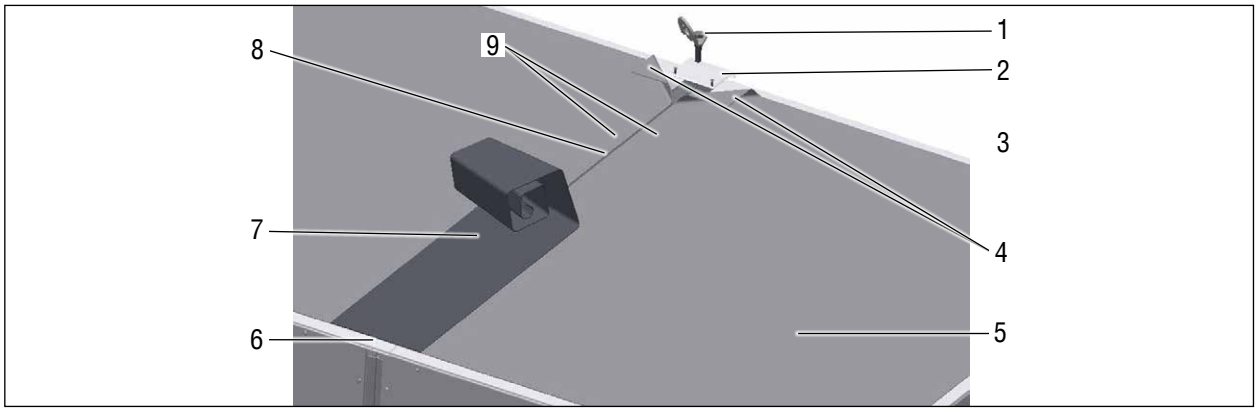


Fig. 24 Sealing of the unit separation points with foil strips

1	Crane eyelet	6	Drip edge coupling piece fitted
2	Drip edge coupling piece (screws 4.2 x 22)	7	Foil strips
3	Drip edge	8	Unit separation line
4	Free roof membrane flaps	9	Solvent welding agent application area
5	Roof membrane		

Step	Action
1	Check that the seal is correctly attached. See chapter “5.3.2 Housing separation point sealing for outdoor installation (weather-proof)” on page 29.
2	Clean the unit roof in the unit separation area using a cloth. The unit separation area must be dust-free and dry.
3	Remove the crane eyelet, if present (1).
4	For units with panel and integrated frame: Screw the drip edge coupling piece (6) to the unit separation point.
5	Clip the coupling piece at the unit separation point under the drip edge.
6	Fold away the free roof membrane flaps (4).
7	Apply the solvent welding agent using the brush in the coupling piece area (2) and in the drip edge area (3) up to the affixed roof membrane (5) to seal on the free roof membrane flaps (4).
8	Press the free roof membrane flaps (4) on securely.
9	Then apply the solvent welding agent again only in the area of the foil strips (7) (depending on the strip width).
10	Then position the foil strips (7) flush with the roof membrane attachment and roll them out.
11	Press down the joints well to avoid wrinkles.

NOTE

For outside temperatures > 10°C, the solvent welding agent or hot air dryer can be used.
At lower outside temperatures, welding with the hot air dryer is to be used to seal the unit separation points.
Check the housing seal carefully.

Weatherproof units with height offset

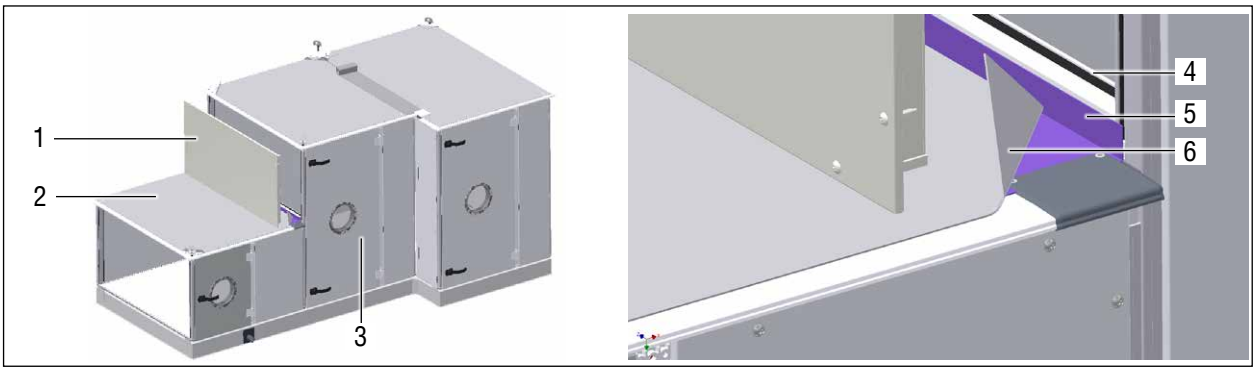


Fig. 25 Weatherproof units with height offset

1	Panel	4	Microbially inert sealing material
2	Lower component	5	Foil bracket
3	Higher component	6	Roof membrane

Step	Action
1	Before placing the components together, unscrew the panel (1) of the higher component (3).
2	Position the lower component (2).
3	Align the components.
4	Screw the components together (see chapter “5.3 Assembly of separated housing” on page 28).
5	Insert the foil bracket (5) under the roof membrane (6) and then onto the component (3).
6	Weld the foil bracket (5) to the roof membrane (6) (see chapter “5.6.1.3 Sealing of the unit separation points with solvent welding agent for weatherproof units” on page 40).
7	Seal the vertical sides and the upper horizontal edge of the foil bracket (5) with microbially inert sealing material (4).
8	Screw the unscrewed panel (1) back on. Ensure that pressure is also applied to the foil bracket (5).

Weatherproof unit with dual-function unit stacked on top

This arrangement can also occur in units with heat recovery diagonally with plate heat exchanger (WRD) or rotary heat exchanger.

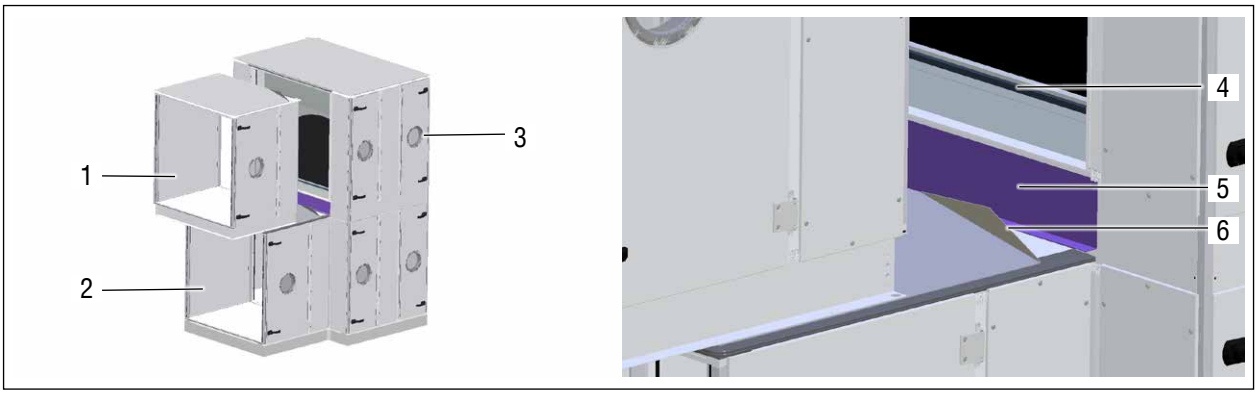


Fig. 26 Weatherproof units with dual-function units, stacked one above the other

1	Component, upper unit	4	Microbially inert sealing material
2	Component, lower unit	5	Foil bracket
3	Component with dual-function unit	6	Roof membrane

Step	Action
1	Position the component lower unit (2) and the component with dual-function unit (3) next to one another.
2	Align the components.
3	Screw the components together (see chapter “5.3 Assembly of separated housing” on page 28).
4	Insert the foil bracket (5) under the roof membrane (6) and then onto the component (3).
5	Weld the foil bracket (5) to the roof membrane (6) (see chapter “5.6.1.3 Sealing of the unit separation points with solvent welding agent for weatherproof units” on page 40).
6	Seal the vertical sides and the upper horizontal edge of the foil bracket (5) with microbially inert sealing material (4).
7	Position the component upper unit (1) onto the component with dual-function unit (3).
8	Align the components.
9	Screw the components together (see chapter “5.3 Assembly of separated housing” on page 28).

Sealing the drip edge corner

- In the case of weatherproof units, the roof membrane is factory-sealed only up to the countersunk holes at the drip edge corner.
- With the drip edge corner, the roof membrane is welded on-site (see chapter “5.6.1.3 Sealing of the unit separation points with solvent welding agent for weatherproof units” on page 40).
- If a crane eyelet is fitted, remove it beforehand.

Transport device corner

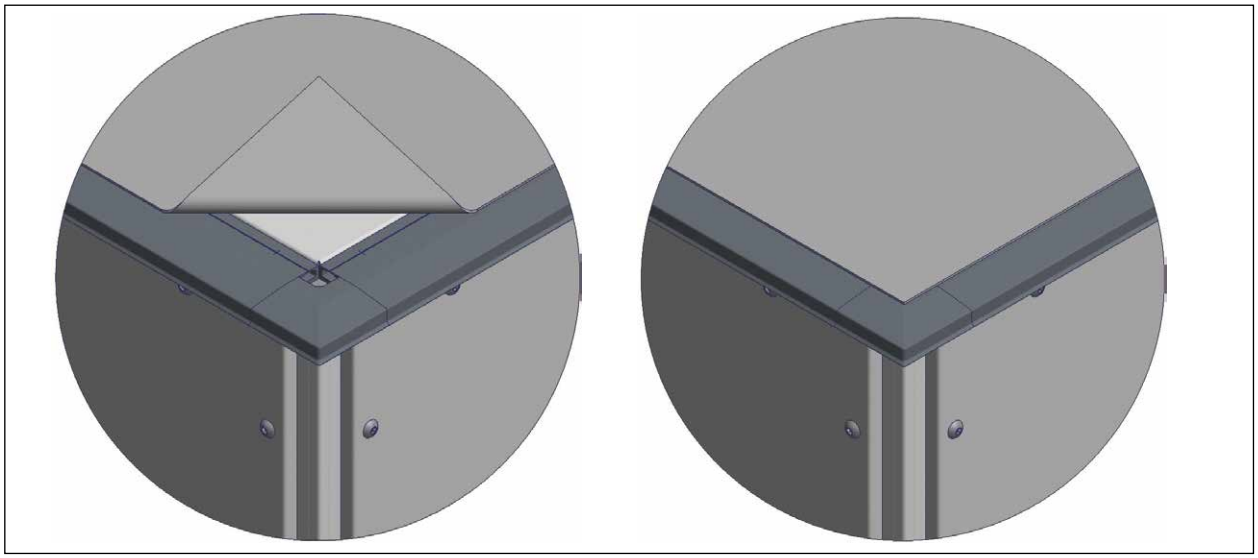


Fig. 27 Weatherproof units with transport device corners on roof assembly with unit frame profile

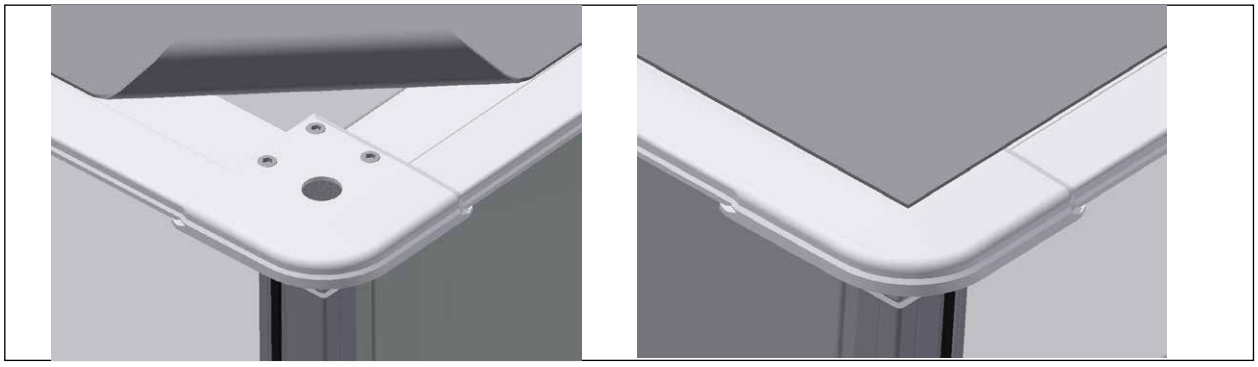


Fig. 28 Weatherproof units with transport device corners on roof assembly without unit frame profile

5.6.1.4 Sealing of the unit separation points with hot air welding for weatherproof units

⚠ WARNING

Risk of burns from hot air and hot foil.

Contact with hot air and hot, molten foil may cause burns to the limbs, especially the hands.

- When hot air welding, use your personal protective equipment and suitable protective gloves to protect your hands against burns.

Seal welding

Required temperature of the hot air	Required hot air nozzle	Pressure roller material
450°C	angled and approx. 40 mm wide	Silicone or metal

Hot air welding of sheets

- The sheets are continuously seal-welded backwards in one operation.

Hot air welding of blanks up to approx. 33 cm wide

- Blanks are first tacked and then seal-welded.

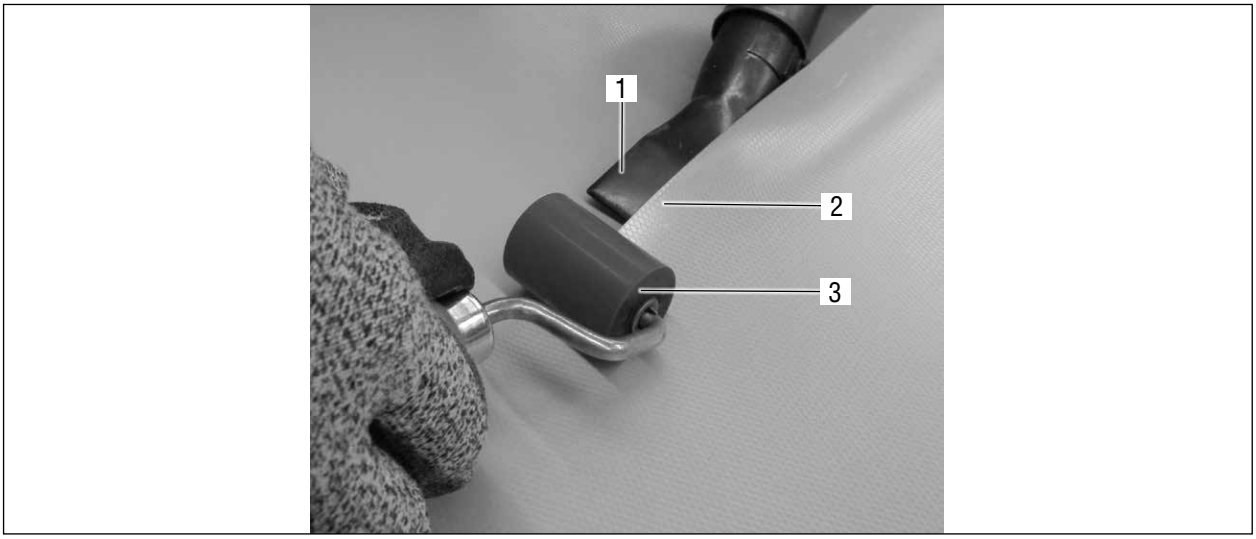


Fig. 29 Sealing of the roof membrane via hot air welding

1	Hot air nozzle	3	Pressure roller
2	Seam overlap		

Step	Action
1	Guide the nozzle of the hand welding unit (1) between the two foil sheets in the seam overlap (2). Align the angle of the nozzle approx. 45° to the edge of the membrane and approx. 30° to the roof surface.
2	Weld the foils together backwards.
3	Ensure that the lower and upper web edges are blown and plastified simultaneously. NOTE: Only insert the nozzle deeply enough that only the seam overlap is plastified.
4	Press the plastified overlap regions together with the pressure roller (3).
5	Feed the pressure roller (3) continuously.

5.7 Cable duct

The air handling units can be designed with a cable duct, which is then mounted on the individual housings. This means the customer can carry out the wiring work via the cable duct on-site, alternatively the units can also be pre-wired and delivered, depending on the design. With pre-wiring, the individual components of the unit modules are wired.

The end-to-end wiring of the individual housings to one another is carried out by the customer and is not included in the scope of delivery from AL-KO THERM.

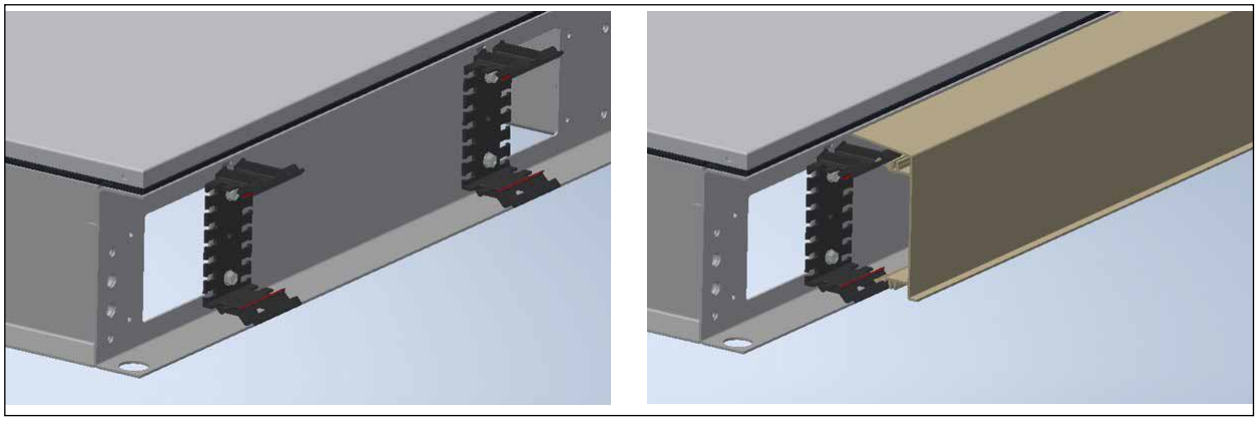


Fig. 30 Bottom part with cable duct and cable duct cover

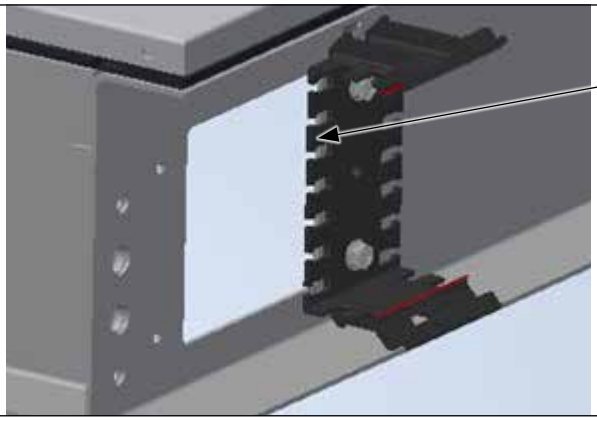


Fig. 31 Detail of cable duct clamp

Assembly of cable duct cover

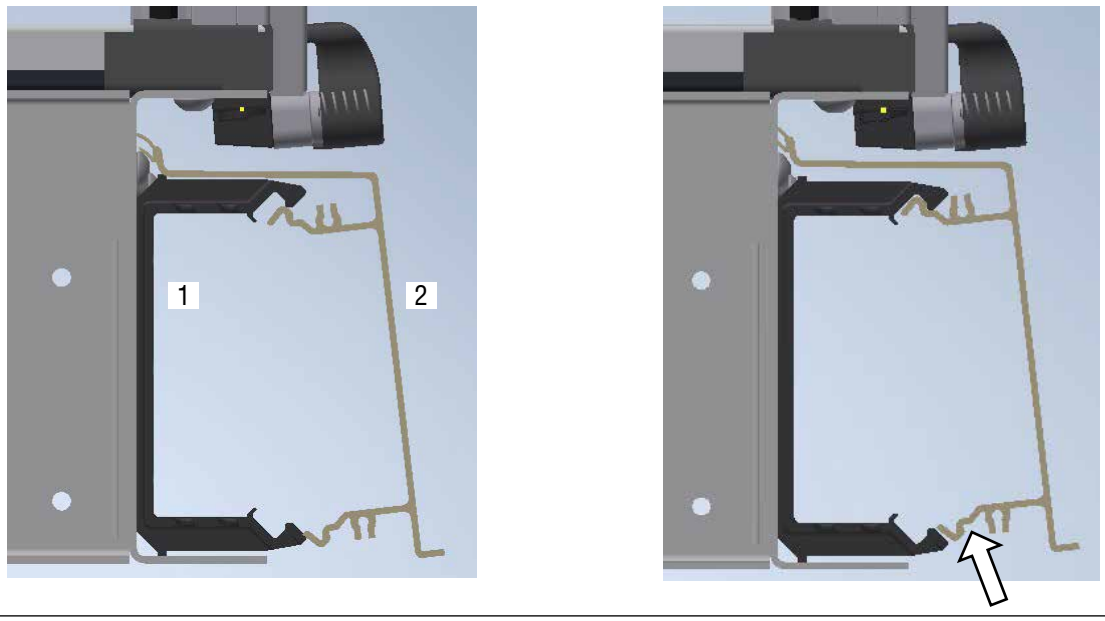


Fig. 32 Threading on the upper nose of the cable duct clamp

1	Cable duct clamp	2	Cable duct cover

Step	Action
1	Thread the cable duct cover onto the upper nose of the cable duct clamp.
2	Press on the lower member and snap in the cable duct cover.

Disassembly of cable duct cover

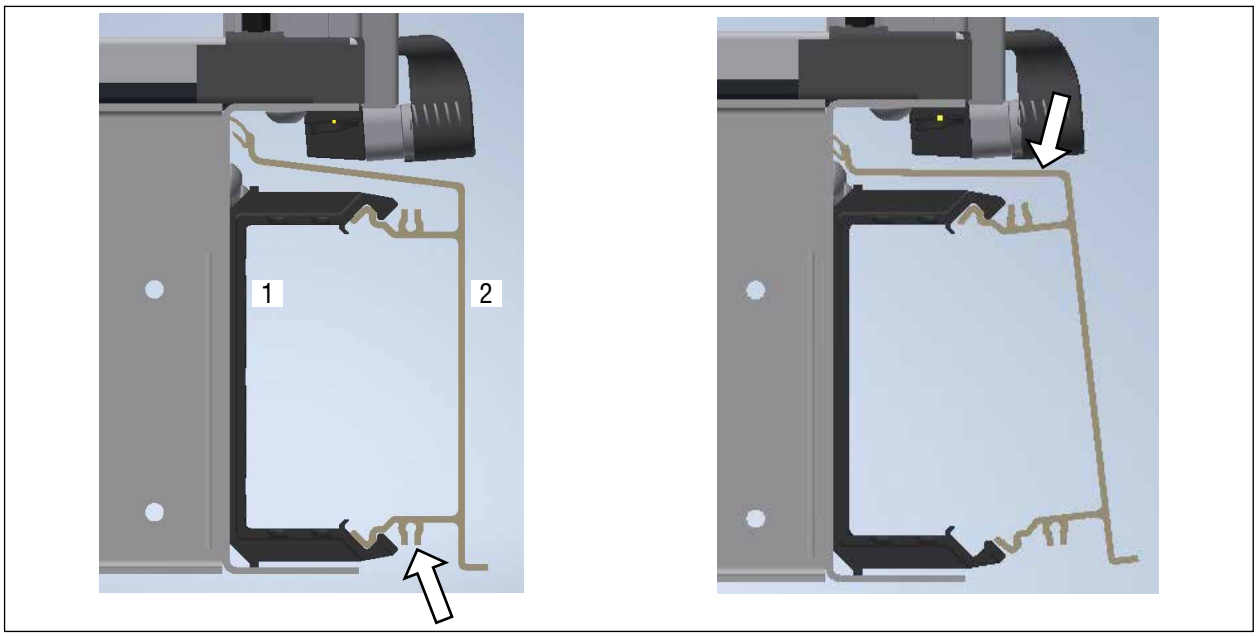


Fig. 33 Disassembly of cable duct cover

1	Cable duct clamp	2	Cable duct cover

Step	Action
1	Press the lower member and allow the cable duct cover to unlatch.
2	Gently knock the cable duct cover from above and unthread the cable duct cover.

5.8 Units with split plate heat exchanger (option)

ATTENTION

Plate heat exchangers must be assembled exactly according to the assembly instructions. The assembly instructions can be requested from customer services if necessary.

Assembly may only be performed by trained qualified staff.

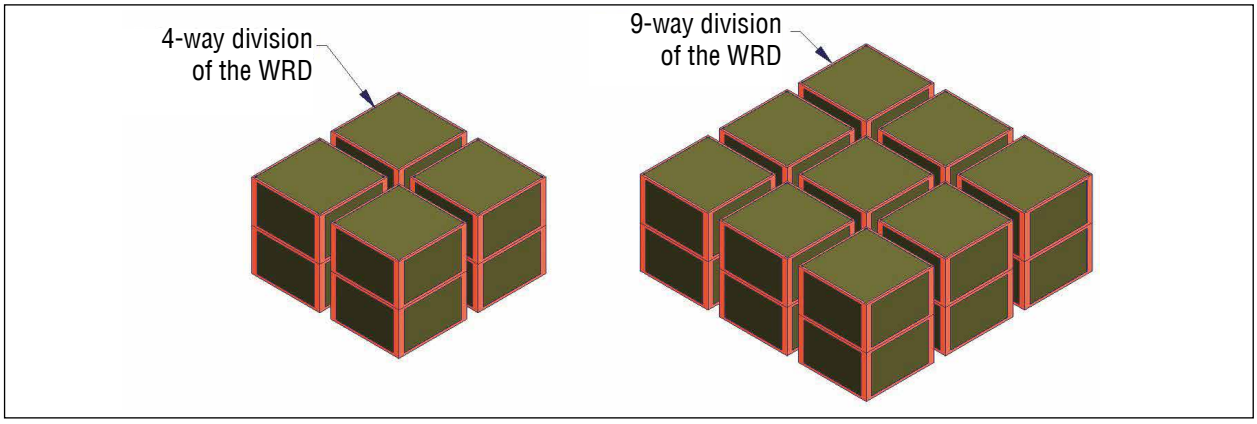


Fig. 34 Units with split plate heat exchanger

- Larger housings with plate heat exchangers are supplied in a split or disassembled version for ease of handling and transport. In this case, the plate exchangers can be supplied in one piece, split into slices or split into cubes. However, this depends on the conditions on the construction site and must be clarified in advance with the manufacturer's factory.
- These components are then assembled on-site. For this purpose, separate assembly instructions are included with the documentation.

5.9 Units with split rotary heat exchanger (option)

ATTENTION

Rotary heat exchangers must be assembled exactly according to the manufacturer's data. The assembly instructions can be requested from customer services if necessary.

Assembly may only be performed by trained qualified staff.

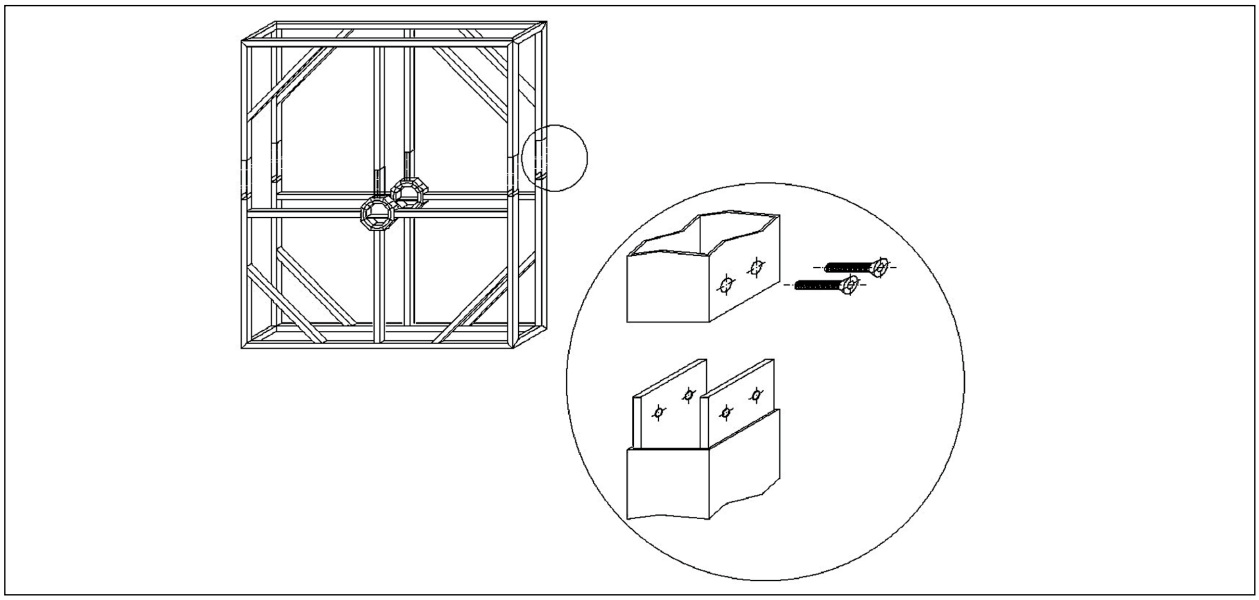


Fig. 35 Units with split rotary heat exchanger

- From a wheel diameter of 2500 mm, the rotary heat exchanger is split.
- These components are then assembled on-site.

5.10 Additional assembly instructions for hygiene and supply air handling units

ATTENTION

After installing and connecting the individual unit components together, the unit separating points incl. unit connecting angles inside the unit must be sealed with microbially inert sealing material.

- During the installation of pipes and supply lines on site, take care that the function and operation of the unit components that can be pulled out to the side are not impaired.
- Directly connecting the water drains of the “hygiene unit” to the drain system is not permissible.

5.11 Heat exchanger connection

NOTE

Vent and drain valves must be provided on-site in the pipeline.

ATTENTION

Ensure in general that the unit remains accessible for maintenance purposes. During installation, particularly of the connecting pipework, ensure that the inspection doors can always be opened.

According to VDI 6022, the retractability of the heat exchangers (and any droplet eliminators) must be ensured up to a clear unit height of 1.6 m.

For connecting a change-over heat exchanger, please consult AL-KO THERM.

5.11.1 Connection of hot water heater (option)

For heating the supply air, a pump hot water air heater (PWW) can be used. Extraction and emptying of the heat exchanger must be carried out on-site.

- The feed and return lines are to be professionally connected on-site.

NOTE

Do not mix up the feed and return lines when connecting the pipelines.

The medium inlet is located on the air outlet side (Fig. 37 Counterflow principle for heat exchanger connection).

ATTENTION

Counter-hold using a suitable tool (e.g. pipe wrench) during connection of the heat exchangers in order to avoid damage.

The limitation of the permissible heating medium temperature of the heat exchanger is to be implemented on-site by the owner/operator.

Install pipes and connections in such a way that the heat exchangers remain freely accessible for maintenance.

- Maximum working pressure: 16 bar
- Maximum hot water flow temperature: 120°C

- Valves and actuators must be installed professionally. Please note here whether a version with a 2-way or 3-way valve is to be set up.
- For electrical connection of the actuator, see the circuit diagram.

Requirements for water	Maximum working pressure	Maximum hot water flow temperature
free of corroding properties free of oxygen free of carbon dioxide	16 bar	120°C

2-way valve and 3-way valve versions

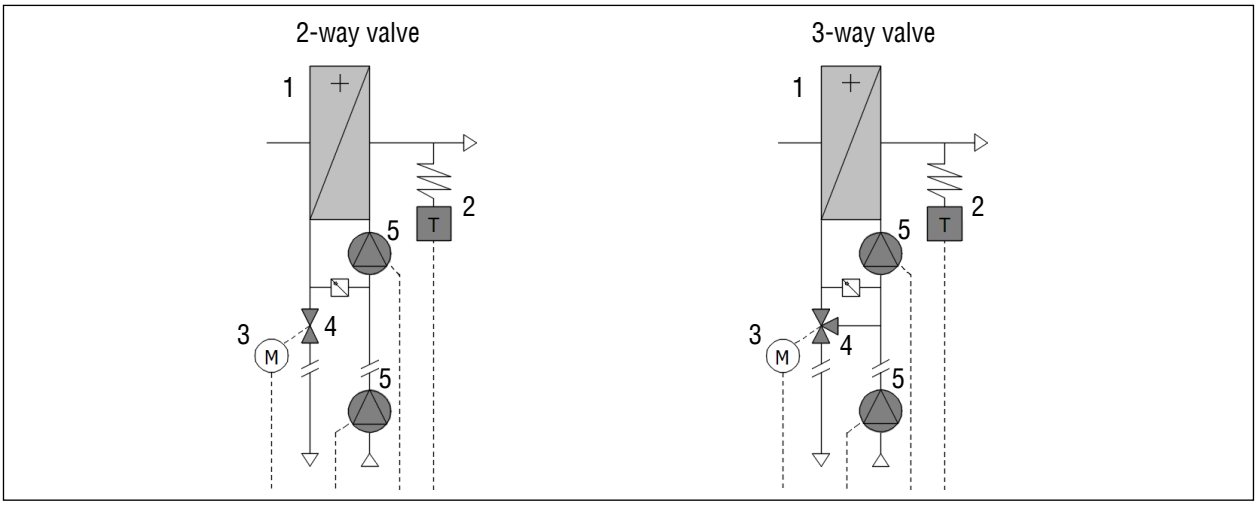


Fig. 36 2-way valve and 3-way valve connection versions

1	PWW heater	4	Valve
2	Frost monitor	5	Recirculation pump (on-site)
3	Valve actuator		

Counterflow principle for heat exchanger connection

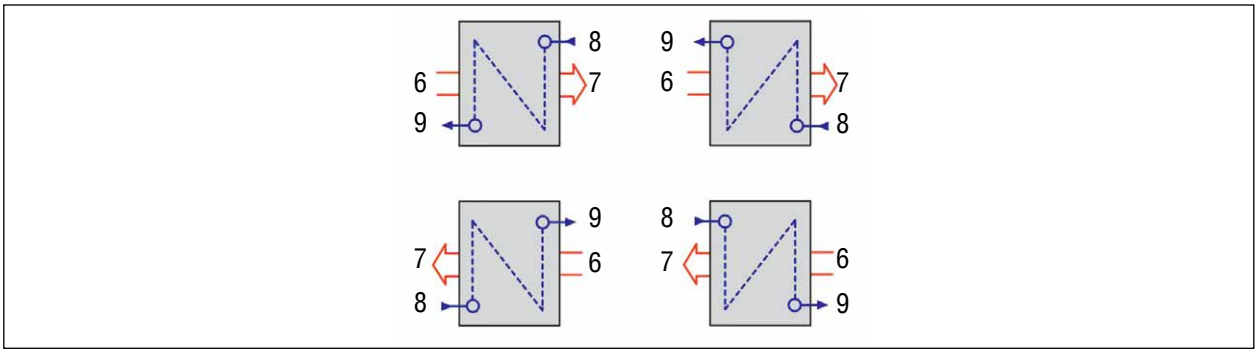


Fig. 37 Counterflow principle for heat exchanger connection

6	Air inlet	8	Media inlet
7	Air outlet	9	Media outlet

Step	Action
1	Connect the heat exchanger using the counterflow principle (water flow direction opposite the air flow direction in the unit).
2	Connect the pre flow up or down depending on the air direction.
3	Carefully vent the heat exchanger.
4	Check all of the piping for leaks.

ATTENTION

For water-filled heat exchangers, frost monitors are mandatory!
It should not be deactivated or bypassed.

NOTE

If the device version control has been selected, neither the valve nor the valve actuator are supplied. In this case, these are on-site services.

NOTE

The figure shows schematics only of the hydraulic connection of the heater. The exact hydraulic connection must be carried out at the discretion of the heating specialist.

If the heat exchanger is the last component in front of the on-site duct, a duct-side inspection opening must be provided directly on the register. This is used for inspection and cleaning.

Function

The heater is included in the control system for the room or supply air temperature. The heat output is metered by regulating the corresponding actuating valve.

ATTENTION

Measures for decommissioning:

At temperatures below freezing point, the heat exchanger must be either drained and blown out with compressed air, or filled with a commercially available antifreeze with corrosion inhibiting additive due to the risk of freezing and corrosion.

5.11.2 Connection of heater/pumps-cold water air cooler (option)

A pump hot water heater (PWW) and pump cold water air cooler (PCW) can be provided for the additional heating and cooling of the supply air.

To avoid condensate transfer into the duct, a droplet eliminator (TA) is installed behind the cooler. If a cooler is optionally retrofitted, check if a TA is to be retrofitted.

- The supply and return lines of both heat exchangers must be professionally connected.

NOTE

Do not mix up the feed and return lines when connecting the pipelines.

The medium inlet is located on the air outlet side (Fig. 39 Counterflow principle for heat exchanger connection).

ATTENTION

Counter-hold using a suitable tool (e.g. pipe wrench) during connection of the heat exchangers in order to avoid damage.

Install pipes and connections in such a way that the heat exchangers remain freely accessible for maintenance.

- Maximum working pressure: 16 bar
- Maximum hot water flow temperature: 120°C

- Valves and actuators must be installed professionally. It should be noted here whether a version with 2-way valves, 3-way valves or with a combination of 2-way and 3-way valves is used.
- For the electrical connection of the actuators, see the circuit diagram.

2-way valve, 3-way valve versions and combined 2-way and 3-way valve versions

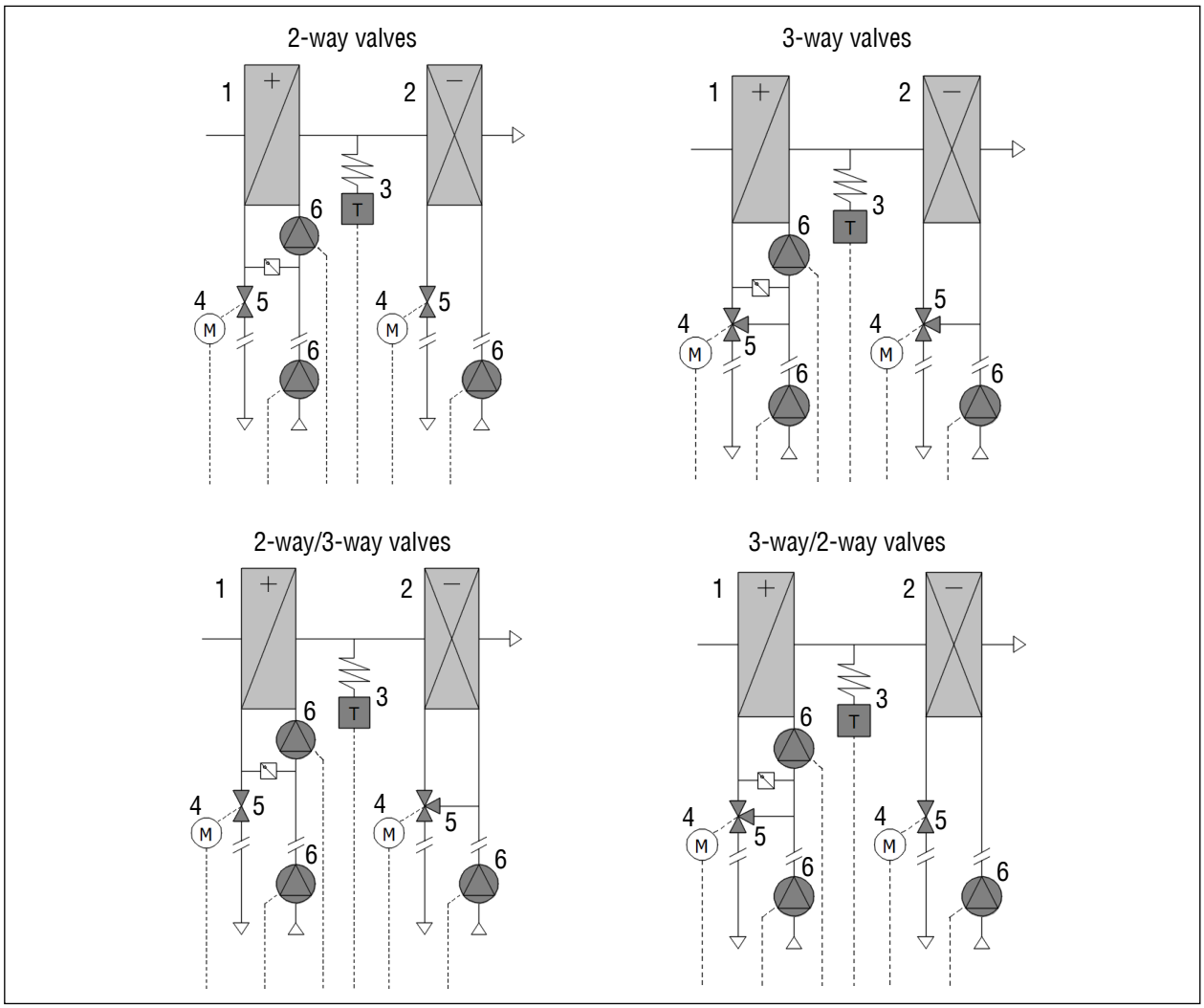


Fig. 38 2-way valve and 3-way valve connection versions

1	PWW heater	4	Valve actuator
2	PCW cooler	5	Valve
3	Frost monitor	6	Recirculation pump (on-site)

Counterflow principle for heat exchanger connection

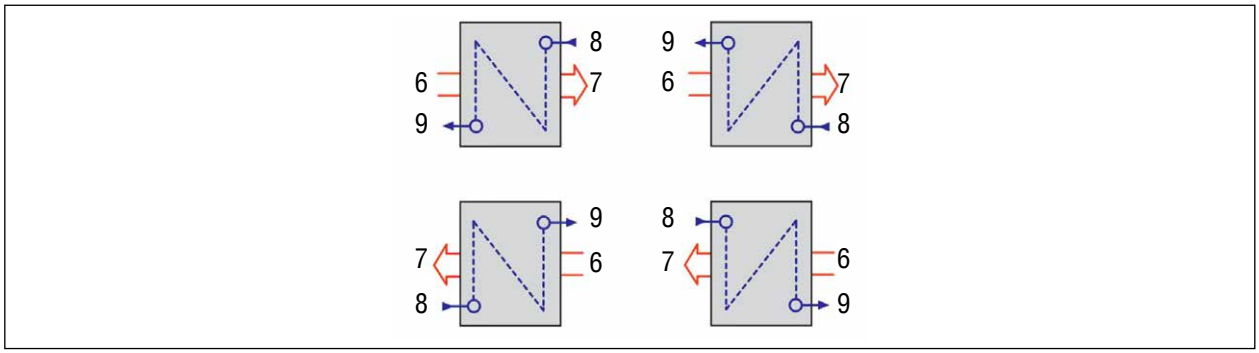


Fig. 39 Counterflow principle for heat exchanger connection

6	Air inlet	8	Media inlet
7	Air outlet	9	Media outlet

Step	Action
1	Connect the heat exchanger using the counterflow principle (water flow direction opposite the air flow direction in the unit).
2	Connect the pre flow up or down depending on the air direction.
3	Carefully vent the heat exchanger.
4	Check all of the piping for leaks.

ATTENTION

If the device version control has been selected, neither the valve nor the valve actuator are supplied. In this case, these are on-site services.

NOTE

The figure shows schematics only of the hydraulic connection of the heater.and the cooler. The exact hydraulic connection must be carried out at the discretion of the heating specialist.

If the heater/cooler module is the last component before the on-site duct, a duct-side inspection opening must be provided directly on the register/droplet eliminator. This is used for inspection and cleaning.

Function

Heater and cooler are integrated into the temperature control. The temperature is set by controlling the cold water and hot water control valves.

ATTENTION

At temperatures below freezing point, the heat exchangers must be either drained and blown out with compressed air, or filled with a commercially available antifreeze with corrosion inhibiting additive due to the risk of freezing and corrosion.

Siphon

ATTENTION

The drain pipe and the siphon are to be kept frost-proof on-site and protected against the effects of UV light.

- A siphon is also required on-site for the cooler and for the direct evaporator.
- Each pan drain must be fitted with a separate siphon.

5.11.3 Connection of pumps/cold water/air cooler (option)

For additional cooling of the supply air, a pump cold water air cooler (PKW) can be used.

If a cooler is optionally retrofitted, check if a droplet eliminator (TA) is to be retrofitted.

- The supply and return lines of both heat exchangers must be professionally connected.

NOTE

Do not mix up the feed and return lines when connecting the pipelines.

The medium inlet is located on the air outlet side (Fig. 41 Counterflow principle for heat exchanger connection).

ATTENTION

Counter-hold using a suitable tool (e.g. pipe wrench) during connection of the heat exchangers in order to avoid damage.

Install pipes and connections in such a way that the heat exchangers remain freely accessible for maintenance.

- Maximum working pressure: 16 bar
- Maximum hot water flow temperature: 120°C

- Valves and actuators must be installed professionally. Please note here whether a version with a 2-way or 3-way valve is to be implemented.
- For the electrical connection of the actuators, see the circuit diagram.

2-way valve and 3-way valve versions

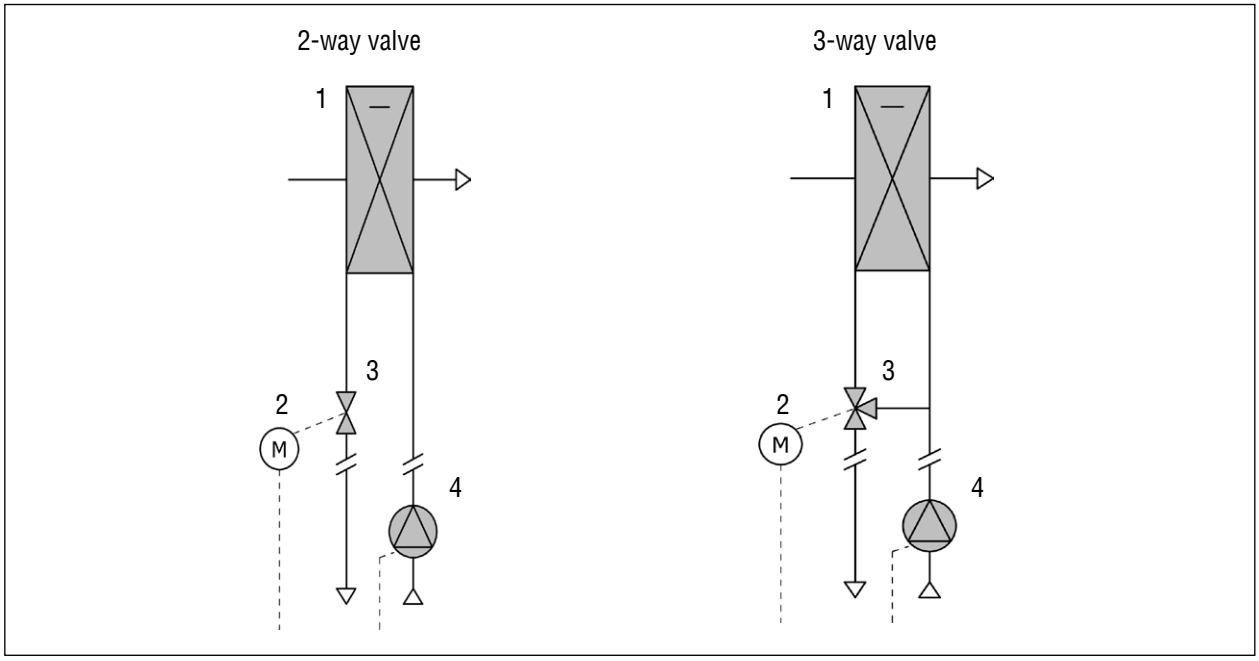


Fig. 40 2-way valve and 3-way valve connection versions

1	PCW cooler	3	Valve
2	Valve actuator	4	Recirculation pump (on-site)

Counterflow principle for heat exchanger connection

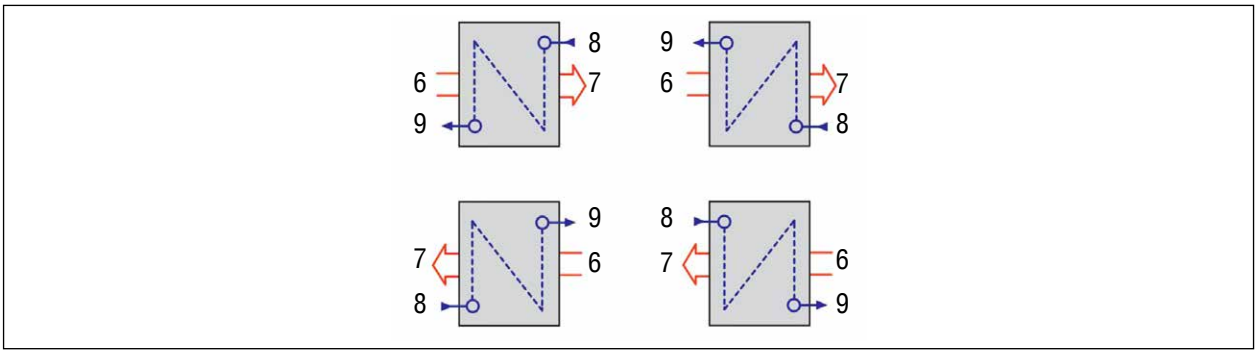


Fig. 41 Counterflow principle for heat exchanger connection

6	Air inlet	8	Media inlet
7	Air outlet	9	Media outlet

Step	Action
1	Connect the heat exchanger using the counterflow principle (water flow direction opposite the air flow direction in the unit).
2	Connect the pre flow up or down depending on the air direction.
3	Carefully vent the heat exchanger.
4	Check all of the piping for leaks.

ATTENTION

If the device version control has been selected, neither the valve nor the valve actuator are supplied. In this case, these are on-site services.

NOTE

The figure shows schematics only of the hydraulic connection of the cooler. The exact hydraulic connection must be carried out at the discretion of the heating specialist.

If the cooler module is the last component before the on-site duct, a duct-side inspection opening must be provided directly on the register/droplet eliminator. This is used for inspection and cleaning.

Function

Coolers are integrated into the temperature control. The temperature is set by controlling the cold water actuating valves.

ATTENTION

At temperatures below freezing point, the heat exchangers must be either drained and blown out with compressed air, or filled with a commercially available antifreeze with corrosion inhibiting additive due to the risk of freezing and corrosion.

Siphon

ATTENTION

The drain pipe and the siphon are to be kept frost-proof on-site and protected against the effects of UV light.

- A siphon is also required on-site for the cooler and for the direct evaporator.
- Each pan drain must be fitted with a separate siphon.

5.11.4 Steam register

⚠ WARNING

Danger of burns/scalds during filling of the heat exchanger with steam.

Danger due to contact with leaking media lines and hot surfaces.

- Perform a visual inspection of the pipelines and connections before filling.
- Wear personal protective equipment.
- Only use steam registers with pre-welding flanges for the corresponding pressure level.
- Comply with the Pressure Equipment Directive and the corresponding standards.
- The steam register is pressurised.

⚠ WARNING

Danger of bursts/explosions during filling of the heat exchanger with steam.

The steam register is pressurised. Damage to the heat exchanger can cause a risk of bursting and an explosion. This is associated with a loud bang.

- Wear your personal protective equipment during filling of the heat exchanger.
- Observe the operating and assembly instructions as well as the working instructions.
- Work with care.
- Secure the hazardous areas. Only trained persons are permitted in this area.
- Operate the heat exchanger and the steam register only at the permissible operating points.
- Check the steam register for visible damage.
- Comply with the Pressure Equipment Directive and the corresponding standards.

⚠ WARNING

Danger of slipping due to puddle formation during filling or leaking of the heat exchanger.

- Clean away puddles and even small spills immediately.
- Use suitable absorbent materials such as cloths or binders.
- Dispose of the used cloths or binders in accordance with the applicable regulations.
- Wear personal protective equipment.
- Dispose of the ingested spills in a professional manner, in accordance with local regulations.

ATTENTION

It is critical to avoid accumulated heat in the area of the steam register.

Damage caused by excessively high temperatures due to accumulated heat is excluded from the warranty.

An air flow over the hot steam register must generally be ensured.

Step	Action
1	Close the media supply at the top, and the media discharge at the bottom.
2	Check all of the piping for leaks.

5.11.5 Circulating coil system CCS (recuperative energy recovery)

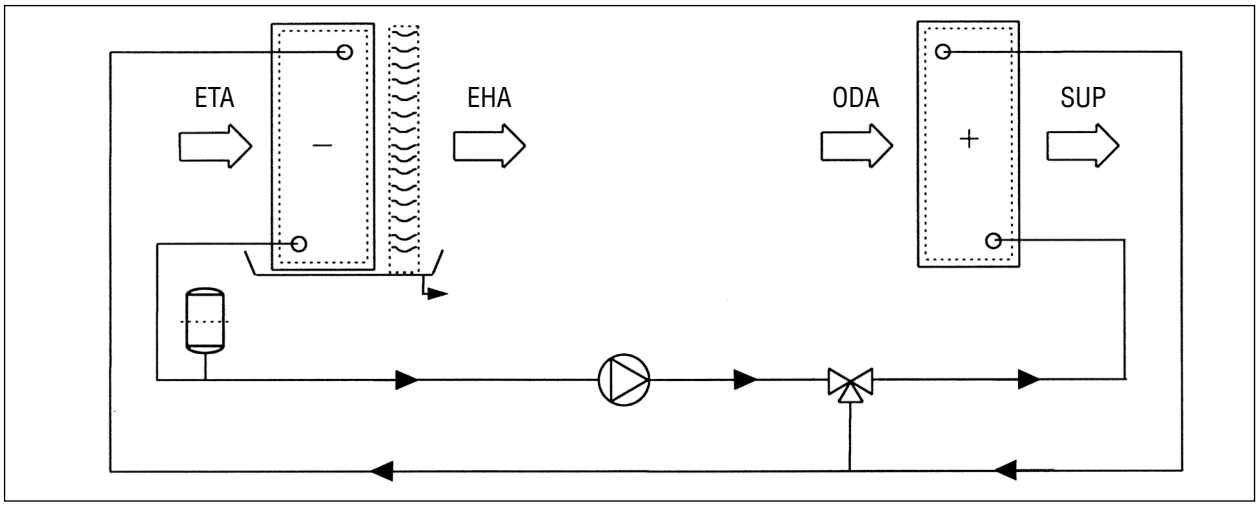


Fig. 42 Schematic diagram of a circulating coil system

EHA	Outgoing exhaust air	ODA	Outdoor air
ETA	Extract air	SUP	Supply air

With heat exchangers in a circulating coil system, the pipe circuits themselves cannot be emptied.

For this reason, the circulating coil system is only to be operated with a frost-proof water/glycol mixture and tested for leak-tightness after assembly.

If the system does have to be drained, the pipe circuits can be blown out with compressed air, although water still remains in the heat exchanger even in this case.

ATTENTION

When using high-performance circulating coil systems, observe the manufacturer's operating instructions.

ATTENTION

During commissioning, observe chapter “5.12.5 Filling and venting” on page 63.

Step	Action
1	Connect the heat exchanger using the counterflow principle (water flow direction opposite the air flow direction in the unit).
2	Connect the pre flow up or down depending on the air direction.
3	Carefully vent the heat exchanger.
4	Check all of the piping for leaks.

- Piping must be provided on-site.
- Circulating pump must be dimensioned according to the technical data sheet.
- Heat exchangers must be connected in the counterflow principle.

- Antifreeze concentration must correspond to the specifications on the technical data sheet.
- The pre flow is at the top or bottom, depending on the air direction.
- We recommend the use of the Antifrogen N with a mixture of 25 – 35 %.

5.11.6 Direct evaporator/condenser

Additional information for the use of direct evaporators:

ATTENTION

The direct evaporator must be installed by an authorised refrigeration company.
Only safety refrigerants according to DIN 8960 are permitted to be used as refrigerants.
Observe the operating instructions for cooling systems and heat pumps.

ATTENTION

For the refrigerant supply line, the cutout may have to be provided on-site.

Siphon

ATTENTION

The drain pipe and the siphon are to be kept frost-proof on-site and protected against the effects of UV light.

- A siphon is also required on-site for the cooler and for the direct evaporator.
- Each pan drain must be fitted with a separate siphon.

Air direction when installing a direct evaporator

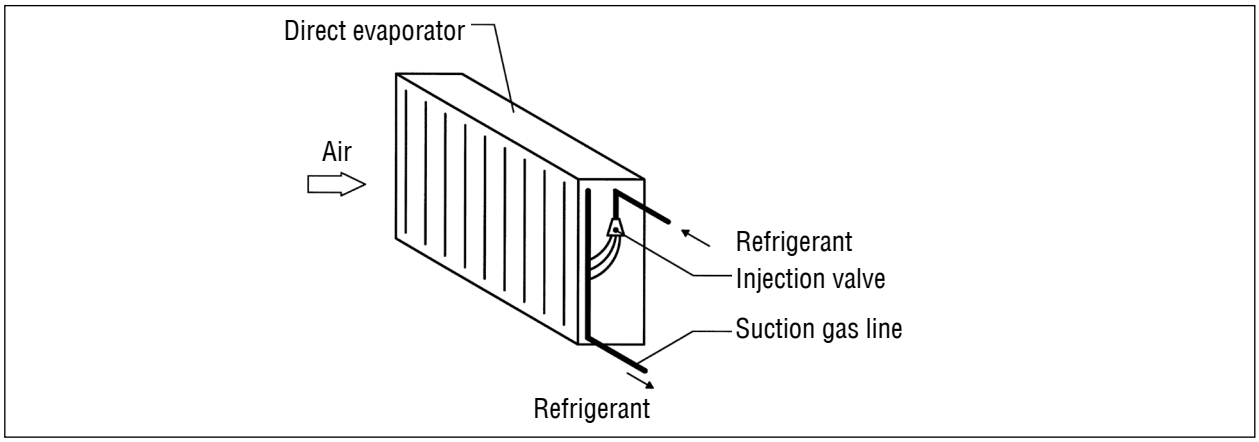


Fig. 43 Air direction when installing a direct evaporator

5.12 Mechanical connection

⚠ WARNING

Risk of crushing

When installing the duct connections as well as fittings and other intake and exhaust options, the damper must be closed. When closing the multi-leaf damper, there is a risk of crushing injuries to the hands.

- Do not reach into the damper when closing the multi-leaf damper.
- Wear personal protective equipment.

⚠ WARNING

Risk of injury due to impact, cutting or stabbing during assembly of the duct connections.

- Have installation, commissioning, servicing and maintenance work carried out only by qualified staff.
- Observe the working instructions and these operating and assembly instructions.
- Work with care.
- Use personal protective equipment at all times when working on the installation.
- Use other protective equipment according to the work carried out (cut-proof gloves).

5.12.1 Duct connection

The duct system of the ventilation directs the outdoor air to the air handling unit and as supply air into the building. The exhaust air is passed through the unit and to the outside as exhaust air for heat recovery.

Duct connectors (option)

For the AT4F air handling units, the duct connection is determined according to the order.

Optionally, both sound-decoupled sockets (connection frames) and canvas nozzles can be included.

- The connection of the ventilation ducts to the unit must be carried out professionally.
- The duct connection must be distortion-free and free of load on the AT4F air handling unit.
- Establish pre-assembled equipotential bonding on the duct.

Requirements for the duct system

In favour of efficiency, energy consumption and air performance of the unit, the pipe system must be designed for slow flow speeds and low pressure drop.

- All connections between the ventilation ducts and air handling unit must be designed and secured to fit exactly.
- Inspection openings must be provided.

Condensation protection/thermal insulation

Outdoor air and exhaust air ducts must always be well insulated to protect against condensation.

- Careful insulation of all ventilation ducts leading directly to the unit and in cold rooms/zones is particularly important. The insulation must be connected directly.
- Following unit installation or duct assembly (especially for outdoor installation of ducts leading into the building) on the unit until commissioning, the suction and discharge opening of the air handling unit must normally be closed to avoid condensation forming in the unit due to the possible overflow/throughflow of warm air. Condensate in the unit can cause damage, especially to electrical components.

5.12.2 Intake and exhaust hood (option)

- For a weatherproof version, an optional intake and exhaust hood can be ordered.
- For units without a factory-delivered intake hood, a drain tray must be provided on site at the unit inlet and in the duct.
- To avoid short-circuit currents, these position and orientation of the intake and outlet ends must be adjusted, depending on the local conditions, using the on-site duct sections. The applicable rules/standards regarding the fresh air intake and the exhaust air outlet must be complied with in this regard.

5.12.3 Condensate drain connection via siphon

- In accordance with VDI 6022, a water drain and siphon is provided on a condensate pan (recommended with back-flow protection).
- Condensate drain lines must be connected to the drain system with a siphon. Direct connection of water drains to the drain system is not permitted.

ATTENTION

The drain pipe and the siphon are to be kept frost-proof on-site and protected against the effects of UV light.

NOTE

The standing height of the respective siphon must be designed for the underpressure or overpressure of the air handling unit to prevent suction or blowing out of air from the closed drain pipe. For a weatherproof version, the pipe trace heating is to be provided. The pipeline must be protected against environmental influences.

Snake siphon (overpressure or vacuum)

The snake siphon is a siphon to be filled for draining AC units in the area of the cooler, humidifiers or other wet areas with overpressure relative to the environment.

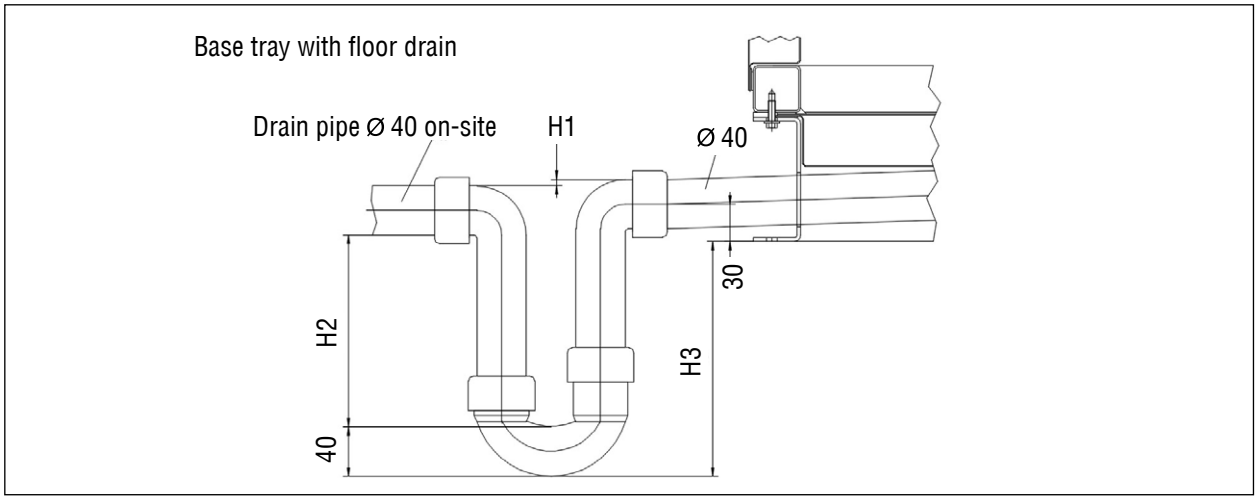


Fig. 44 Connection of the condensate drain with snake siphon

Ball siphon (overpressure)

The ball siphon is a self-filling siphon for draining coolers, steam humidifiers and other wet areas with vacuum relative to the environment. An inserted float ball prevents the suction of air in the dry operating condition, so that the first condensate produced can fill the siphon. The ball continues to act as a check valve in the event of pressure shocks in the system and prevents empty suction.

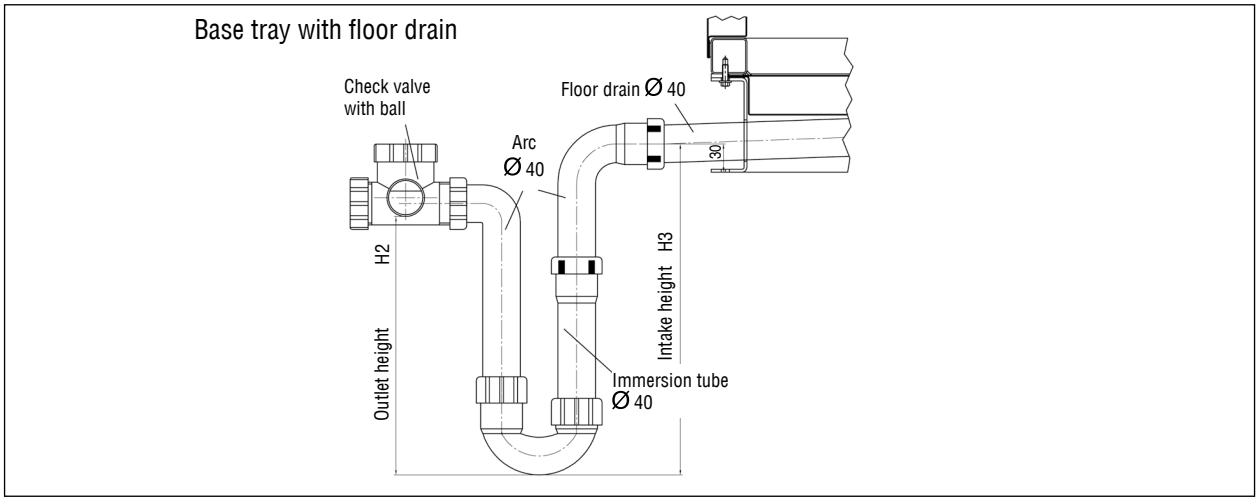


Fig. 45 Connection of the condensate drain with ball siphon with overpressure

Dimensioning of snake siphon (overpressure or vacuum) and ball siphon (overpressure)

Below 600 Pa observe min. dimensions H1 - H3.

10 Pa = 1 mmWS (water column)

Height	minimal	maximal	Overpressure up to 1900 Pa	Vacuum up to 1300 Pa
H1	0 mm	190 mm	50 mm	mmWS + 50 mm
H2	55 mm	245 mm	1.5 × mmWS + 25 mm	mmWS / 2 + 50 mm
H3	100 mm	270 mm	H2 + 40 mm	H1 + H2 - 10 mm

Ball siphon (vacuum)

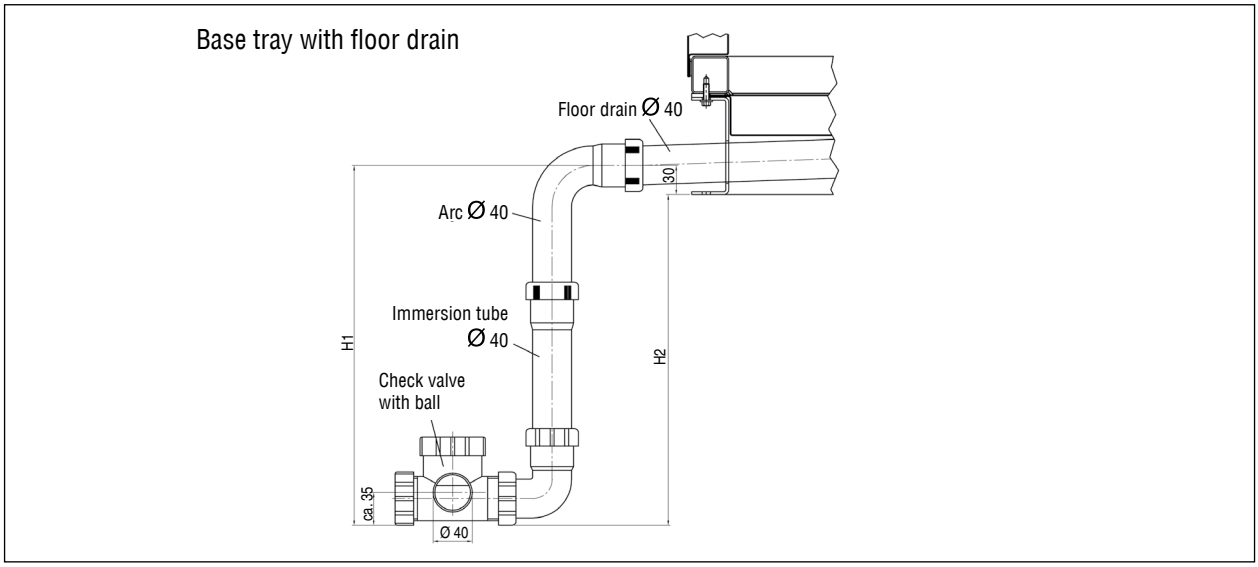


Fig. 46 Connection of the condensate drain with ball siphon with vacuum

Dimensioning of ball siphon (vacuum)

Height	minimal	maximal	Vacuum up to 3200 Pa
H1	30 mm	350 mm	mmWS + 30 mm
H2	0 mm	320 mm	mmWS

NOTE

The installation height of the siphon must be taken into account when setting up the unit.

Observe minimum dimensions H1-H3.

5.12.4 Humidifier media connections

Via these connections, the transmission media provided on-site is introduced into the humidifier.

- Please refer to the manufacturer's documentation.

5.12.5 Filling and venting

⚠ WARNING

Danger of burns/scalds during filling.

Danger due to contact with leaking media lines and hot surfaces.

- Perform a visual inspection of the pipelines and connections before filling.
- Wear personal protective equipment.

⚠ WARNING

Risk of poisoning when filling with glycol.

- Work with care.
- Avoid skin and eye contact with glycol, do not swallow glycol and observe the safety data sheet.
- Use only approved containers.
- Perform a visual inspection of the pipelines and connections before filling.
- Wear personal protective equipment.

⚠ WARNING

Danger of slipping due to puddle formation.

- Clean away puddles and even small spills immediately.
- Use suitable absorbent materials such as cloths or binders.
- Dispose of the used cloths or binders in accordance with the applicable regulations.
- Wear personal protective equipment.
- Dispose of the ingested spills in a professional manner, in accordance with local regulations.

ATTENTION

- At temperatures below freezing point, the heat exchangers must be filled with a commercially available antifreeze with corrosion inhibiting additive due to the risk of freezing and corrosion.
- The glycol content must be prepared according to the manufacturer's data.
- The glycol mixture is to be renewed after a certain operating time in accordance with the manufacturer's data.

- The glycol/water mixture must already be mixed before filling. Otherwise, subsequent mixing is not guaranteed.
- The pipe system must be resistant to the glycol/water mixture used.
- The pipeline system must be carefully and completely vented via the ventilation unit provided on-site.

5.13 Electrical connection

⚠ DANGER

Hazard due to electric current.

Incorrect connection to the energy supply or incorrect installation of electrical components can result in electric shock.

- Only have the electrical connection carried out by an approved electrician.
- Perform the connection exactly according to the circuit diagram and the assignment plan.
- Observe the valid DIN and VDE regulations.
- Observe the directives of the local energy supply company.
- Use personal protective equipment at all times when working on the installation.
- Use other protective equipment according to the work carried out.
- Do not operate the unit with defective or damaged cables or plugs.
- Regularly check the connection cables for damaged areas.
- Use only the permissible tool.
- Shut off the energy supply for maintenance work and secure it to prevent restart.
- Observe the electrical safety regulations.

⚠ WARNING

Risk of injuries due to incorrect or faulty connection.

- Electrical connections must only be undertaken by a certified electrician under consideration of the valid DIN and VDE regulations as well as the directives of the local energy supply company.
- Only have assembly, servicing and maintenance carried out by qualified staff.
- Wear personal protective equipment.

ATTENTION

Main switch or repair switch

It must be possible to shut down the supply line on all poles via a main switch and/or a repair switch.

The operating and assembly instructions for the individual field devices must be observed.

- For the electrical connection, also observe the points under “2.3 General safety instructions” on page 12, in particular chapter “7.3.11 Electric motor” on page 111.
- Check that the data on the type plate matches the connection data.
- After completion of the electrical connection work, a safety inspection of the installation must be carried out in accordance with VDE 0701 Part 1 and VDE 0702.

5.13.1 Electric motor

ATTENTION

Electric motors with a nominal output of 3 kW or more must be operated with star-delta starting. Increased switching frequencies (“cycling”) of the motors lead to premature malfunctions.

- Wire the motor according to the supplied circuit diagrams.
- Measure the power consumption on all three phases and compare the measured values with the values on the motor type plate.

ATTENTION

- Wiring must be carried out according to DIN VDE 0100-100, DIN EN 60204-1 (DIN VDE 0113) and DIN EN 50156-1 (DIN VDE 0116).
- Motor wiring must be designed so that the motor can be moved to the V-belt tension.
- The power consumption may only be measured with the maintenance doors and maintenance panels closed due to the risk of overloading the motor. The power consumption must not exceed the specified nominal current.
- With multistep motors, operation via a frequency converter is not permitted.
- If the motor is speed-controlled, the frequency converter can also be used to evaluate the PTC thermistor.
- All other motors must be protected with an overload circuit breaker.
- For adjustable motors, the maximum power consumption of the transformer and the motor must not be exceeded. For adjustable motors, the motor protection must be dimensioned accordingly.
- All electrical clamping points must be retightened.
- If the motor is operated via a FC or EC technology, the combination can be secured using a residual current circuit breaker. For this purpose, an all-current sensitive residual current circuit must be selected.
- It is imperative that the motor is integrated into the on-site equipotential bonding system with low impedance.

NOTE

The operating and assembly instructions of the motor manufacturer must be observed.

5.13.1.1 Connection of three-phase motors

ATTENTION

Do not switch the upper speed directly. Observe the wiring diagram in the motor terminal box for motors with PTC thermistor or thermal contact.

Circuit for one speed

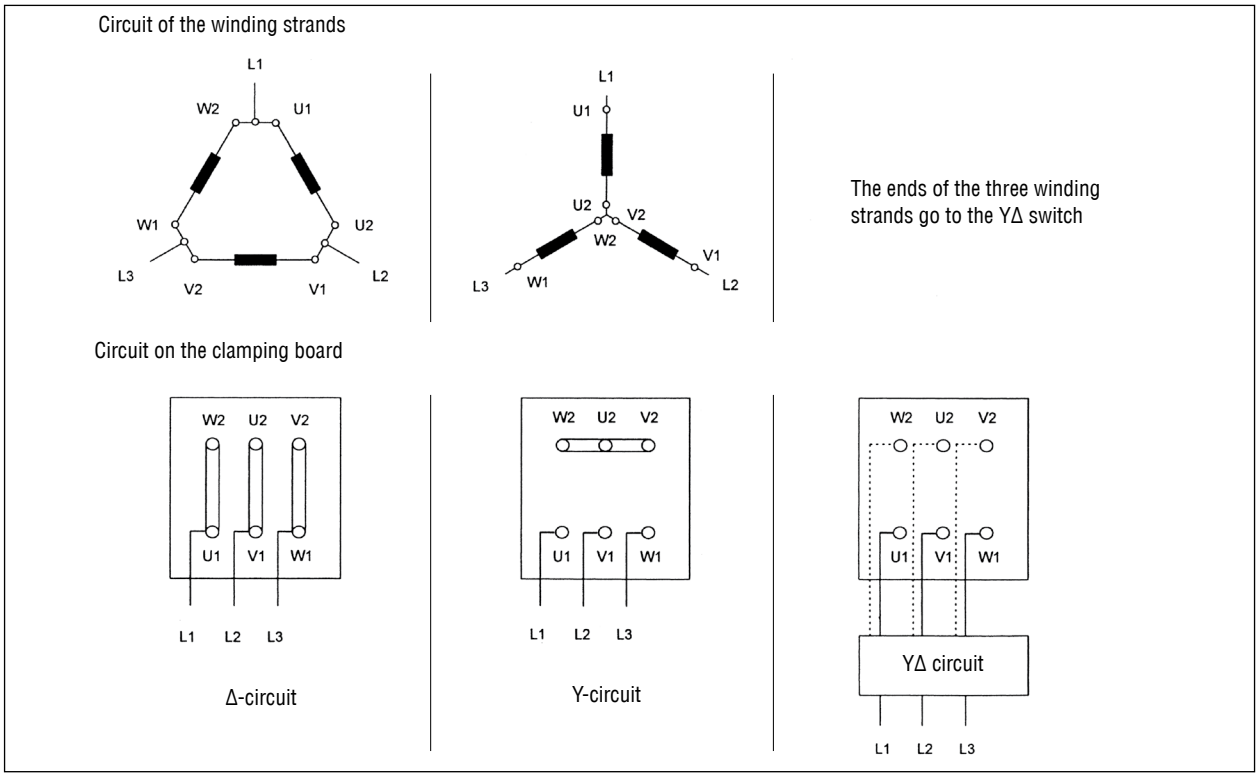


Fig. 47 Circuit of three-phase motors for one speed

Circuits for two speeds in the ratio 1 : 2 (winding in the Dahlander pole changing)

Version e.g. for 1500/3000 rpm or 4-/2-pole or 750/1500 rpm or 8-/4-pole

In motors with Dahlander pole changing, the six winding ends 1U, 1V, 1W and 2U, 2V, 2W are connected to the six terminals of the clamping board of a normal motor terminal box.

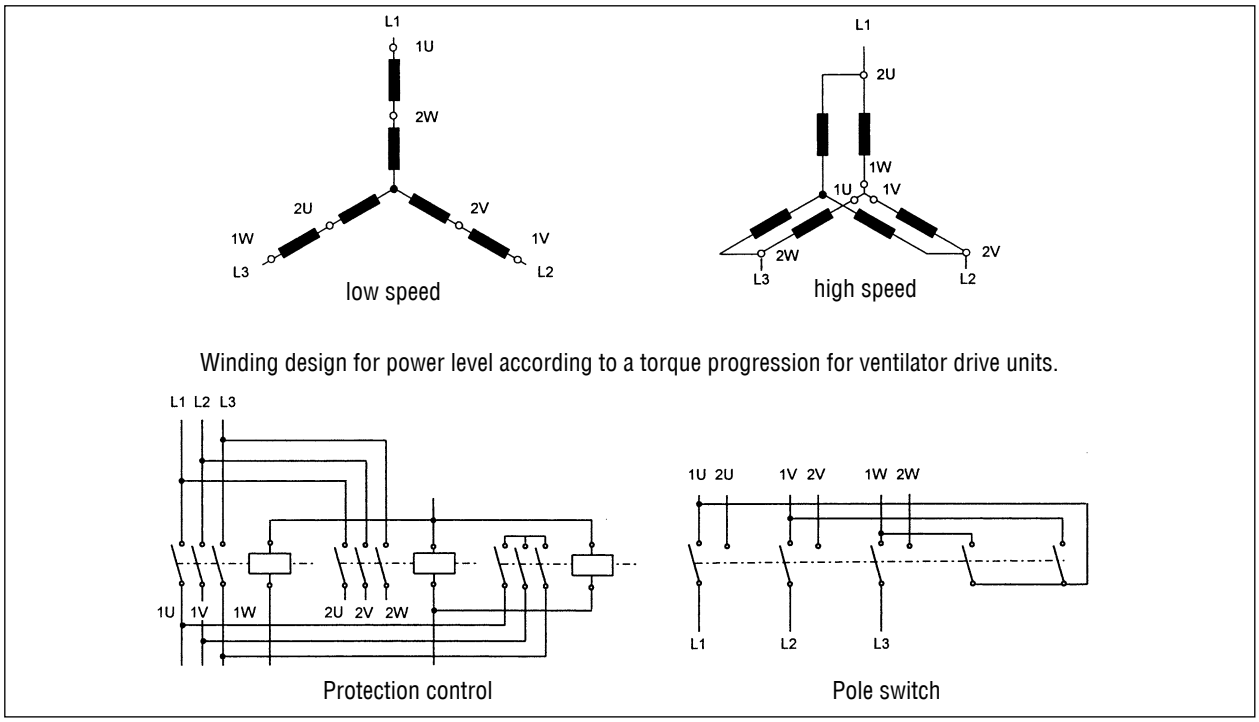


Fig. 48 Circuit of three-phase motors for two speeds in the ratio 1 : 2

Circuit for two speeds (two separate windings)

Version e.g. for 1000/1500 rpm or 6-/4-pole or 750/1000 rpm or 8-/6-pole

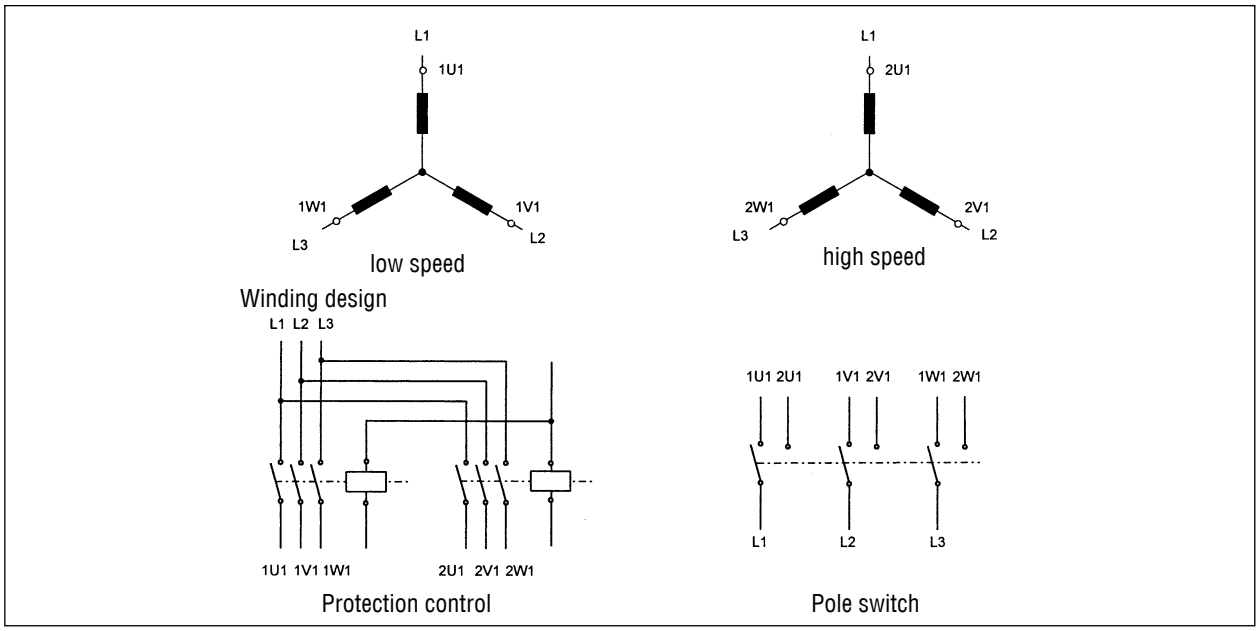


Fig. 49 Circuit of three-phase motors for two speeds

Circuits for three speeds

(two separate windings, one in Dahlander pole changing, nine terminals are required here). Version for ventilator drive units 750/1000/1500 rpm or 8-/6-/4-pole; 750/1500 rpm in Dahlander pole changing.

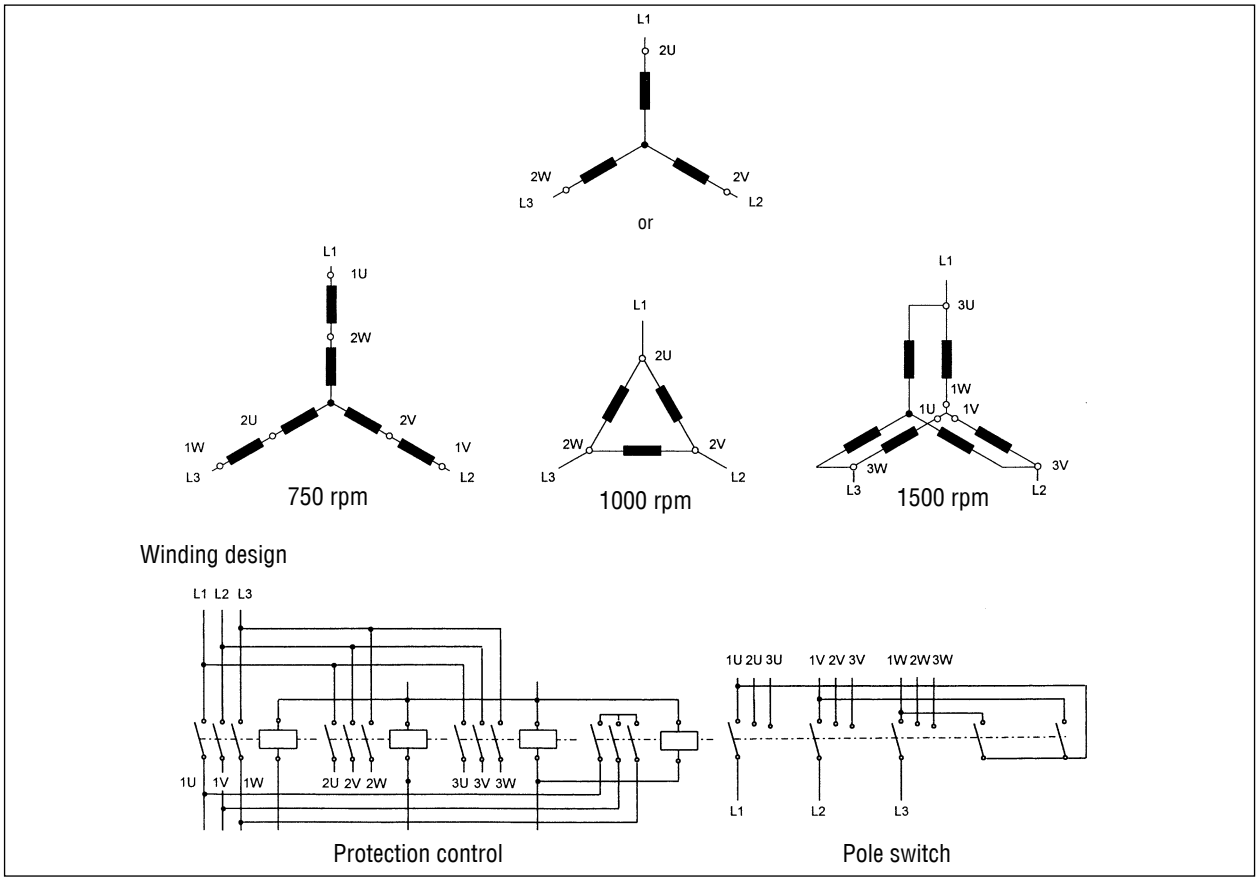


Fig. 50 Circuit of three-phase motors for three speeds

5.13.1.2 Circuit with frequency converter, wiring examples

Wiring example: FC wiring (FC 102) with external repair switch and pressure transmitter

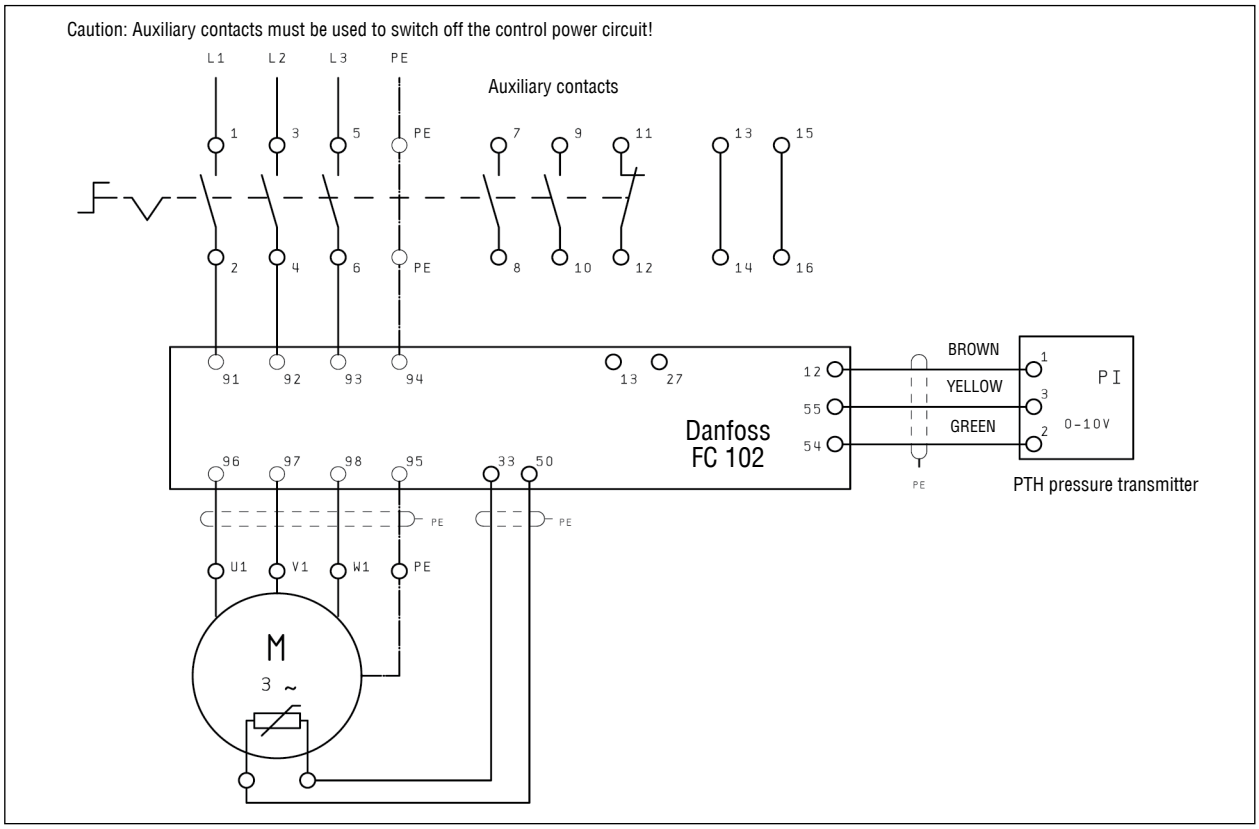


Fig. 51 Circuit of three-phase motors with frequency converter (FC 102) and external repair switch

Wiring example: FC wiring (FC 102) with integrated repair switch and pressure transmitter

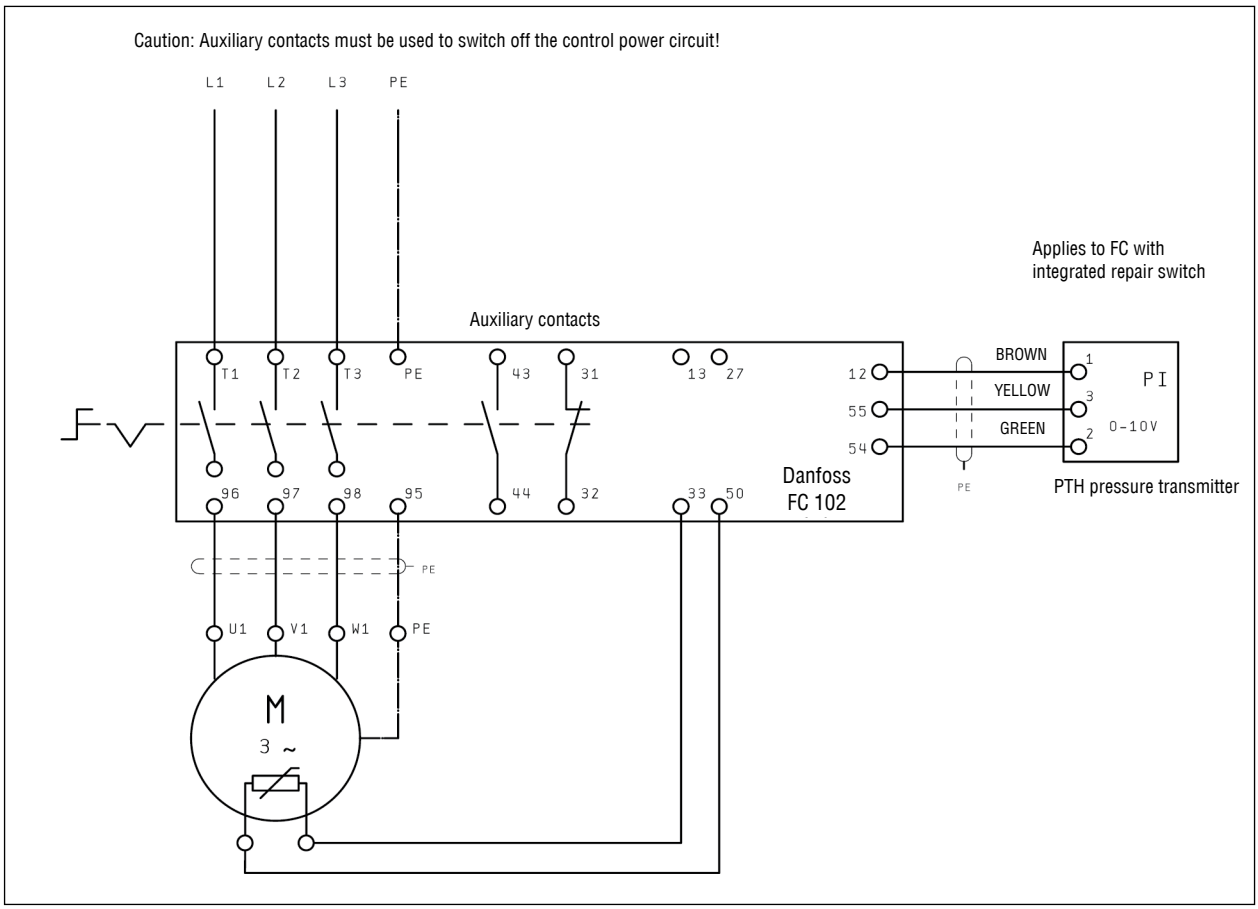


Fig. 52 Circuit of three-phase motors with frequency converter (FC 102) and integrated repair switch.

The following must be noted when operating with frequency converter:

1. The fan motor combination must be suitable for operation via frequency converters.
2. The motor must be protected against overload, e.g. PTC thermistor. A motor protection switch with bimetallic release is not suitable.
3. Under no circumstances may the permitted maximum speed of the fan and the motor be exceeded.
4. Observe the operating instructions of the frequency converter manufacturer.
5. Installation in accordance with the EMC Directive must be guaranteed.
6. If the motor is operated via a FC or EC technology, the combination can be secured using a residual current circuit breaker. For this purpose, an all-current sensitive residual current circuit must be selected.

5.13.1.3 Connection of EC fans

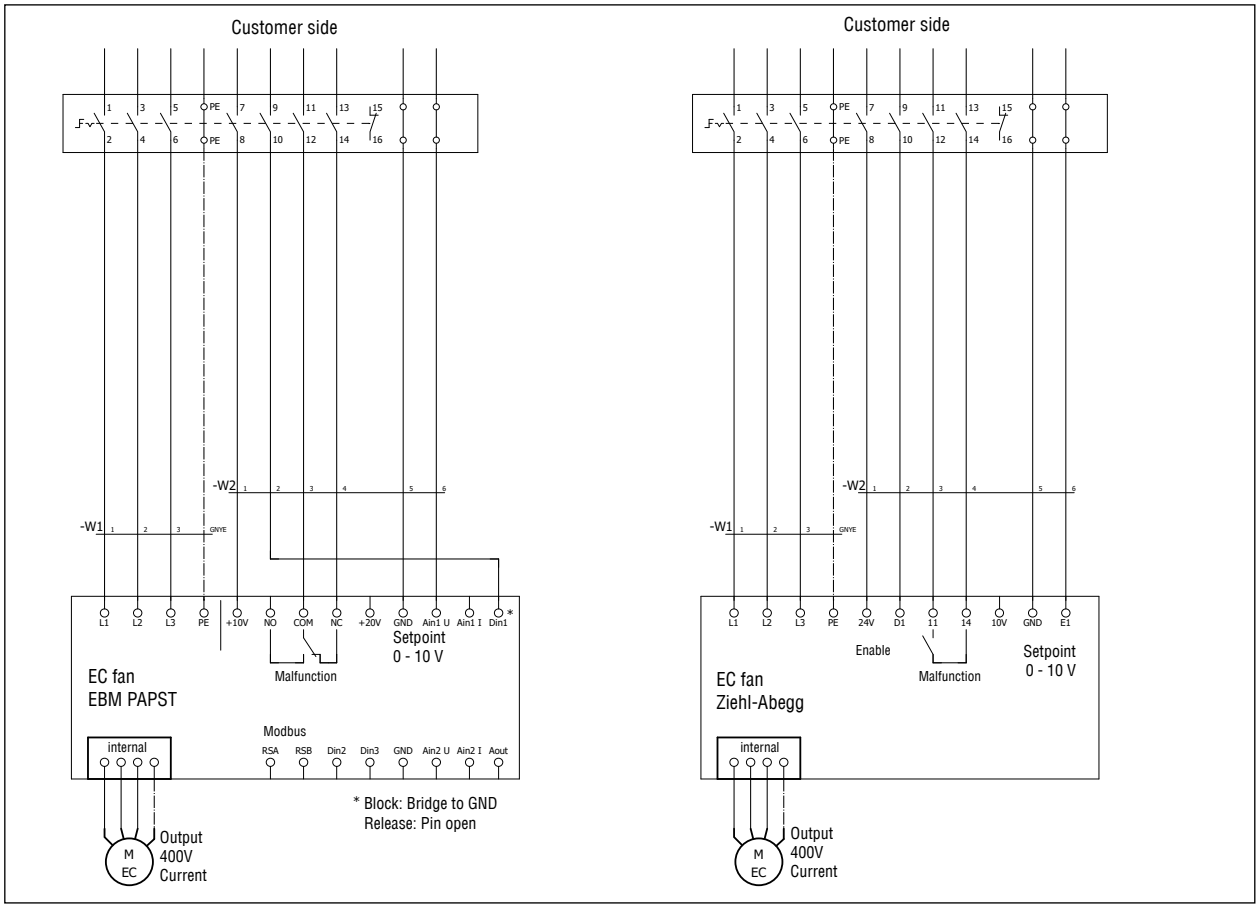


Fig. 53 Connection of EC fans from EBM Papst (left) or Ziehl-Abegg (right)

ATTENTION

The connection diagrams in Fig. 53 are intended for illustration only. The actual connection diagram for the specific installation is to be found in the installation documentation and applied.

- The motors are generally equipped with internally connected temperature monitors.
- If the motor is operated via a FC or EC technology, the combination can be secured using a residual current circuit breaker. For this purpose, an all-current sensitive residual current circuit must be selected.

The following must be observed when operating EC fans:

1. The EC motor has integrated protection functions that automatically switch off the motor in case of a fault. No upstream motor protection device is required.
2. Enter the release for the EC motor via the control signal or via the control input 0-10 V (system-related).
3. Do not switch on and off the motor (e.g. in cyclic operation, operational switching) via the mains. In the event of an accident (e.g. fire), the motor can be switched off on the mains side.
4. To avoid electromagnetic interference, care must be taken to ensure a sufficient distance between the mains and control lines.
5. Observe the operating and assembly instructions from the EC fan manufacturer.
6. Installation in accordance with the EMC Directive must be guaranteed.

5.13.2 Connection of electric air heater

⚠ WARNING

Risk of injuries due to incorrect or faulty connection.

- Only have the electrical connection carried out by an approved electrician.
- Only have assembly, servicing and maintenance carried out by qualified staff.
- Wear personal protective equipment.

⚠ CAUTION

Risk of burns due to contact with the hot electric air heater.

- Wait until the hot electric air heater has cooled down.
- Wear personal protective equipment.

⚠ CAUTION

Risk of fire due to foreign objects on the electric heating register.

- Before commissioning, check the electric heating register for foreign objects.

Special instructions for electric air heaters:

- For the use of an electric air heater, DIN VDE 0100-420 must be observed.
- A separate mains supply is required for the electric air heater.
- Always carry out the electrical connection of the air heater according to the circuit diagram.
- Observe the operating instructions of the electric air heater manufacturer.
- The electric air heater may only be operated in combination with a flow monitor and safety temperature limiter (positioning and adjustment is carried out on-site).
- The temperature monitor and the safety temperature limiter are to be integrated into the control circuit of the electric air heater.
- In the case of speed-controlled fans, the power of the electric air heater must be reduced accordingly.
- After any power failure or fault messages, the installation is to be checked for damage and replacement measures must be taken where necessary.
- It is imperative that the fans have a delay of min. 5 minutes after switching off the electric heating.

ATTENTION

It is critical to avoid accumulated heat in the area of the electric air heater.

Damage caused by excessively high temperatures due to accumulated heat is excluded from the warranty.

5.13.2.1 On-site retrofitting of electric air heaters

When retrofitting on site, the following distances to other components must be observed:

Clear unit height (grid)	Clear unit height (mm)	Distance to other components
to BG 16	to 1224 mm	300 mm
greater than BG 16	---	450 mm

5.13.2.2 Frequent causes of error for accumulated heat with electric air heaters

Cause	Remedy
No air volume flow	Heater groups may only be released when a sufficient air flow is conveyed via the heater → Use of a volume flow monitor AL-KO THERM recommends the integration of the electric air heater control into the repair switch circuit (auxiliary switch)
Insufficient air volume flow through controlled fans	The heating capacity must also be adjusted in accordance with the reduced air volume flow → Infinitely variable control of the heating energy or switching of heating groups according to the specified air volume flow
Temperature monitor is not connected	During commissioning, the function of the temperature-related shutdown must be checked
Safety temperature limiter is not connected	During commissioning, the shutdown function must be checked
No fan delay	It is imperative that the fans have a delay of min. 5 minutes after switching off the electric heating. Alternatively, the fan delay can also be controlled using a thermostat.
Incorrect commissioning – Checking the electric heater without sufficient air flow due to closed flaps or false air, for example	Ensure that there is always a sufficient air volume flow at the heating coil during testing
Air temperatures above 60°C	Ensure that the air temperatures do not exceed 60°C at any time. The air temperature in normal operation (continuous operation) must not exceed 40°C

5.13.3 LED lamp connection

⚠ DANGER

Hazard due to electric current.

Incorrect connection to the energy supply or incorrect installation of electrical components can result in electric shock.

- Only have the electrical connection carried out by an approved electrician.
- Perform the connection exactly according to the circuit diagram and the assignment plan.
- Observe the valid DIN and VDE regulations.
- Observe the directives of the local energy supply company.
- Use personal protective equipment at all times when working on the installation.
- Use other protective equipment according to the work carried out.
- Do not operate the unit with defective or damaged cables or plugs.
- Regularly check the connection cables for damaged areas.
- Use only the permissible tool.
- Shut off the energy supply for maintenance work and secure it to prevent restart.
- Observe the electrical safety regulations.

⚠ WARNING

Risk of injuries due to incorrect or faulty connection.

- Electrical connections must only be undertaken by a certified electrician under consideration of the valid DIN and VDE regulations as well as the directives of the local energy supply company.
- Only have assembly, servicing and maintenance carried out by qualified staff.
- Wear personal protective equipment.

- For the line protection of the lamp wiring, a max. prefuse of 2 A is required.
- The LED lamp is pre-wired to a junction box at the factory. The cross connection between the junction box or junction box to the light switch is to be wired on-site.

6 Commissioning

ATTENTION

Commissioning protocol

During commissioning, all functions are checked, logged and signed by the operator. Transfer of the operating and assembly instructions is also confirmed on signing. These documents must be attached to the unit documentation.

6.1 Principles

⚠ WARNING

Accident and injury risk due to human misconduct.

Failure to observe the safety instructions, standards, directives and regulations leads to a risk of injury.

- Disconnect the AT4F unit from the mains power supply on all poles and secure it to prevent restart before starting any repair or maintenance work.
- Wear personal protective equipment.
- The maintenance instructions in the operating and assembly instructions for the AL-KO THERM AT4F Series central ventilation units must be observed under all circumstances.
- Have installation, commissioning, servicing and maintenance work carried out only by qualified staff.
- Observe standards and directives.

ATTENTION

AL-KO THERM generally recommends the replacement of all installed filters after a short period of operation of the AC unit in order to remove any dirt that may have entered the filters during the installation phase and after commissioning.

NOTE

Observe the operating and assembly instructions for the individual field devices/components.

Before commissioning, always ensure the following:

- that the unit has been installed as described in these operating and assembly instructions (see chapter “5 Assembly” on page 25).
- that all the filter elements are correctly installed. Check the tight fit of all installed filters, in particular the fine dust filters.
- that the duct system and the water and drain pipe are properly connected to the unit.
- the fresh air inlet is at a sufficient distance from contamination sources (kitchen hood extraction, central dust extraction, etc.).
- that the electrical installations have been implemented completely and professionally.
- that all media connections have been professionally connected and are leak-tight.

6.2 Before system start

⚠ WARNING

To be carried out by the person responsible:

- After carrying out the work, ensure that there are no longer any persons in the installation.
- Before commissioning the installation, ensure that all factory-installed protective measures are functioning correctly.
- Ensure that all inspection doors/panels are correctly and securely closed.

⚠ WARNING

Risk of injuries due to run-on of fans.

- Only open the inspection doors only when the fans are switched off and stationary.
- Observe the delay time of the fans. Observe a waiting time of 3 minutes, until the fan impellers are stationary, before opening the inspection doors.
- Never brake the impellers of the fans by hand or using an object.

⚠ WARNING

Risk of injury from fan during fan test run.

- Never disassemble or bypass safety installations.
- Work with care.
- Remove any loose parts in the air handling unit.
- Eliminate tripping hazards.
- Maintain the safety distance.
- Do not remain in the rubble cloud when the fan starts up.
- Wait until the fan impeller has come to a standstill.
- Perform a vibration measurement of the fan impeller. If the permissible vibrations are exceeded, no commissioning may take place. Observe the table with the respective vibration values (see chapter “7.3.12.5 Fan free-wheel with direct drive” on page 115). Contact AL-KO THERM customer service if necessary.

  Phone: +49 8225 39 - 2574
  E-mail: service.center@alko-air.com
  Web: www.alko-airtech.com

- Carry out a visual inspection for cracks in the impeller.
- Wear personal protective equipment (ear protection).
- Never brake the impellers of the fans by hand or using an object.

⚠ CAUTION

Risk of fire due to foreign objects on the electric heating register.

- Before commissioning, check the electric heating register for foreign objects.

ATTENTION

Hygienic and toxicological concerns may arise during 100% recirculation air operation due to the contamination of the waste air with pollutant gases. A minimum outdoor air volume flow must therefore be ensured during recirculation air operation.

ATTENTION

Before commissioning, check that the seals are securely in position.

Before starting up the system, check:

- Mechanical function of the multi-leaf dampers.
- Tight fit of all installed filters.

NOTE

AL-KO THERM generally recommends the replacement of all installed filters after a short period of operation of the AC unit to remove any dirt that may have entered the filters during the installation phase and after commissioning (see chapter “7.4 Replacing components” on page 120).

Use original spare parts.

After Sales
Phone: +49 8225 39 - 2600
E-mail: airtech.after-sales@alko-air.com
Web: www.alko-airtech.com

- Before commissioning the rotary heat exchanger, make sure that no objects or excessively compressed seals impede the free running of the thermal mass.
- Bypass damper for mechanical function (plate heat exchanger).
- Fan for foreign objects and easy running.
- Heat exchangers for contamination, damage and leakage of the media connections.
- Each condensate drain must be connected to the drain system by a separate siphon. Direct connection of water drains to the drain system is not permitted.
- Fully assemble the unit and commission it according to the commissioning protocol.
- Inspection doors/inspection covers must be closed.

6.2.1 Commissioning of the electric heating coil

ATTENTION

Electric heating coil

Check safety chain: Test the function of the flow monitor and safety temperature limiter and adjust these if necessary. This is the only way to ensure safe operation of the air handling unit.

- Observe the operating instructions of the manufacturer.

6.2.2 Commissioning of fans

⚠ WARNING

Risk of injury caused by impeller breakage.

Operation with impermissibly high vibration values, in particular with fans without spiral housing, can result in impeller breakage, which can lead to serious property damage and personal injuries.

- Perform a vibration measurement of the fan impeller regularly and document the checks. If the permissible vibrations are exceeded, no operation may take place. Observe the table with the respective vibration values, see chapter “7.3.12.5 Fan free-wheel with direct drive” on page 115.
- When operating with a frequency converter, the frequency converter should generally be operated without overmodulation.
- During commissioning, determine the resonance speeds. Eliminate them, e.g. by hiding the frequencies on the frequency converter.
- Do not operate fans in the range of the resonance speed (and its multiples) of the fan motor system.
- Operation with impermissibly high vibration values can result in impeller breakage, which can lead to serious property damage and personal injuries. AL-KO THERM recommends continuous monitoring using a vibration sensor (available as an option).

ATTENTION

- Danger of motor overloading with an incorrect direction of rotation.
- Power consumption must not exceed the specified nominal current.
- Maximum motor speed must not be exceeded.
- Maximum fan speed must not be exceeded.
- Above a rated motor output of 3 kW: Star-delta starting.

- Observe the operating instructions of the manufacturer.

6.2.2.1 Commissioning of fans with belt drive

- Remove transport locks from the fan base frame.
- Inspect the duct system and fan for foreign objects.
- Check the impeller moves freely by turning it by hand.
- Check the fan rotation direction (see arrow on fan housing) by briefly switching on the motor (caution with open door).
- If necessary, reverse the motor polarity and correct the rotation direction.
- Measure the power consumption with closed maintenance doors and compare to the nominal current specified on the motor type plate.
- Perform a protective earthing conductor test.
- Check for loose components (correctly tightened taper-lock clamping bushes, screws on the motor substructure/ pressure bulkhead), see chapter “7.3.12.3 Fan with belt drive” on page 113.

Belt drive commissioning

- Check alignment (flush) of the V-belt pulleys.
- Check the belt drive and set the required belt tension.
- Check the frictional seating of the pulleys and their exact alignment (parallelism).
- After approx. 1 hour, check the V-belt pulley, motor and fan screws and, if necessary, retighten, check the belt tension and, if necessary, tighten, see the clamping specification for the belt drives.

ATTENTION

Incorrectly tensioned belt drives can cause bearing damage to the fan and the electric motor. From a standstill time of 3 months, the belt drives must be relaxed or removed to avoid bearing damage, otherwise the warranty will be voided.

If the belt drive is changed without AL-KO THERM design, the limit speeds of the fan and the limit value diagrams for the belt tension forces in the respective technical catalogue must be observed.

6.2.2.2 Commissioning of fan free-wheel with direct drive

- Remove transport locks from the fan base frame.
- The unit must be inspected for transport damage before commissioning.
- The impeller must not touch the fan inlet nozzle. Check the impeller moves freely by turning it by hand.
- Check the fan rotation direction (see arrow on fan housing) by briefly switching on the motor (caution with open door).
- If necessary, reverse the motor polarity and correct the rotation direction.
- Measure the power consumption with closed maintenance doors and compare to the nominal current specified on the motor type plate.
- Perform a protective earthing conductor test.
- Check for loose components (correctly tightened taper-lock clamping bushes, screws on the motor substructure/ pressure bulkhead), see chapter “7.3.12.3 Fan with belt drive” on page 113.

6.2.3 Commissioning of rotary heat exchanger

Before commissioning (especially with horizontal rotors), make sure that no objects or excessively compressed seals are blocking free running.

- Check drive V-belt for tension.
- Check correct position of the belts.
- Further information can be found in the manufacturer's documentation.

Observe the rotation direction of the rotary heat exchanger in conjunction with a flushing chamber (optional):

Make sure that the thermal mass always rotates from the exhaust air via the flushing chamber into the supply air. This rotation direction of the thermal mass is identified by a marking.

ATTENTION

Check the rotation direction during commissioning.

Check the seals

ATTENTION

Check seals before commissioning and apply seals when fans are running.

The seals must be pushed as close to the thermal mass as possible, but direct grinding must be avoided.

The rotary heat exchangers are equipped with low-maintenance brush seals, but the seal can still be impaired by transport or installation.

- Check the seals for damage and correct seating.

NOTE

Observe the manufacturer's documentation.

6.2.4 Commissioning of circulating coil system CCS (recuperative energy recovery)

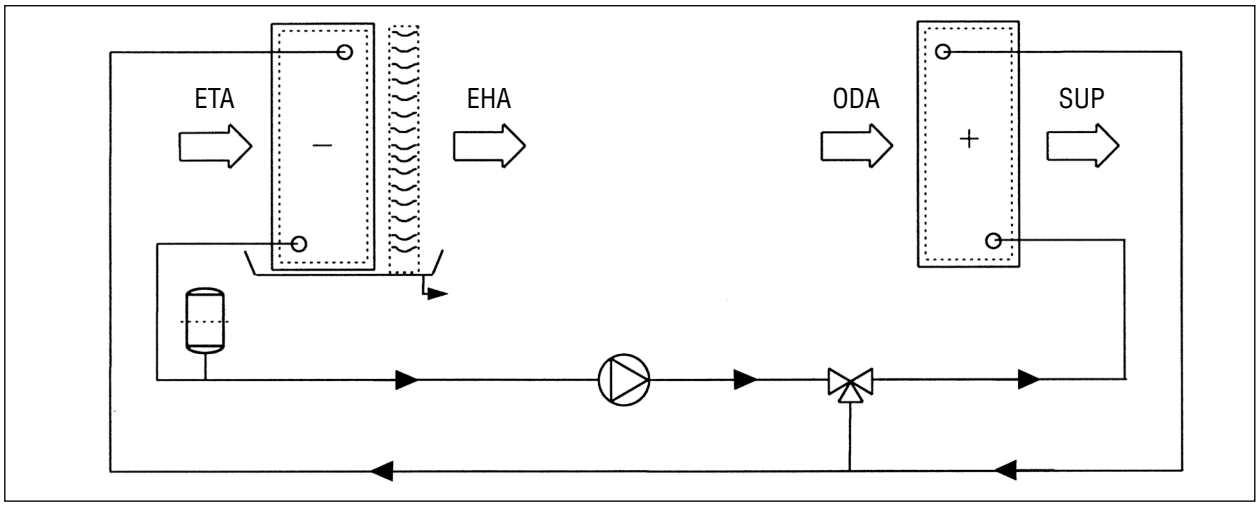


Fig. 54 Schematic diagram of a circulating coil system

EHA	Outgoing exhaust air	ODA	Outdoor air
ETA	Extract air	SUP	Supply air

ATTENTION

When using high-performance circuit heat recovery systems, observe the manufacturer's operating instructions.

ATTENTION

During commissioning, observe chapter “5.12.5 Filling and venting” on page 63.

- Piping must be provided on-site.
- Circulating pump must be dimensioned according to the technical data sheet.
- Heat exchangers must be connected in the counterflow principle.
- In the case of two-part heat exchangers, their pipe or screw connections are to be retightened in the air handling unit and tested for leak-tightness.
- Antifreeze concentration must correspond to the specifications on the technical data sheet.
- The pre flow is at the top or bottom, depending on the air direction.
- We recommend the use of the Antifrogen N with a mixture of 25 – 35 %.
- During the pressure test, the entire installation must be checked for leakage.
- It is to be rinsed until no more residual particles and scale are flushed out.

6.2.5 Commissioning of spray humidifier (air washer)

ATTENTION

If a spray humidifier (air washer) is installed, a siphon must be installed on-site, see chapter “5.12.3 Condensate drain connection via siphon” on page 61.

NOTE

AL-KO THERM recommends the installation of electric dry run protection for the water circulation pump.

Install the spray humidifier as the last component in the air handling unit directly at the entry to the duct network.

NOTE

Observe the manufacturer's documentation.

- Inspect the spray humidifier for completeness and possible transport damage.
- Remove any coarse soiling from the humidifier tray and check the proper seating of the pump screen.
- Check the spray direction and proper seating of the vaporiser nozzles.
- Fill the humidifier tray to approx. 10 mm below the upper edge of the siphon or overflow nozzle and then set the float of the float valve to this water level.
- Check the function of the drain and overflow and clean the dirt trap and siphon.
- Check the direction of rotation of the water circulation pump.
- Check the screw and flange connections of the pump pressure line for leaks.
- In the case of a manual blow-down procedure, adapt the blow-down rate indicated by the manufacturer to the quality of the water used.
- Check the installation of the water filter.
- Check the droplet eliminator for dielectric strength.
- The specified water quality must be maintained at all times and corrected at regular intervals.
- If the volume flow rate is reduced (e.g. when using a frequency converter), be sure to also reduce the pump output.

ATTENTION

The rotation direction of the water circulation pump may only be checked with the washer tray full. The water level in the humidifier tray must be sufficient to prevent any dry running of the water circulation pump.

The blow-down rate is reduced by 50 % when using fully desalinated water. When using droplet eliminators made from plastic profiles, a slight breakthrough of water may occur for a short time in exceptional cases as the surface is not yet weathered due to the production method. Weathering occurs after approx. 24 operating hours.

6.2.6 Commissioning of the contact humidifier

NOTE

Observe the manufacturer's documentation.

6.2.6.1 Fresh and circulation water systems in contact humidifier

ATTENTION

- A pressure reducer, a water filter (150 µm) and a shut-off valve are to be installed on-site upstream of supply solenoid valve. Constant water pressure between 1.5 and 6.0 bar.
- When connecting to the drinking water mains, a pipe separator installation type 2 is required in accordance with EN 1717 “Technical regulations for drinking water installation”.
- The pan drain must be connected to the drain system on-site via a siphon. In accordance with VDI 6022, an open drain is required downstream of the siphon in the on-site drain pipe.
- The water quality for the contact humidifier must be ensured according to the manufacturer's data.

- Check the assembly of the contact humidifier. Are all water distribution hoods hooked in and locked with the safety snap closures?
- Check installation of the contact humidifier and assembly of accessories.
- Check water and wastewater installation.
- Check the electrical connections.
- Fill the siphon with water.
- The water tank must be clean and free of any foreign objects. Metal chips, in particular, can lead to corrosion and damage.
- Adjust the water pressure on the pressure reducer.
- Open the shut-off valve and solenoid valves and check all connections for leaks.
- Adjust the water flow rates (l/min) to the individual cassettes on the balancing valves.

additionally for circulation water system:

- Check the rotation direction of the circulation pump.
- Adjust the desalination rate.
- Adjust the cleaning rinse run.
- Adjust the water intake amount on the pressure reducer.

6.2.7 Commissioning of high-pressure humidifier

ATTENTION

- Prescribed maintenance interval twice per year.
- Before starting the maintenance work, the installation is to be taken out of operation.
- Oil change of the pump after the first 50 operating hours. Then every 500 operating hours.
- Gear oil according to manufacturer's data.

NOTE

Observe the manufacturer's documentation.

- Check the assembly of the high-pressure humidifier.
- Check installation of the high-pressure humidifier and assembly of accessories.
- Check water and wastewater installation.
- Check the electrical connections.
- Fill the siphon with water.
- The water tank must be clean and free of any foreign objects. Metal chips, in particular, can lead to corrosion and damage.
- Check the construction of the pump unit and wiring of HD connections. Check the pressure and adjust if necessary.

6.2.8 Commissioning of steam humidifier

ATTENTION

The water quality for the steam humidifier must be ensured according to the manufacturer's data.

NOTE

Observe the manufacturer's documentation.

- Inspect the steam humidifier for soiling, damage and corrosion.
- Check the steam and condensate pipe for leakage.
- Check the function of the steam distributor.
- Check the function of the solenoid valves.
- Check the measuring and control devices.

Steam humidifier with separate steam generator:

- Check the function of the water supply and water level.
- Measure power consumption.

Steam humidifier without separate steam generator:

- Check the function of the control valve.
- Readjust the stuffing box of the control valve.

NOTE

The company AL-KO THERM does not assume any warranty for on-site steam humidifier installations or on-site housing bushings as well as improper treatment of the base tray and improperly connected drainage connections. This also applies to improperly operated humidifiers or humidifier output.

6.2.9 Commissioning of the combustion chamber

NOTE

Observe the manufacturer's documentation.

- Check the tightness of all media connections.
- Carry out commissioning according to the manufacturer's data.

6.2.10 Commissioning of UV disinfection

⚠ WARNING

Risk of injury to eyes and skin due to UV radiation.

- Work on the unit may only be carried out by authorised personnel.
- De-energise the unit before opening it for maintenance work.
- Avoid direct eye contact with the UV lamp.

NOTE

Observe the manufacturer's documentation.

- Carry out commissioning according to the manufacturer's data.

6.3 Switching the installation on/off

⚠ WARNING

Risk of severe injuries or death.

Working on the AT4F unit can result in serious injury or death.

- After switching off via the main switch, no safety functions of the unit are then guaranteed (e.g. frost protection).
- Never use the main switch to switch it on and off during operation.
- Use the main switch only for repair purposes.

- The main switch connects the installation to the mains power supply. This means that all control and regulating modules are ready for operation.

6.4 After system start

NOTE

Further information on the control of the AT4F unit can be found in the AL-KO THERM operating manual/functional description for “Control ART TECH LEVEL II”.

⚠ WARNING

Risk of injuries due to run-on of fans.

- Only open the inspection doors only when the fans are switched off and stationary.
- Observe the delay time of the fans. Observe a waiting time of at least 3 minutes, until the fan impellers are stationary, before opening the inspection doors.
- Never brake the impellers of the fans by hand or using an object.

- Check the valves of the heat exchangers to see if they are in the correct position. If this is not the case, the direction of rotation of the valve actuators must be changed if necessary.
- Set the time, date, average and low air performance, and program the weekly schedule.

7 Servicing and maintenance

7.1 Safety instructions for servicing and maintenance

⚠ WARNING

Risk of injuries.

- Disconnect the AT4F unit from the mains power supply on all poles and secure it to prevent restart before starting any repair or maintenance work.
- Close the media supply (water, gas, etc.) before all repair and maintenance work.
- Follow the applicable safety rules.
- Have installation, commissioning, servicing and maintenance work carried out only by qualified staff.

To be carried out by the person responsible:

- After carrying out the work, ensure that there are no longer any persons in the installation.
- Before restarting the installation, ensure that all factory-installed protective measures are functioning correctly.

⚠ WARNING

Risk of cuts

There is a risk of cutting injuries during cleaning and maintenance of the AT4F unit.

- Wear personal protective equipment (cut-proof gloves).

⚠ WARNING

Risk of slipping! Leaked medium/condensate

- Immediately take up the spill quantity and dispose of it properly.

⚠ WARNING

Risk of injury from falling from ladders, scaffolding or work platforms.

- Only use suitable and tested ladders, steps, scaffolding and work platforms.
- Work with care.

⚠ WARNING

Risk of injuries due to run-on of fans.

- Only open the inspection doors only when the fans are switched off and stationary.
- Observe the delay time of the fans. Observe a waiting time of at least 3 minutes, until the fan impellers are stationary, before opening the inspection doors.
- Never brake the impellers of the fans by hand or using an object.

⚠ CAUTION

Risk of burns as a result of contact with hot surfaces and media (plate heat exchanger, heat exchanger and electric heating coil)

- Wait until the hot surfaces have cooled down.
- Wear personal protective equipment.

NOTE

The owner/operator of an RLT installation is obliged to have the system maintained regularly by trained qualified staff.

AL-KO THERM recommends that maintenance is carried out in accordance with German VDI 6022 and VDMA 24186.

In addition, a hygiene inspection in compliance with VDI 6022 is required every 3 years.

Upon conclusion of a maintenance contract, AL-KO THERM undertakes these tasks.

Customer Service
Phone: +49 8225 39 - 2574
E-mail: service.center@alko-air.com
Web: www.alko-airtech.com

ATTENTION

Only use original consumables and spare parts. This is the only way to ensure safe operation.

Otherwise the warranty will be voided.

A spare parts list can be found as part of the unit documentation.

After Sales
Phone: +49 8225 39 - 2600
E-mail: airtech.after-sales@alko-air.com
Web: www.alko-airtech.com

7.1.1 Qualifications of personnel

Constant adherence to the hygiene requirements and execution of the operation and maintenance measures required for this in AC installations necessitate corresponding personnel qualifications. Demanding operating activities as part of maintenance as well as inspections and repairs must only be performed by trained qualified staff.

- Special training courses for “simple hygiene activities” (also called category B) and “demanding hygiene activities” (also called category A) are offered for these activities.
- Only qualified staff who have successfully completed this training is authorised to perform hygiene activities.

The tasks involved in maintenance measures are described in greater detail in the following table:

Grouping of the measures (according to VDMA)		
Inspection **Objectives of the measures (acc. to DIN 31 051)**	**Maintenance** **Objectives of the measures (acc. to DIN 31 051)**	**Repair** **Objectives of the measures (acc. to DIN 31 051)**
Determining and assessing the actual condition	Maintaining the nominal condition	Restoring the nominal condition
Individual measures	**Individual measures**	**Individual measures**
Checking, measuring, assessing	Checking, adjusting, replacing, adding, lubricating, preserving, cleaning	Repairing, replacing
Execution by	**Execution by**	**Execution by**
Technicians, engineers, skilled trades-persons	Trained personnel (limited deployment), Specialists, qualified persons	Specialists, qualified persons
Required hygiene training according to VDI 6022 Sheet 4	**Required hygiene training according to VDI 6022 Sheet 4**	**Required hygiene training according to VDI 6022 Sheet 4**
Category A	Category B	Category B

7.2 Maintenance instructions in accordance with VDI 6022 and VDMA 24186

- The owner/operator is obliged to have the installation maintained regularly by qualified staff.
- The operating and assembly instructions for the installed parts must be observed under all circumstances (request them if necessary).

7.2.1 Initial and repeat inspections must only be performed by Category A trained qualified staff according to VDI 6022 Sheet 1

Inspections necessitate particular specialist training or technician qualification in the field of supply technology as well as category A training. Hygiene inspections have to be performed regularly to meet these requirements.

Hygiene inspection intervals

- For AC units with humidifier every 2 years
- For AC units without humidifier every 3 years.

We recommend that hygiene specialists are called in for these inspections.

The hygiene inspections include at least the following activities:

- Inspection of the central AC unit, including all components and the rooms supplied via the unit.
- If hygiene deficiencies are discovered: Measurement of physical climate parameters (temperature, humidity, air velocity) at representative points of the AC unit.
- Determination of the total microbial content and the concentration of Legionella in the circulated water of humidifier systems.
- In the case of visually noticeable hygiene deficiencies, the causes must be identified and eliminated. If required for determination, perform additional microbiological investigations, e.g. determination of the supply air colony count, semi-quantitative surface investigations or differentiation according to microbe types.

As the result of the hygiene inspection, documentation of the hygiene status of the inspected AC installation and written notification of the inspection result to the owner, including a list of necessary measures, must be drawn up. The date of any necessary follow-up inspection must be defined depending on the urgency of the measures to be performed.

Critical findings exist in the following cases:

- On repeated exceeding of the total microbial counts in the humidifier water (guideline value 1000 CFU/ml)
- On repeated contamination of the humidifier water with moulds
- On Legionella infestation in the humidifier water
- On occurrence of higher microbial counts downline of air conditioning installations than upline
- On visible mould infestation or other microbial coatings

In the event of a critical finding, a hygienist or further qualified staff must be consulted, and the company physician must be involved.

7.2.2 Performing of hygiene checks during maintenance by Category B trained maintenance personnel in accordance with VDI 6022 Sheet 1

The aim of the hygiene checks to be performed regularly by the maintenance personnel is to determine and eliminate hygiene deficiencies on the air conditioning installations at an early stage through frequent visual inspections or random microbiological self-checks.

The regular hygiene checks include the following measures:

- Visual inspection of the relevant AC area for hygiene deficiencies such as e.g. microbial growth or soiling, rust formation, calcium deposits and damage.
- Check of the total colony count in the circulated water of air humidifiers.

Table 6 in Section 5.5 of VDI 6022 Sheet 1 specifies the type and scope of the checks to be performed, any measures required to eliminate ascertained hygiene deficiencies and the time intervals within which the respective hygiene checks are to be performed.

7.2.3 Maintenance schedule

Hygiene requirements and maintenance, servicing of air handling units in accordance with VDI 6022 and VDMA 24186

	Activity/unit components	Measure / remark	Inspections to be performed at monthly intervals				
			1	3	6	12	24
1	**Hygiene inspection**		**1**	**3**	**6**	**12**	**24**
		To be performed by trained qualified staff in accordance with VDI 6022 Sheet 4	AC systems without humidification: every 3 years AC systems with humidification: every 2 years				
2	**Outdoor air intakes and exhaust air outlets**		**1**	**3**	**6**	**12**	**24**
2.1	Check for soiling, damage and corrosion	Clean completely and repair				X	
3	**Unit housing**		**1**	**3**	**6**	**12**	**24**
3.1	Inspect for soiling, damage and corrosion on the air side	Clean and repair				X	
3.2	Check for water formation (condensate, leaks)	Clean and identify the cause			X		
3.3	Check function of drains	Clean, if necessary				X	
3.4	Check flexible connections for leaks					X	
3.5	Doors and locks for ease of movement and leak-tightness	Repair				X	
4	**Air filter**		**1**	**3**	**6**	**12**	**24**
4.1	Check for impermissible soiling, damage (leaks) and odours	Air filters must have a filtration efficiency appropriate to the filter class over their entire period of use. If there is noticeable soiling or leakage, the filter must be replaced. Replace the air filter concerned if the last change of the filter stage is less than six months ago, otherwise replace the whole filter stage		X			
4.2	Check differential pressure	If the maximum differential pressure is exceeded replace the filter stage	X				
4.3	Latest filter change with non-regenerative air filters, otherwise thorough cleaning					X	
	1. filter stage					X	
	2. filter stage						X
4.4	Check the hygiene condition					X	
5	**Humidifier**		**1**	**3**	**6**	**12**	**24**
		Measures must be taken to ensure that water cannot get behind the humidifier unit at any time during operation					
5.1	**Evaporation and rotary spray humidifier**	**The infeed water must satisfy a minimum of the Drinking Water Standards, and must not exceed a total hardness of 7° dH**	**1**	**3**	**6**	**12**	**24**
5.1.1	Check for soiling, damage and corrosion	Clean and repair	X				
5.1.2	Determine the colony count in the humidifier water (dip slides)	With colony counts > 1000 CFU/ml: Wash with cleaning agent, rinse and dry the tray, disinfect if necessary	Every 14 days				
5.1.3	Inspect the vaporiser nozzles for deposits	Clean nozzles or replace, if necessary	X				
5.1.4	Check the dirt trap for condition and function	Clean and repair		X			

	Activity/unit components	Measure / remark	Inspections to be performed at monthly intervals				
			1	3	6	12	24
5.1.5	Check for flocculation in the bottom of the air humidifier tray	Clean drip tray	X				
5.1.6	Inspect the circulation pump for soiling and coating formation in the intake line	Clean pump circuit		X			
5.1.7	Check function of blow-down device	Adjust the blow-down device			X		
5.1.8	Check the function of the conductivity measuring cell	Repair	X				
5.1.9	Check function of disinfection system	Repair			X		
5.1.10	Check function of water supply and distribution	Repair			X		
5.1.11	Check water level	Top up			X		
5.1.12	Adjust water level regulation facility					X	
5.1.13	Check function of drain and overflow	Repair		X			
	Droplet eliminator		**1**	**3**	**6**	**12**	**24**
5.1.14	Inspect on the air side for soiling and damage	Function-preserving cleaning of all surfaces, including drip trays; dismantle the droplet eliminator, if necessary	X				
5.1.15	Inspect the droplet eliminator for coating formation	Function-preserving cleaning in the event of visible encrustation, dismantle droplet eliminator if necessary	X				
5.1.16	Check function of water drain and odour trap	Clean and repair				X	
5.2	**Steam humidifier with separate steam humidifier and without separate steam humidifier**	**To be operated in such a way that no condensate can enter the air line system. Steam must not contain any harmful substances**	**1**	**3**	**6**	**12**	**24**
5.2.1	Inspect for soiling, damage and corrosion	Clean and repair, disinfect if necessary		X			
5.2.2	Check for condensate deposit in the humidifier chamber	Determine the causes and eliminate them, clean the steam humidifier	X				
5.2.3	Wash with cleaning agent, rinse and dry the humidifier chamber, disinfect if necessary				X		
5.2.4	Check the dirt trap for condition and function	Clean and repair			X		
5.2.5	Check the steam lance for deposits	Clean			X		
5.2.6	Check the condensate drain	Clean and repair		X			
5.2.7	Check function of control valve	Repair			X		
5.2.8	Check the hygiene condition	Wall surface, pans			X		
5.2.9	Check the steam cylinder for deposits	If necessary, regenerate or replace			X		
5.2.10	Check steam pipes and condensate line for leaks and damage	Repair			X		
5.3	**Ultrasonic, atomizing and hybrid humidifier**		**1**	**3**	**6**	**12**	**24**
5.3.1	Check for soiling, incrustation, damage and corrosion	Clean and repair, disinfect if necessary		X			
5.3.2	Clean water tank				X		
5.3.3	Check function of electrical system	Repair			X		
5.3.4	Check function of the energy converter (only for ultrasonic humidifiers)	Replace			X		
5.3.5	Check function of water supply and distribution	Repair			X		

	Activity/unit components	Measure / remark	Inspections to be performed at monthly intervals				
			1	3	6	12	24
5.3.6	Check pump (only for atomizing and hybrid humidifiers)	Repair			X		
5.3.7	Check the hygiene condition	Wall surfaces and pans			X		
6	**Droplet eliminator**		**1**	**3**	**6**	**12**	**24**
6.1.1	Inspect on the air side for soiling and damage	Function-preserving cleaning of all surfaces, including drip trays; dismantle the droplet eliminator, if necessary	X				
6.1.2	Inspect the droplet eliminator for coating formation	Function-preserving cleaning in the event of visible encrustation	X				
6.1.3	Check function of water drain and odour trap	Clean and repair				X	
7	**Heat exchangers, general**		**1**	**3**	**6**	**12**	**24**
		If cleaning in installed state is not sufficient, the heat exchanger must be pulled out and cleaned accordingly					
7.1.1	Check for soiling, damage and corrosion	Clean and repair		X			
7.1.2	Check wet cooler, condensate drip tray and droplet eliminator for soiling, corrosion and function	Repair		X			
7.1.3	Check function of siphon	Repair		X			
7.1.4	Check the hygiene condition					X	
7.2	**Air heater**		**1**	**3**	**6**	**12**	**24**
7.2.1	Inspect on the air side for soiling, damage and corrosion	Repair		X			
7.2.2	Clean to preserve function (air-side)					X	
7.2.3	Check function of flow and return flow					X	
7.2.4	Venting					X	
7.3	**Electric air heater**		**1**	**3**	**6**	**12**	**24**
7.3.1	Check for scale deposits and corrosion	Clean and repair			X		
7.3.2	Clean to preserve function (air-side)					X	
7.3.3	Check functionality	Repair				X	
7.3.4	Check control and safety equipment for correct function	Repair				X	
7.4	**Air cooler (air/liquid) dehumidifier evaporator (air/refrigerant)**	**The siphon with backflow protection must be dimensioned according to the pressure conditions and located in such a way that the condensate can drain off without delay**	**1**	**3**	**6**	**12**	**24**
7.4.1	Inspect for soiling, damage and corrosion	Clean and repair			X		
7.4.2	Inspect wet cooler, condensate pan and droplet eliminator for soiling, corrosion and function. Check function of siphon	Repair		X			
7.4.3	Clean wet cooler, droplet eliminator and trays					X	
7.4.4	Check function of flow and return flow					X	
7.4.5	Venting	(with liquid only)				X	
7.4.6	Check for icing	(at the evaporator only) only possible during operation				X	
7.4.7	Check the hygiene condition					X	

	Activity/unit components	Measure / remark	Inspections to be performed at monthly intervals				
			1	3	6	12	24
	Droplet eliminator		**1**	**3**	**6**	**12**	**24**
7.4.8	Inspect for soiling damage and coating formation	Function-preserving cleaning of all surfaces, including drip trays; dismantle the droplet eliminator, if necessary	X				
7.4.9	Inspect the droplet eliminator for coating formation	Function-preserving cleaning in the event of visible encrustation	X				
7.4.10	Check function of water drain and odour trap	Clean and repair				X	
8	**Heat recovery, general**		**1**	**3**	**6**	**12**	**24**
		Heat exchangers and their accessories must be checked periodically for airborne contamination, corrosion and damage					
8.1.1	Check for soiling, damage and corrosion	Clean and repair			X		
8.1.2	Check the leak-tightness between exhaust and outdoor air	Repair		X			
8.1.3	Inspect condensate pan and droplet eliminator for soiling, corrosion and function	Repair		X			
8.1.4	Check function of siphon	Repair		X			
8.1.5	Clean wet cooler, droplet eliminator and condensate pan				X		
8.1.6	Check the hygiene condition					X	
8.2	**Rotary heat exchanger**		**1**	**3**	**6**	**12**	**24**
8.2.1	Inspect on the air side for soiling and corrosion	Clean and repair			X		
8.2.2	Function-preserving cleaning	The rotors can be cleaned off using compressed air. In this process, the air jet must act on the thermal mass at right angles				X	
8.2.3	Check rotor for unbalance					X	
8.2.4	Check bearings for noise	The ball bearings used are low-maintenance and designed for running times of up to 100,000 hours. They can generally be used up to 120°C				X	
8.2.5	Grease bearings using a relubrication	Only with bearings with relubrication device				X	
8.2.6	Check the function of the sealing element	The brush seals on the thermal mass are factory-set			X		
8.2.7	Check for hygienic condition					X	
8.2.8	Check drive elements					X	
8.3	**Cross-flow heat exchanger**		**1**	**3**	**6**	**12**	**24**
8.3.1	Inspect on the air side for soiling, damage and corrosion	Clean and repair			X		
8.3.2	Clean to preserve function (air-side)					X	
8.3.3	Check function of cleaning equipment	Repair, if available				X	
8.3.4	Check for hygienic condition					X	
	Droplet eliminator		**1**	**3**	**6**	**12**	**24**
8.3.5	Inspect on the air side for soiling and damage	Function-preserving cleaning of all surfaces, including drip trays; dismantle the droplet eliminator, if necessary	X				
8.3.6	Inspect the droplet eliminator for coating formation	Function-preserving cleaning in the event of visible encrustation, dismantle droplet eliminator if necessary	X				
8.3.7	Check function of water drain and odour trap	Clean and repair				X	

	Activity/unit components	Measure / remark	Inspections to be performed at monthly intervals				
			1	3	6	12	24
9	**Sound absorber**		**1**	**3**	**6**	**12**	**24**
		Sound absorbers are to be inspected externally at periodic intervals for soiling, damage and corrosion. If it is not possible to see inside the sound absorbers, they must be removed					
9.1	Inspect sound absorbers for soiling, damage and corrosion	Repair				X	
9.2	Inspect the inner air line surface for soiling and corrosion at two to three representative points	Determine the cause and clean the corresponding air line sections				X	
10	**Dampers**		**1**	**3**	**6**	**12**	**24**
10.1	Check for soiling, damage and corrosion	Clean and repair				X	
10.2	Check the mechanical function	Repair				X	
10.3	Actuators	Function check				X	
11	**Fire prevention dampers if installed in the unit**		**1**	**3**	**6**	**12**	**24**
		The test certificate must also be observed See also VDMA 24186 Part 7					
11.1	Check flaps for ease of movement	Repair				X	
11.2	Check engagement device for soiling and function	Clean, if necessary				X	
11.3	Check trigger element for soiling and function	Replace trigger element if necessary				X	
11.4	Check seals for soiling and damage	Clean and repair				X	
11.5	Actuators, position indicator	Function check				X	
12	**Fans**		**1**	**3**	**6**	**12**	**24**
		The fan and drive units must be checked periodically for soiling, damage and corrosion					
12.1	Check for soiling, damage and corrosion Check the impeller, particularly welding seams, for possible cracking.	Clean and repair			X		
12.2	Function-preserving cleaning of the water drain and parts of the fan that come into contact with air					X	
12.3	Vibration check!				X		
12.4	Check bearings for noise					X	
12.5	Grease bearings using a relubrication device					X	
12.6	Check flexible connection for leaks	Repair				X	
12.7	Any external motor ventilation: Check the hose for damage	Check for external air function from the outside			X		
12.8	Check function of vibration absorbers	Repair				X	
12.9	Drive elements	see item 12					
12.10	Measuring and control equipment	Check the function of pressure/volume flow controllers				X	
13.	**Drive elements**		**1**	**3**	**6**	**12**	**24**
13.1	**Electric motors**		**1**	**3**	**6**	**12**	**24**
13.1.1	Check the exterior for dirt, secure fitting, damage, and corrosion	Clean and repair				X	

	Activity/unit components	Measure / remark	Inspections to be performed at monthly intervals				
			1	3	6	12	24
13.1.2	Check the direction of rotation (initial commissioning)						
13.1.3	Re-tighten connection terminals					X	
13.1.4	Measure tension	Measured data must be documented in the measurement log				X	
13.1.5	Measure power consumption	Measured data must be documented in the measurement log				X	
13.1.6	Measure phase symmetry	Measured data must be documented in the measurement log				X	
13.1.7	Check bearings for noise					X	
13.1.8	Grease bearings using a relubrication device					X	
13.1.9	Check the function of the protection device	Repair				X	
13.2	**Belt drive**		**1**	**3**	**6**	**12**	**24**
13.2.1	Inspect for soiling, damage and wear	Replace if necessary			X		
13.2.2	Function-preserving cleaning	Scope of services must be defined and agreed upon				X	
13.2.3	Check for tension and alignment	Readjust			X		
13.2.4	Replace belt					X	
13.2.5	Check the function of the protection device	Repair				X	

7.3 Maintaining and cleaning components

All installed components are either freely accessible for cleaning or can be pulled out of the unit or removed after opening the inspection doors/removing the inspection cover.

- Coarse dirt in the housing can be removed using an industrial vacuum cleaner.
- Remove other dirt with a damp cloth.

Cleaning

- Only lukewarm water, possibly with a mild detergent without perfume, should be used for cleaning.
  Do not use mechanical aids, e.g. sharp tools, grinding stones, wire brushes, files, steel wool made of unalloyed or low-alloy carbon steel, etc.

Disinfection

- If disinfection is necessary with air handling units, a check must be performed at a suitable and non-critical point before using disinfectants to ensure that the disinfectant does not cause damage to the seals, surfaces, etc.

ATTENTION

Only lukewarm water, possibly with a mild detergent without perfume, should be used for cleaning of the inspection glass.

No cleaning agents and disinfectants that attack the materials used in the HV unit are permitted to be used.

The following points are to be observed for the use of disinfectants and for carrying out the disinfection:

- Specifications from the safety data sheet of the disinfectant must be complied with.
- The disinfectant must be used according to the manufacturer's instructions (e.g. concentration, exposure time, etc.).
- Remove the disinfectant completely.
- Dispose of the disinfectant and the necessary aids correctly.

- Disinfectants containing chloride in combination with a strong continuous action of moisture (e.g. areas around spray humidifiers) can cause corrosion damage to (even coated) materials and may not be used in this application.

Also observe the following:

- Do not use a high-pressure cleaner for cleaning or disinfection.
- Detergents or disinfectants must not penetrate into electrical or mechanical system parts.
- If necessary, completely reinstall the protective and safety installations or coverings removed for cleaning or disinfection and check their functionality.

(Subsequent) damage resulting from a nonetheless carried out or incorrect application of corresponding disinfection or cleaning are at the expense of the initiator.

Hygiene checks

The aim of the hygiene checks to be performed regularly is to determine and eliminate hygiene deficiencies on the air conditioning systems at an early stage through frequent visual inspections or random microbiological self-checks.

The regular hygiene checks include the following measures:

- Visual inspection of the relevant unit area for hygiene deficiencies such as e.g. microbial growth or soiling, rust formation, calcium deposits and damage.
- If soiled components are detected during the hygiene checks, these must be cleaned immediately.
- If necessary for cleaning, the inspection glasses of the AT4F unit series can be easily removed and have two lenses.
- If housing covers sealed with sealing material are removed for maintenance purposes, the inside of the housing must be sealed again following maintenance using microbially inert sealing material.

7.3.1 Finned heat exchanger

These include the pump hot water and pump cold water heat exchangers, as well as the evaporators, condensers and steam registers.

⚠ WARNING

Risk of cuts

During maintenance and cleaning of the heat exchanger there is a risk of cuts.

- Wear personal protective equipment (cut-proof gloves).

⚠ CAUTION

Risk of burns as a result of contact with hot surfaces and media (plate heat exchanger, heat exchanger and electric heating coil)

- Wait until the hot surfaces have cooled down.
- Wear personal protective equipment.

⚠ CAUTION

Risk of slipping! Leaked medium/condensate

- Immediately take up the spill quantity and dispose of it properly.

ATTENTION

At temperatures below freezing, the heat exchanger must be either **drained** and blown out with compressed air, or filled with a commercially available antifreeze with corrosion inhibiting additive due to the risk of freezing and corrosion.

ATTENTION

The use of high-pressure water cleaners with conventional single-jet nozzles is not permitted due to the risk of damage.

The heat exchanger is essentially maintenance-free. Regular cleaning of the heat exchangers is necessary in order to ensure their proper function.

Fins of the finned heat exchanger

Dents in the fins of the heat exchanger have no influence on the function of the system as a whole – as long as the pipes of the fin unit are not damaged – and do not constitute grounds for complaints. The fins can be “combed out” on-site. If necessary, the corresponding tool can be obtained from the manufacturer.

NOTE

For the following heat exchanger designs, additional points are to be observed:

Chapter “7.3.1.3 Circulating coil system (heat exchanger with pipe circuits)” on page 97

Chapter “5.11.5 Circulating coil system CCS (recuperative energy recovery)” on page 58

7.3.1.1 Maintenance

- Inspect the heat exchangers on the air side for soiling, damage and corrosion.
- Check connections and screw fittings.
- Check function of flow and return lines.
- Check the venting valve and filling of the heat exchangers.
- Check the function of the frost protection thermostat.
- Check antifreeze concentration and top up if necessary.
- Inspect the siphon and top up, if necessary.
- Check function of water drain and odour trap.
- Inspect the droplet eliminator and clean, if necessary.

NOTE

During prolonged standstills, corrosion can be caused in the heat exchangers by sulphate-reducing bacteria. These sulphides primarily attack the solder seams as well as the copper base material.

We recommend the following measures to reduce this type of copper corrosion:

- Use of sulphate-free water in the whole circuit
- Ensure that the circuit has no leaks
- Avoid prolonged standstills of the filled circuit
- Avoid frequent topping up of fresh water
- Use of material-compatible inhibitors or use of biocides

7.3.1.2 Cleaning

Only methods that do not damage the fins may be used for cleaning of the heat exchanger registers.

	Cleaning methods	Can be used for all types of finned heat exchanger
1	Compressed air	All heat exchanger registers
2	Steam cleaners	Steel galvanised heat exchanger registers only
3	High-pressure water cleaner **only** with THD multi-jet method	All heat exchanger registers

ATTENTION

When using compressed air and steam cleaners ensure a sufficient distance and that the jet is aligned parallel to the fins.

NOTE

Complete removal of the deposits in heat exchangers is not possible using compressed air. Thorough cleaning cannot be guaranteed, particularly in deep registers, by using only compressed air and steam cleaners.

As a result, the dirt deposits are compacted in the depths of the heat exchangers instead of being removed. The consequences are increased pressure losses, a lack of hygiene, odours, material attack, etc.

- The use of high-pressure water cleaners using conventional spray nozzles is not permitted as these can damage the delicate fins and thorough cleaning, particularly in the deeper heat exchanger registers, cannot always be achieved.
- Heat exchanger registers should therefore only by cleaned with high-pressure water cleaners using the THD multi-jet method. This ensures damage-free deep cleaning of the heat exchanger registers. This applies to all heat exchanger register types.

- The cleanability of the AL-KO THERM heat exchanger registers using the THD multi-jet method was demonstrated by the Institute for Air Hygiene Berlin during the hygiene conformity evaluation for the AL-KO air handling units (see Fig. 55 THD multi-jet method).
- The use of the THD multi-jet method includes the correction of any bent fins to restore the optimum flow and performance of the heat exchangers (“fluidic renovation”).

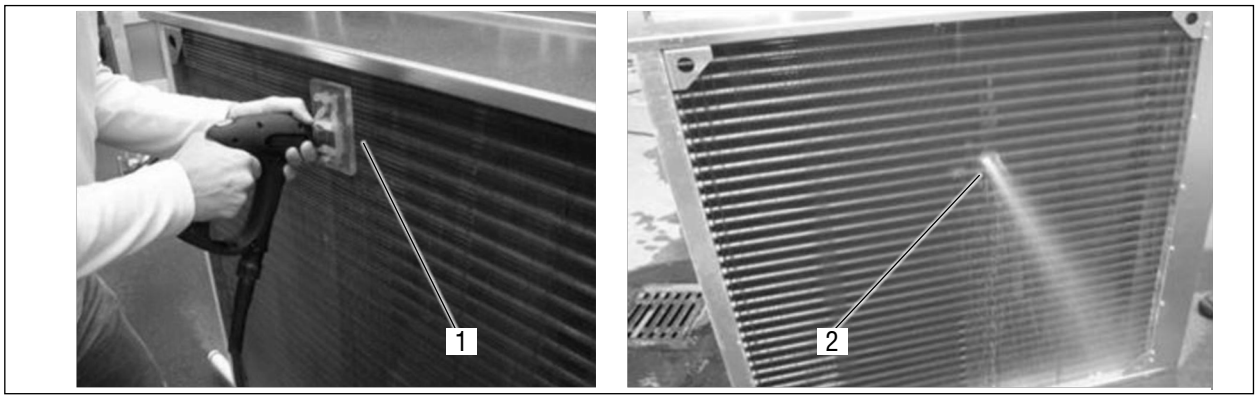


Fig. 55 THD multi-jet method

1	THD multi-jet method/front	2	THD multi-jet method/back

For further information on the THD multi-jet method:
THD
Technischer Hygiene Dienst GmbH
Am Kleingewerbegebiet 3
15745 Wildau
Phone: +49 / (0)30 / 66 76 57 75-0
Fax: +49 / (0)30 / 66 76 57 75-5
E-mail: info@thd-berlin.de
Web: www.thd-berlin.de

7.3.1.3 Circulating coil system (heat exchanger with pipe circuits)

With heat exchangers in a circulating coil system, the pipe circuits themselves cannot be emptied.

For this reason, the circulating coil system is only to be operated with a frost-proof water/glycol mixture and tested for leak-tightness after assembly.

If the system does have to be drained, the pipe circuits can be blown out with compressed air, although water still remains in the heat exchanger even in this case.

ATTENTION

When using high-performance circulating coil systems, observe the manufacturer's operating instructions.

ATTENTION

The maintenance work for the heat exchangers must be carried out at regular intervals.

- Antifreeze concentration must correspond to the specifications on the technical data sheet.
- We recommend the use of the Antifrogen N with a mixture of 25 – 35 %.

7.3.1.4 Steam register

⚠ WARNING

Danger of bursting due to pressure

The steam register is pressurised. Damage to the heat exchanger can cause a risk of bursting and an explosion. This is associated with a loud bang.

- Observe the operating and assembly instructions as well as the working instructions.
- Work with care.
- Secure the hazardous areas. Only trained persons are permitted in this area.
- Operate the heat exchanger only at the permissible operating points.
- Check the steam register for visible damage.
- Comply with the Pressure Equipment Directive and the corresponding standards.

⚠ WARNING

Risk of slipping! Leaked condensate

- Immediately take up the spill quantity and dispose of it properly.

⚠ CAUTION

Risk of burns as a result of contact with hot surfaces and media (plate heat exchanger, heat exchanger and electric heating coil)

- Wait until the hot surfaces have cooled down.
- Wear personal protective equipment.

ATTENTION

Observe the manufacturer's documentation.

- Carry out maintenance and cleaning work according to the manufacturer's data.

7.3.1.5 Evaporator/condenser

⚠ WARNING

Danger of bursting due to pressure

The evaporator/condenser is pressurised. Damage to the heat exchanger can cause a risk of bursting and an explosion. This is associated with a loud bang.

- Observe the operating and assembly instructions as well as the working instructions.
- Work with care.
- Secure the hazardous areas. Only trained persons are permitted in this area.
- Only operate the evaporator/condenser in the permissible operating points.
- Check the evaporator/condenser for visible damage.
- Comply with the Pressure Equipment Directive and the corresponding standards.

⚠ WARNING

Risk of slipping! Leaked condensate

- Immediately take up the spill quantity and dispose of it properly.

⚠ CAUTION

Risk of burns as a result of contact with hot surfaces and media (plate heat exchanger, heat exchanger and electric heating coil)

- Wait until the hot surfaces have cooled down.
- Wear personal protective equipment.

ATTENTION

Observe the manufacturer's documentation.

- Carry out maintenance and cleaning work according to the manufacturer's data.

7.3.2 UV disinfection

⚠ WARNING

Risk of injury to eyes and skin due to UV radiation.

- Work on the unit may only be carried out by authorised personnel.
- De-energise the unit before opening it for maintenance work.
- Avoid direct eye contact with the UV lamp.

⚠ CAUTION

Risk of burns due to contact with hot surfaces and media

- Wait until the hot surfaces have cooled down.
- Wear personal protective equipment.

ATTENTION

Observe the manufacturer's documentation.

- Carry out maintenance and cleaning work according to the manufacturer's data.

7.3.3 Combustion chamber

⚠ CAUTION

Risk of burns due to contact with hot surfaces and media

- Wait until the hot surfaces have cooled down.
- Wear personal protective equipment.

ATTENTION

Observe the manufacturer's documentation.

- Carry out maintenance and cleaning work according to the manufacturer's data.

7.3.4 Plate heat exchanger

⚠ WARNING

Risk of cuts

During maintenance and cleaning of the plate heat exchanger there is a risk of cuts.

- Wear personal protective equipment (cut-proof gloves).

⚠ WARNING

Risk of slipping! Leaked condensate

- Immediately take up the spill quantity and dispose of it properly.

⚠ WARNING

Risk of injury from falling from ladders, scaffolding or work platforms.

- Only use suitable and tested ladders, steps, scaffolding and work platforms.
- Work with care.

⚠ CAUTION

Risk of burns as a result of contact with hot surfaces and media (plate heat exchanger, heat exchanger and electric heating coil)

- Wait until the hot surfaces have cooled down.
- Wear personal protective equipment.

7.3.4.1 Maintenance

- Check plates for soiling.
- Remove dust and fibrous materials or similar, clean condensate drain.
- Check water drain and siphon of the drain tray and top up if necessary.
- Check the damper connection, drive and control functions.

7.3.4.2 Cleaning

- Dry dusts or fibrous materials can be removed using compressed air.
- Remove oil and grease deposits using hot water, steam or grease-dissolving cleaning agents.
- Remove damp, greasy and greasy deposits with a high-pressure cleaner and steam or hot water.

The heat exchanger can be cleaned using a hot water high pressure cleaner.
The following parameters are to be observed here:

Nozzle	Flat jet nozzle
Pressure	max. 20 bar
Water volume	max. 450 l/h
Water temperature	max. 70°C
Distance to heat exchanger*	min. 30 cm
Nozzle direction	90° offset to foil embossing or fins

* Minimum distance to the heat exchanger is a recommendation. The minimum distance must be selected in such a way that complete and thorough cleaning without damage is ensured.

Cleaning direction: from the exhaust air side to the outgoing exhaust air side

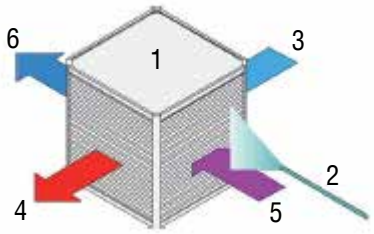


Fig. 56 Cleaning direction for plate heat exchanger

1	Plate heat exchanger	4	Supply air
2	High pressure flat jet nozzle	5	Extract air
3	Outdoor air	6	Outgoing exhaust air

ATTENTION

The specified values must be adhered to, otherwise the plate heat exchanger may be damaged.

NOTE

To remove stubborn dirt, cleaning agents can also be used (e.g. all-purpose cleaner, biodegradable).

It must then be rinsed using plenty of fresh water.

Do not use aluminium cleaners! These are acidic and attack the surface of the plate heat exchanger.

7.3.5 Rotary heat exchanger

⚠ WARNING

Risk of injuries.

- Disconnect the AT4F unit from the mains power supply on all poles and secure it to prevent restart before starting any maintenance or cleaning work.

⚠ WARNING

Risk of cuts

During maintenance and cleaning of the rotary heat exchanger there is a risk of cuts.

- Wear personal protective equipment (cut-proof gloves).

⚠ WARNING

Risk of injury from falling from ladders, scaffolding or work platforms.

- Only use suitable and tested ladders, steps, scaffolding and work platforms.
- Work with care.

⚠ CAUTION

Risk of burns as a result of contact with hot surfaces and media (plate heat exchanger, heat exchanger and electric heating coil)

- Wait until the hot surfaces have cooled down.
- Wear personal protective equipment.

7.3.5.1 Maintenance

ATTENTION

Check seals before commissioning.

Check drive elements and control elements.

Observe the rotor manufacturer's documentation.

ATTENTION

To avoid bearing damage, the thermal mass must be rotated periodically (monthly) in the event of a prolonged standstill.

- Check drive elements and control elements.
- Clean the rotor regularly using compressed air, water, steam or grease-dissolving cleaning agents.
- Check the seal for wear, damage and correct seating.
- Further information can be found in the manufacturer's documentation.

7.3.5.2 Cleaning

ATTENTION

The contamination must be reduced from the outset by using filters.

- The rotors can be cleaned off using compressed air/water. In this process, the jet must act on the thermal mass at right angles.
- Optionally, the rotary heat exchanger can be equipped with a cleaning device.
- Observe the rotor manufacturer's instructions.
- As access for cleaning the thermal mass of the rotary heat exchanger, you can use the inspection doors/inspection covers of the upstream and downstream functional units.
- The cleaning of the thermal mass must be selected depending on the material used!

The thermal mass of the rotary heat exchanger is made of wound aluminium foil. On the basis of the counterflow principle, self-cleaning takes place in most cases, which prevents contamination of the thermal mass.

If this self-cleaning is not sufficient, the thermal mass can be stored at appropriate intervals (depending on the degree of contamination) with compressed air or in the case of stubborn contamination with high-pressure units (medium only water without chemical additives) can be cleaned.

ATTENTION

Only use compressed air or water without chemical additives as the medium. The air or water jet must act on the thermal mass at right angles, otherwise there is a risk of damage.

The residual water must be blown out of the rotor after cleaning.

Rotation direction of the thermal mass

Make sure that the thermal mass always rotates from the exhaust air via the flushing chamber into the supply air. This rotation direction of the thermal mass is identified by a marking.

ATTENTION

Check seals before commissioning and apply seals when fans are running.

ATTENTION

To avoid bearing damage, the thermal mass must be rotated periodically (monthly) in the event of a prolonged standstill.

7.3.5.3 Drive belt maintenance

- Check drive V-belt for tension.
- Check drive V-belt for wear.
- Check correct position of the drive V-belts.
- Further information can be found in the manufacturer's documentation.

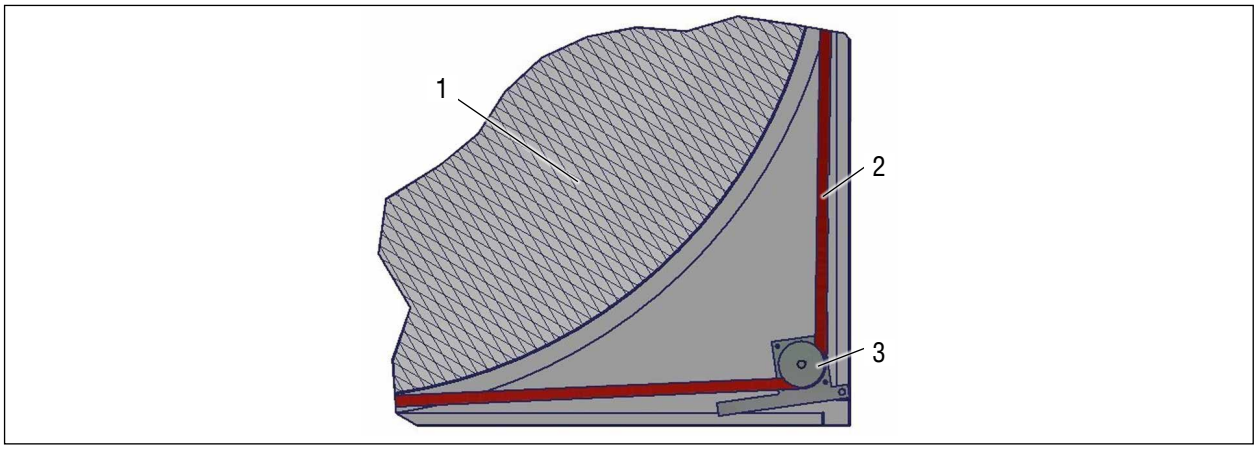


Fig. 57 Drive V-belt installation situation

1	Rotary heat exchanger	3	V-belt pulley
2	Drive V-belt		

- Check the tension of the drive V-belt
  - The drive V-belt can stretch, particularly within the first 400 operating hours.
  - If the drive belt stretches too much, it must be shortened.
  - This can be carried out by simply removing links. Please refer to the relevant manufacturer's documentation.

7.3.6 Grease trap filter

The grease trap filter must be cleaned with hot water (> 80°C) or steam if soiled by grease or dust or after reaching the recommended end pressure difference (type plate). Servicing and assembly are generally carried out on the dusty air side.

Cleaning the filter elements up to unit size 16 x 16

Step	Action
1	Pull the filter element with the mounting frame including the collecting troughs out of the unit.
2	Unfasten the clamping bracket on the filter frame and clean the filter element including the collecting tray.

Cleaning the filter elements from unit size 20 x 16

Step	Action
1	Detach the clamping bracket from the filter frame.
2	Remove the filter element and clean it.
3	Clean collecting tank.

7.3.7 Dampers

⚠ WARNING

Risk of crushing

When closing the multi-leaf damper, there is a risk of crushing injuries to the hands.

- Do not reach into the damper when closing the multi-leaf damper.
- Wear personal protective equipment.

7.3.7.1 Maintenance

- Inspect the multi-leaf dampers for soiling, damage and corrosion.
- Check the mechanical function of the multi-leaf dampers.
- Lubricate the damper bearing and joints if necessary using appropriate lubricants.
- Check the end position of the damper adjusting actuators and adjust, if necessary.

7.3.7.2 Cleaning

- Clean the multi-leaf dampers at regular intervals.

7.3.8 Sound absorber

⚠ WARNING

Risk of cuts

During maintenance and cleaning of the sound attenuator splitters there is a risk of cuts.

- Wear personal protective equipment (cut-proof gloves).

7.3.8.1 Maintenance

- Check the sound absorbers for soiling and damage at regular intervals.

7.3.8.2 Cleaning

- Sound attenuator splitters (optional) can be taken out/removed from the unit for cleaning.

NOTE

Following extended operating intervals, clean the sound attenuator splitters (optional) using an industrial vacuum cleaner.

7.3.9 Droplet eliminator

⚠ WARNING

Risk of cuts

There is a risk of cutting injuries during cleaning and maintenance of the droplet eliminator.

- Wear personal protective equipment (cut-proof gloves).

- The droplet eliminator can be pulled out of the housing to the side for cleaning and maintenance purposes.

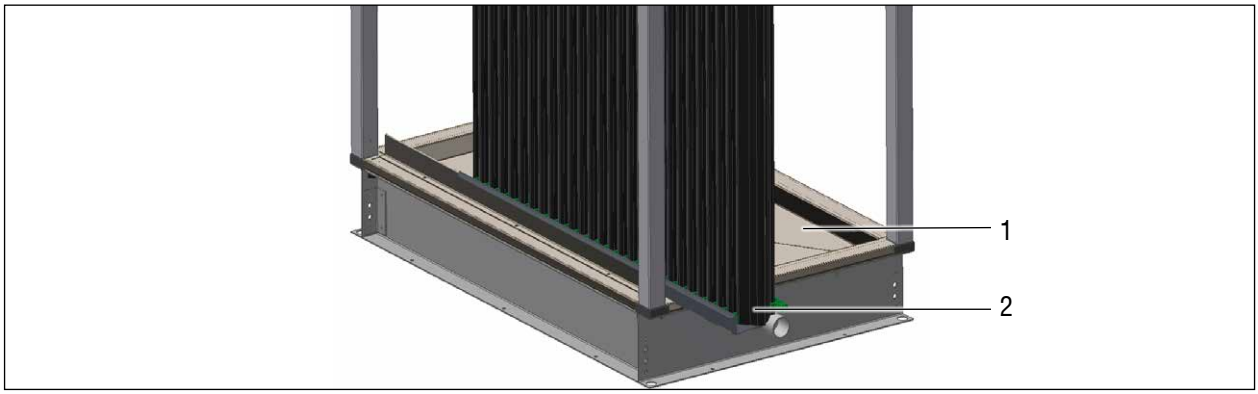


Fig. 58 Droplet eliminator installation situation

1	Condensate collecting pan	2	Droplet eliminator

7.3.9.1 Maintenance

- Inspect the droplet eliminator for soiling, damage and corrosion.
- Inspect the water drain and odour trap.
- Check water drain and siphon of the drain tray and top up if necessary.

ATTENTION

During installation of the pipelines on site, ensure that the droplet eliminator can still be pulled out to the side.

7.3.9.2 Cleaning

- Clean the droplet eliminator and condensate collecting pan using compressed air, water, steam or grease-dissolving cleaning agents.

7.3.10 Humidifier

⚠ CAUTION

Health hazards due to germs.

Check the humidifiers for microbial contamination.

If germs are present, the unit must be switched off and subjected to hygienic cleaning. It is mandatory to carry out this hygiene cleaning.

Observe the operating instructions of the manufacturer.

7.3.10.1 Spray humidifier (air washer)

Maintenance

- Inspect the spray humidifier for soiling, damage and corrosion.
- Inspect the siphon and top up, if necessary.
- Inspect the float valve.
- Check the installation of the water filter.
- Check the screw and flange connections of the pump pressure line for leaks.
- The specified water quality must be maintained at all times and corrected at regular intervals.

ATTENTION

Observe the humidifier manufacturer's maintenance, commissioning and assembly instructions. Clean the spray humidifier with foaming cleaning agent.

Cleaning

- Clean the spray humidifier unit, including the nozzles and manifolds, at least once a year.
- Inspect the blow-down device and clean, if necessary.
- Inspect and clean the droplet eliminator/rectifier.
- Observe the manufacturer's documentation.

ATTENTION

Observe the humidifier manufacturer's maintenance, commissioning and assembly instructions. Clean the spray humidifier with foaming cleaning agent.

7.3.10.2 Contact humidifier

Maintenance

ATTENTION

Observe the manufacturer's documentation.

Fresh water system of the contact humidifier

ATTENTION

The water quality for the contact humidifier must be ensured according to the manufacturer's data.

- Check humidifier for function, damage and soiling.
- Check water flow rates.
- The specified water quality must be maintained at all times.
- The operator must document the maintenance work in writing.

Circulation water system for contact humidifier

ATTENTION

The water quality for the contact humidifier must be ensured according to the manufacturer's data.

- Check humidifier for function, damage and soiling.
- Check water flow rates.
- Check the desalination rate.
- The specified water quality must be maintained at all times.
- The operator must document the maintenance work in writing.

Cleaning

ATTENTION

Observe the manufacturer's documentation.

Fresh water system of the contact humidifier

ATTENTION

The water quality for the contact humidifier must be ensured according to the manufacturer's data.

- Only products from the humidifier manufacturer are approved for disinfection, cleaning and water treatment!
- The operator must document the maintenance work in writing.

Circulation water system for contact humidifier

ATTENTION

The water quality for the contact humidifier must be ensured according to the manufacturer's data.

- Only products from the humidifier manufacturer are approved for disinfection, cleaning and water treatment!
- The operator must document the maintenance work in writing.

7.3.10.3 High-pressure humidifier

Maintenance

ATTENTION

Observe the manufacturer's documentation.

Use gear oil according to manufacturer's data.

- Check the high-pressure nozzles. Visual inspection of the spray cone.
- Oil check or oil change (especially during extended standstill times) of the high-pressure pump.
- Check the ratio, toothed belt and tooth discs.
- Functional check of safety installations (solenoid valves, pressure gauge, pressure switch).
- Check the setting values of the controller, correct if necessary.

Cleaning

ATTENTION

Observe the manufacturer's documentation.

- Cleaning the interior with water. For heavier soiling, an alkaline cleaning agent can be used.
- Water with drinking water quality should be used as a minimum for rinsing. Make sure there is sufficient fresh water flushing.
- If necessary, clean or replace the nozzles. Rinse with water.
- Rinsing of the HP hose, the manifold and the nozzle assemblies with the above cleaning agent. Rinse sufficiently with fresh water (permeate) and clean with compressed air.
- Flushing of the inlet filter with sufficient fresh water (permeate), replace the filter insert if necessary.

7.3.10.4 Steam humidifier

Maintenance

ATTENTION

Observe the manufacturer's documentation.

ATTENTION

The water quality for the steam humidifier must be ensured according to the manufacturer's data.

- Inspect the steam humidifier for soiling, damage and corrosion.
- Check the steam and condensate pipe for leakage.
- Check the function of the steam distributor.
- Check the function of the solenoid valves.
- Check the measuring and control devices.

Additional maintenance work for steam humidifier with separate steam generator:

- Check the function of the water supply and water level.
- Measure power consumption.
- Check the steam cylinder for deposits and replace if necessary.

Additional maintenance work for steam humidifier without separate steam generator:

- Check the function of the control valve.
- Readjust the stuffing box of the control valve.

Cleaning

ATTENTION

Observe the manufacturer's documentation.

ATTENTION

The water quality for the steam humidifier must be ensured according to the manufacturer's data.

- Clean the steam humidifier and dirt trap regularly.

7.3.11 Electric motor

⚠ DANGER

Hazard due to electric current.

Incorrect connection to the energy supply or incorrect installation of electrical components can result in electric shock.

- Only have the electrical connection carried out by an approved electrician.
- Perform the connection exactly according to the circuit diagram and the assignment plan.
- Observe the valid DIN and VDE regulations.
- Observe the directives of the local energy supply company.
- Use personal protective equipment at all times when working on the installation.
- Use other protective equipment according to the work carried out.
- Do not operate the unit with defective or damaged cables or plugs.
- Regularly check the connection cables for damaged areas.
- Use only the permissible tool.
- Shut off the energy supply for maintenance work and secure it to prevent restart.
- Observe the electrical safety regulations.

⚠ WARNING

Risk of injuries.

- Disconnect the AT4F unit from the mains power supply on all poles and secure it to prevent restart before starting any repair or maintenance work.
- Follow the applicable safety rules.
- Have installation, commissioning, servicing and maintenance work carried out only by qualified staff.

To be carried out by the person responsible:

- After carrying out the work, ensure that there are no longer any persons in the installation.
- Before restarting the installation, ensure that all factory-installed protective measures are functioning correctly.

⚠ WARNING

Risk of injuries due to incorrect or faulty connection.

- Electrical connections must only be undertaken by a certified electrician under consideration of the valid DIN and VDE regulations as well as the directives of the local energy supply company.
- Only have assembly, servicing and maintenance carried out by qualified staff.
- Wear personal protective equipment.

ATTENTION

Observe the motor manufacturer's documentation.

Observe the separate operating manual for a motor removal device.

Only use lubricants according to the manufacturer's data.

7.3.11.1 Maintenance

The electric motors are usually equipped with permanently lubricated motor bearings.

In the case of electric motors with relubricatable motor bearings, these must be regularly checked and, if necessary, relubricated. Use only lubricants specified by the motor manufacturer.

- Check motor for dirt, damage and corrosion.
- Check motor mounting and retighten all fastening screws.
- Check the bearing and re-lubricate if necessary.
- Check the function of the protective devices.
- All fastening screws/electrical connections must be retightened.

7.3.11.2 Cleaning

- Clean the motor and motor substructure regularly.

7.3.12 Fans

⚠ WARNING

Risk of injury from fan during fan test run.

- Never disassemble or bypass safety installations.
- Work with care.
- Remove any loose parts in the air handling unit.
- Eliminate tripping hazards.
- Maintain the safety distance.
- Do not remain in the debris shadow when the fan starts up.
- Wait until the fan impeller has come to a standstill.
- Carry out a visual inspection for cracks in the impeller.
- Wear personal protective equipment (ear protection).

⚠ WARNING

Risk of injury caused by impeller breakage.

Operation with impermissibly high vibration values, in particular with fans without spiral housing, can result in impeller breakage, which can lead to serious property damage and personal injuries.

- Perform a vibration measurement of the fan impeller regularly and document the checks. If the permissible vibrations are exceeded, no operation may take place. Observe the table with the respective vibration values, see chapter “7.3.12.5 Fan free-wheel with direct drive” on page 115.
- When operating with a frequency converter, the frequency converter should generally be operated without overmodulation.
- Do not operate fans in the range of the resonance speed (and its multiples) of the fan motor system.
- Check the fan impeller for cracking.

⚠ WARNING

Risk of injuries due to run-on of fans.

- Switch off the unit on all poles and secure it against restart.
- Only open the inspection doors only when the fans are switched off and stationary.
- Observe the delay time of the fans. Observe a waiting time of at least 3 minutes, until the fan impellers are stationary, before opening the inspection doors.
- Never brake the impellers of the fans by hand or using an object.

7.3.12.1 Maintenance

- Check fan impeller for soiling and unbalance.
- Check fan gap and overlap, see chapter “7.3.12.6 Check gap and overlap in fans” on page 117.
- Check the bearing and re-lubricate if necessary.
- Retighten all fastening screws, see chapters “7.3.12.7 Tightening torques of the screw connections on the fan part” on page 118 and “7.3.12.8 Maintenance or inspection of the taper-lock clamping bushes” on page 118.
- Check the function of the vibration absorbers.
- Check the drainage function if necessary.
- Inspect the fan for soiling, damage and corrosion.

7.3.12.2 Cleaning

- Clean the fan unit at regular intervals.

7.3.12.3 Fan with belt drive

- Inspect V-belt drive for soiling, damage and wear.
- Check V-belt tension and retighten if necessary.
- Check alignment of the V-belt pulleys.
- Clean the V-belt drive at regular intervals.

ATTENTION

When replacing V-belts in multi-groove drives, the entire V-belt set must always be replaced.

Clamping specification for V-belt drive

The correct belt tension is achieved when with the individual test force F_p a belt deflection b according to the technical data sheet has been reached. Alternatively, it can also be adjusted using frequency measurement.

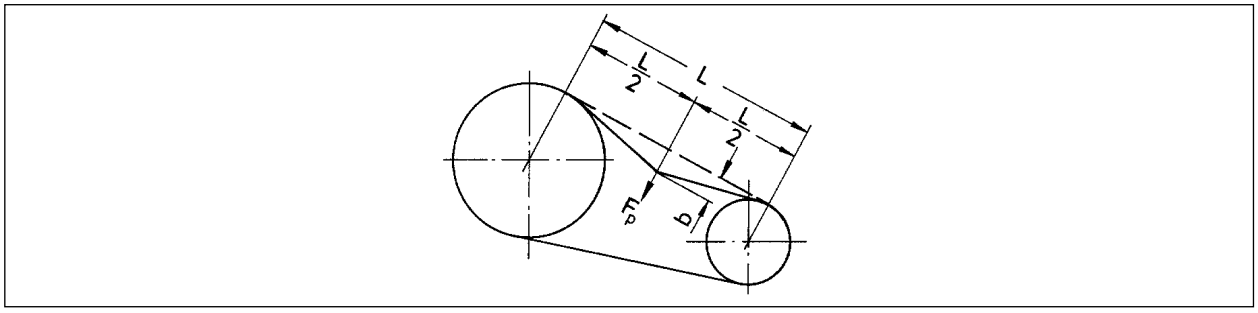


Fig. 59 Checking the belt tension on the V-belt drive

L	Span length	F_p	Test load in N from AL-KO THERM document or type plate
b	Belt deflection under the test force F_p		

Clamping specification for flat-belt drive

The correct belt tension has been reached when the measuring mark distance L_{Mu} has increased by the overlay elongation E*. The adjustment should be made in two steps with a time interval of a few hours to avoid overloading the bearings.

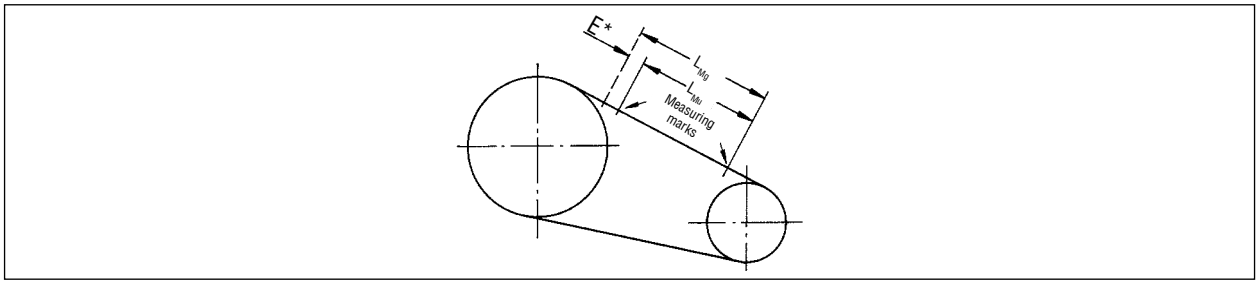


Fig. 60 Checking the belt tension on the flat belt drive

L_{Mu}	Measuring mark distance on the unclamped flat belt
L_{Mg}	Measuring mark distance on the correctly clamped flat belt
E*	Overlay elongation in mm from supplied document

Changing the V-belt pulley

ATTENTION

Ensure that the motor disc and fan drive pulley are precisely flush.
Fit and tension the belt according as prescribed.

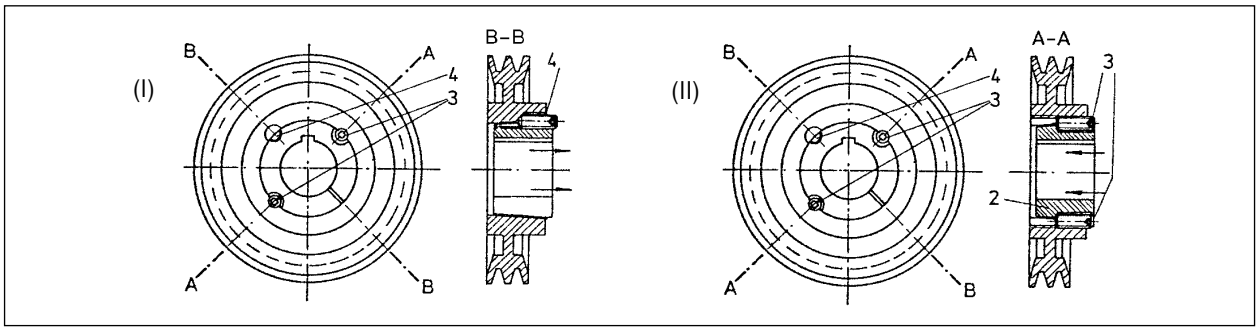


Fig. 61 Fastening of the V-belt pulley

3	Screws	4	Threaded bore

Unfasten the V-belt pulley

Step	Action
1	Unscrew the screws.
2	Insert the screw hexagonal bolt into the threaded hole.
3	Push the clamping bush out of the conical bore.
4	V-belt pulley can then be gently pushed out of the shaft.

Fasten the V-belt pulley

Step	Action
1	Unscrew the screw hexagonal bolt from the threaded hole.
2	Pull V-belt pulley and clamping bush together by means of threaded pins or screw hexagonal bolts. In this process, observe the tightening torques given under point “Maintenance or inspection of the taper-lock clamping bushes”. Too high a tightening torque leads to damage to the taper-lock clamping bush.

7.3.12.4 EC fan

⚠ CAUTION

Risk of burns due to contact with hot surfaces.

- Wait until the hot surfaces have cooled down.
- Wear personal protective equipment.
- Observe the manufacturer's documentation.

- Check fan for hygienic condition, dirt, damage, corrosion, and a secure fastening.
- Check the function of the protection devices.

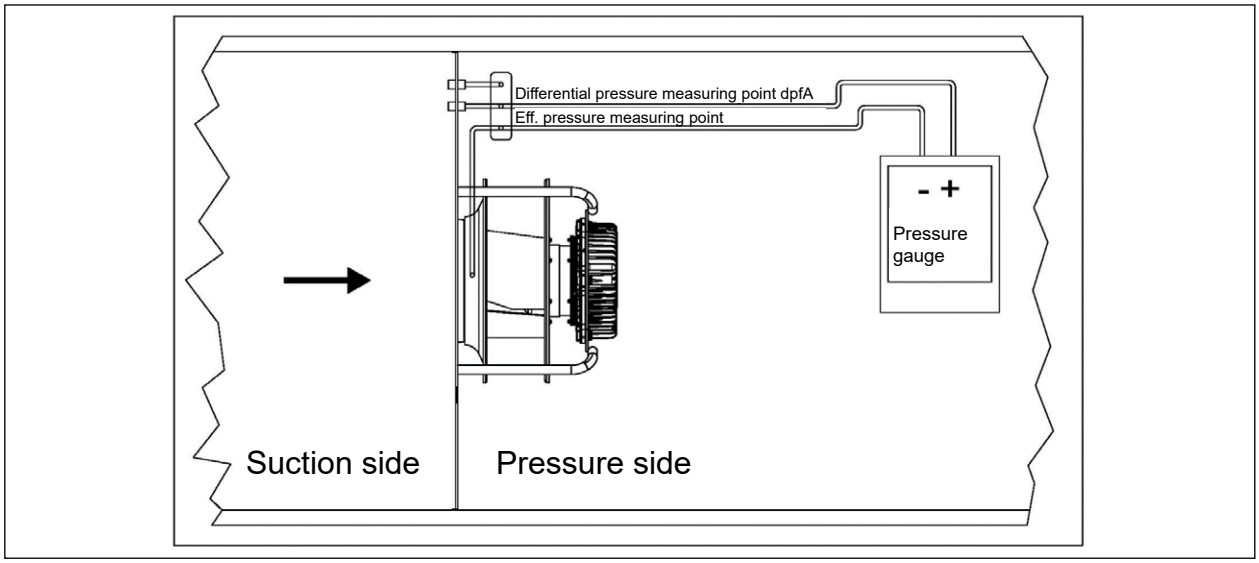


Fig. 62 Wiring diagram for volume flow measurement

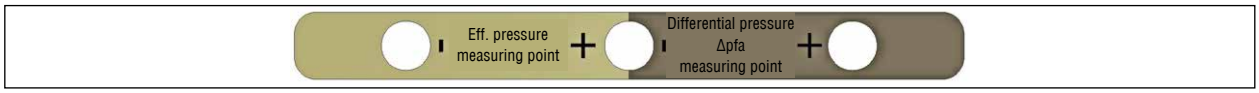


Fig. 63 Pressure measuring point stickers

7.3.12.5 Fan free-wheel with direct drive

⚠ WARNING

Risk of injury caused by impeller breakage.

Operation with impermissibly high vibration values, in particular with fans without spiral housing, can result in impeller breakage, which can lead to serious property damage and personal injuries.

- Perform a vibration measurement of the fan impeller regularly and document the checks. If the permissible vibrations are exceeded, no operation may take place. Observe the table with the respective vibration values (“Table of vibration speeds” on page 116).
- When operating with a frequency converter, the frequency converter should generally be operated without overmodulation.
- Do not operate fans in the range of the resonance speed (and its multiples) of the fan motor system.
- Check the fan impeller for cracking.

NOTE

AL-KO THERM recommends continuous monitoring using a vibration sensor (available as an option).

Table of vibration speeds

The following limit values according to ISO 14694, fan category BV-3 are to be observed:

State	Operation	Alarm	Shut-down
rigid installation	4.5 mm/s	7.1 mm/s	9.0 mm/s
elastic installation	6.3 mm/s	11.8 mm/s*	12.5 mm/s

Operation: In this area, the fan can work in continuous operation without being damaged.
Alarm: In this area, the fan must not be operated for a longer period of time, the damage must be repaired at the next opportunity.
Shut-down: Under no circumstances may the fan work in this area, it must be shut down immediately.

* AL-KO THERM recommends setting this value to 9.5 mm/s.

Maintenance

- Perform maintenance at least once per year.
- Check fan gap and overlap, see chapter “7.3.12.6 Check gap and overlap in fans” on page 117.
- Check fan for soiling, vibration, damage, loose screws and corrosion.
- Check the impeller, particularly welding seams, for possible cracking every 6 months.
- Check the function of the safety installations (door catch, protective grille).

Operating point setting

- The operating point can be approached accurately with an adjustable fan speed.
- When controlling the speed, make sure that the maximum fan speed and the permissible motor currents are not exceeded.
- The nozzle gap must not be adjusted.

Air volume determination

Optionally, the fans are equipped with a volume flow measuring device. The pressure difference between the static pressure in the suction-side chamber and the pressure at the inlet nozzle is measured via a pressure measuring point on the inlet nozzle. This differential pressure (effective pressure) has a fixed relationship to the volume flow. Detailed description on request.

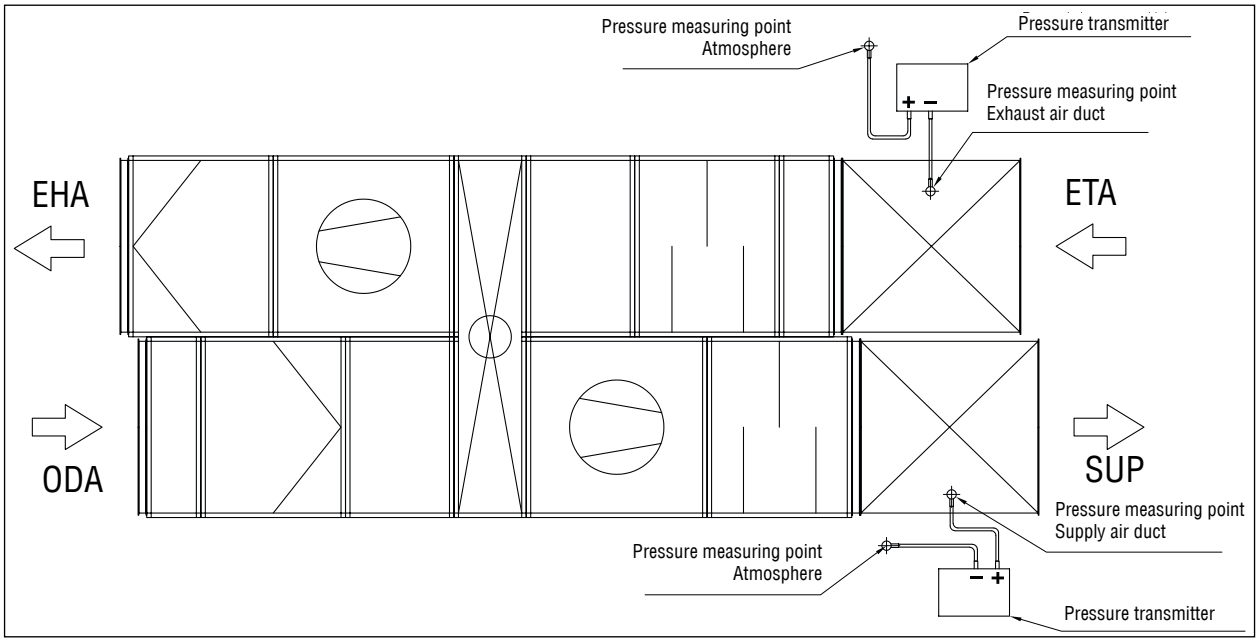


Fig. 64 Wiring diagram for volume flow measurement

EHA	Outgoing exhaust air	ODA	Outdoor air
ETA	Extract air	SUP	Supply air

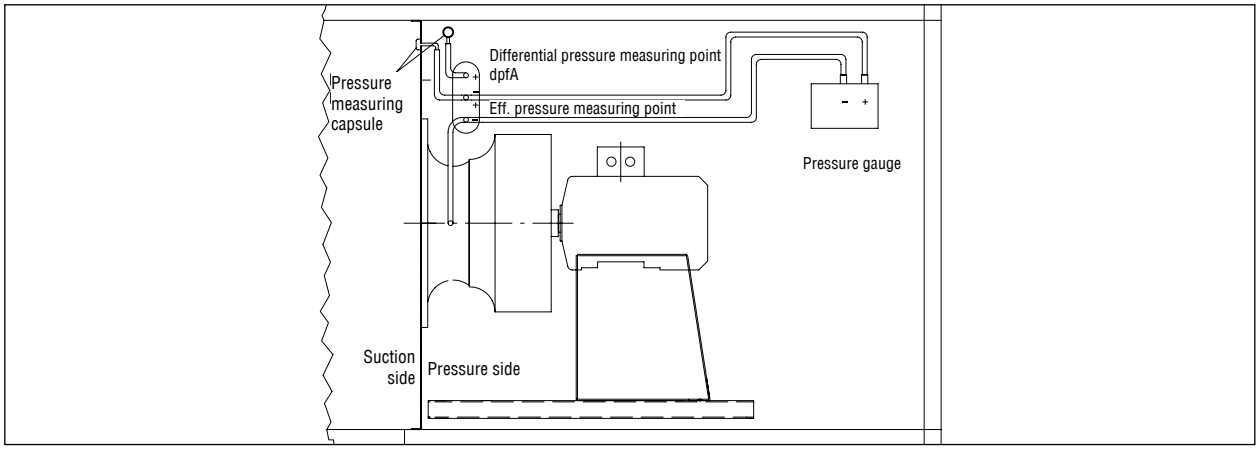


Fig. 65 Air volume determination via measuring differential pressure

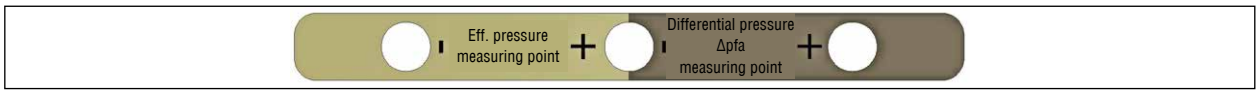


Fig. 66 Pressure measuring point stickers

7.3.12.6 Check gap and overlap in fans

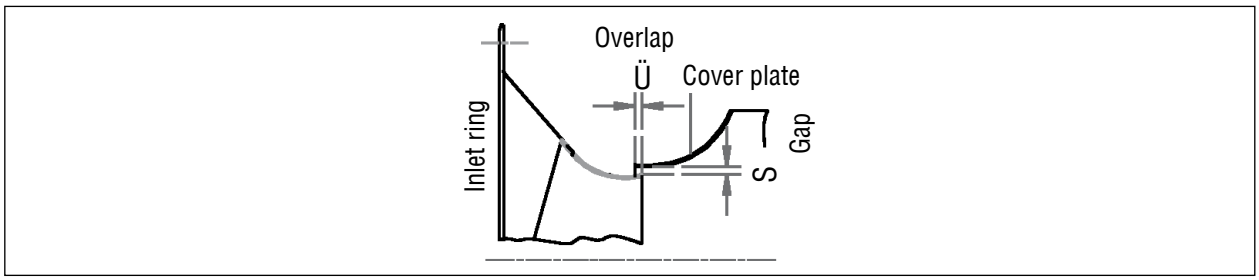


Fig. 67 Gap dimension and overlap

Step	Action
1	Visually and manually check the gap dimension at four points offset by 90° by feeling with the fingertips.
2	Check if the impeller is rubbing: The impeller must not rub, and the gap should be as large as possible around the circumference.
3	Perform a visual check of the overlap: Normally, a check for “zero” is carried out – i.e. an overlap must be present, it should be “greater than 0”.
4	Visually check that a gap is present: When manually rotating the impeller from multiple viewing angles, no gap must be visible.
	If in doubt, check the presence of a gap using a sheet of paper. The test is passed if the paper cannot be pushed between the inlet nozzle and the cover plate.

ATTENTION

The exact gap dimensions can be requested from the respective fan manufacturer.

7.3.12.7 Tightening torques of the screw connections on the fan part

ATTENTION

After approx. 1 hour, check the screw connections on the fan base frame and, if necessary, tighten evenly with the screw tightening torques specified in the table below using a torque wrench.

Thread dimension	Screw thread tightening torque (Nm)
M6	10
M8	25
M10	49
M12	85

7.3.12.8 Maintenance or inspection of the taper-lock clamping bushes

- Clean and degrease all bare surfaces such as the hole and the conical surface of the taper-lock clamping bush as well as the conical hole of the disc. Insert the taper-lock clamping bush into the hub and bring all the connection holes to coincide (half threaded holes must face half smooth holes).
- Threaded pin (size 1008 – 3030) or cylinder screws (size 3535 – 5050) are lightly covered with threadlocker and screwed in – do not tighten the screws yet!
- Clean and degrease shaft. Slide the disc onto the shaft using a taper-lock clamping bush.
- If a feather key is used, it must first be inserted into the groove of the shaft. There must be back clearance between the feather key and the bore groove.
- Using the torque wrench, threaded pins or hexagon socket head cap screws, tighten evenly with the tightening torques specified in the table.

Bushing	Screw tightening torques (Nm)	Screws	
		Quantity	Size
1008/1108	6	2	1/4" BSW
1310/1315	20	2	3/8" BSW
1210/1215	20	2	3/8" BSW
1610/1615	20	2	3/8" BSW
2012	31	2	7/16" BSW
2517	48	2	1/2" BSW
3020/3030	90	2	5/8" BSW
3535	112	3	1/2" BSW
4040	170	3	5/8" BSW
4545	192	3	3/4" BSW
5050	271	3	7/8" BSW

7.3.13 Cooling system and heat pump

ATTENTION

Observe the requirements in the separately supplied operating instructions for cooling systems and heat pumps.

7.3.14 Electric air heater

Frequent causes of error for accumulated heat with electric air heaters

Cause	Remedy
No air volume flow	Heater groups may only be released when a sufficient air flow is conveyed via the heater → Use of a volume flow monitor AL-KO THERM recommends the integration of the electric air heater control into the repair switch circuit (auxiliary switch)
Insufficient air volume flow through controlled fans	The heating capacity must also be adjusted in accordance with the reduced air volume flow → Infinitely variable control of the heating energy or switching of heating groups according to the specified air volume flow
Temperature monitor is not connected	During commissioning, the function of the temperature-related shutdown must be checked
Safety temperature limiter is not connected	During commissioning, the shutdown function must be checked
No fan delay	It is imperative that the fans have a delay of min. 5 minutes after switching off the electric heating. Alternatively, the fan delay can also be controlled using a thermostat.
Incorrect commissioning – Checking the electric heater without sufficient air flow due to closed flaps or false air, for example	Ensure that there is always a sufficient air volume flow at the heating coil during testing
Air temperatures above 60°C	Ensure that the air temperatures do not exceed 60°C at any time. The air temperature in normal operation (continuous operation) must not exceed 40°C

- After any power failure or fault messages, the installation is to be checked for damage and replacement measures must be taken where necessary.
- Observe the manufacturer's documentation.

7.4 Replacing components

7.4.1 Changing the filter

⚠ WARNING

Risk to health when changing the filters due to dust load and microbial contamination.

- Switch off the unit on all poles and secure it against restart.
- Adhere to the maintenance plan.
- Wear personal protective equipment (dust mask) during a filter change.
- Use other protective equipment according to the work carried out.

Special instructions for operating the units

ATTENTION

The built-in filter elements fulfil a safety function and may only be operated up to the final pressure losses stated on the data sheet.

NOTE

Do not wash and reuse used air filters; always replace them. Otherwise, the hygienic requirements will not be met.

ALU mesh filters are excluded from this.

ATTENTION

Only use original consumables and spare parts. This is the only way to ensure safe operation.

Otherwise the warranty will be voided.

A spare parts list can be found as part of the unit documentation.

After Sales
Phone: +49 8225 39 - 2600
E-mail: airtech.after-sales@alko-air.com
Web: www.alko-airtech.com

- The filter elements must be approved according to ISO 16890.
- The filter elements must be monitored for the final pressures and checked for damage on a regular basis.
- Use only original spare parts.
- Technical data, e.g. final pressures, can be found in the data sheets of the filter manufacturer.

7.4.1.1 Replacing bag filters

ATTENTION

The filter bags should generally be replaced when the permissible end pressure difference indicated on the type plate is reached.

The filter bags must be disposed of in accordance with the currently valid and applicable local regulations.

- Inspect all filter classes at regular intervals for soiling and damage and replace, if necessary.
- Replace the 1st filter stage every 12 months at the latest.
- Replace the 2nd filter stage every 24 months at the latest.

Bag filters can be replaced either on the dust-air side or on the clean-air.

The filters are delivered packed in a cardboard box.

A filter quick change device is optionally available for all filter classes up to a clear unit height of 1836 mm.

Replacing the filter bags when fastening the clamps:

NOTE

When inserting the filter bags, make sure that they are installed centrally and firmly clamped to the seal by all four filter clamps.

Step	Action
1	Disconnect the clamps in the filter frame by unhooking.
2	Pull the filter bags out individually.
3	Check the filter gaskets, inspect and replace any damaged gaskets.
4	Install new filter bags into the filter frame.
5	Close the clamps in the filter frame by hooking and check that they are secure.

Fig. 68 Filter mounting frame, left filter clamp

Fig. 69 Filter mounting frame, right filter clamp

Fig. 70 Filter mounting frame with filter clamps

Replace the filter bags with quick change device:

Step	Action
1	Release the clamping device by simply pulling it out using pull-out lever that is supplied loose.
2	Pull the filter bags out of the unit individually.
3	Check the filter gaskets, inspect and replace any damaged gaskets.
4	Install new filter bags.
5	Close the clamping device by pushing it in.

7.4.1.2 Change the activated carbon filter

The activated carbon must be replaced after reaching saturation. Servicing and assembly are generally carried out on the clean air side.

In general, activated carbon cartridges are delivered packed in a cardboard box in the marked components.

Changing the filter cartridge

Step	Action
1	Release the bayonet closure on the base plate (key for optional accessories) and remove the filter cartridge.
2	Clean the sealing surfaces of the filter wall/base plate.
3	Reattach new filter cartridges to the base plate using the bayonet closure.
4	Check the filter insert for secure fitting.

Replace the cassette filters with quick change device:

Step	Action
1	Release the clamping device by simply pulling it out using pull-out lever that is supplied loose.
2	Pull the cassette filters out of the unit individually.
3	Check the filter gaskets, inspect and replace any damaged gaskets.
4	Install new cassette filters.
5	Close the clamping device by pushing it in.

7.4.1.3 Replace the particulate air filter

ATTENTION

The particulate air filters should generally be replaced when the permissible end pressure difference indicated on the type plate is reached.

Servicing and assembly are generally carried out on the dusty air side.

Replacing the filter elements:

Step	Action
1	Unfasten the screws on the filter frame and remove the filter element.
2	Clean the sealing surfaces of the filter wall/filter frame.
3	Insert new filter element and secure.

ATTENTION

AL-KO THERM does not assume any warranty for damage due to improper handling of the particulate air filter during assembly and disassembly.

8 Emergencies and malfunctions

8.1 Emergency

ATTENTION

In case of fire, used building materials can develop toxicologically hazardous substances.
To protect against any released pollutants, rooms must only be entered with breathing masks.
Safety of persons has priority over safety of property.

8.2 Help in the event of malfunctions

⚠ WARNING

Risk of injury due to incorrectly implemented measures.

Incorrect or incorrectly executed measures can put the installation in a potentially dangerous state. There is then a risk of injuries and even electric shock.

- Only allow work on electrical equipment inside the switch cabinet (e.g. test work, replacement of fuses) to be carried out by qualified staff.
- Only allow diagnosis, troubleshooting and recommissioning to be carried out by authorised persons.
- Use personal protective equipment at all times when working on the installation.
- Use other protective equipment according to the work carried out.

NOTE

Further information on “General malfunctions” of the AT4F unit can be found in the AL-KO THERM operating manual/functional description for “Control ART TECH LEVEL II”.

8.3 Contact for malfunctions

For all questions that you have in connection with AL-KO THERM products, please contact the manufacturer of your ventilation installation, an AL-KO THERM branch or directly to:

AL-KO THERM GMBH	Phone:	(+49) 82 25 / 39 - 0
Hauptstraße 248-250	Fax:	(+49) 82 25 / 39 - 2113
D-89343 Jettingen-Scheppach	E-mail:	klima.technik@alko-air.com
Germany	Web:	www.alko-airtech.com
Customer Service	Phone:	(+49) 82 25 / 39 - 2574
	E-mail:	service.center@alko-air.com

9 Shut-down

9.1 Decommissioning

De-energise the installation before beginning work (all-pole shutdown) and secure it against unauthorised restart.

⚠ WARNING

Risk of injury due to pressurised parts.

- When decommissioning, note that certain installation parts are pressurised.
- Comply with the safety rules!

ATTENTION

In winter, there is a general freezing hazard for all components. If necessary, take suitable measures such as fully draining the liquid media. At temperatures below freezing point, the heat exchanger must be either drained and blown out with compressed air, or filled with a commercially available antifreeze with corrosion inhibiting additive due to the risk of freezing and corrosion.

- If the installation is decommissioned for a long period of time, the instructions for the individual components must be observed.
- The information from the component manufacturers must also be followed (request this information if necessary).
- Before recommissioning, observe chapters “6 Commissioning” on page 74 and “7 Servicing and maintenance” on page 85.
- In the event of decommissioning, the intake and exhaust openings of the ventilation unit must generally be closed to prevent condensation forming in the unit due to the possible overflow/throughflow of warm air. Condensate in the unit can cause damage, especially to electrical components.

9.2 Dismantling

- Dismantling must be carried out according to the currently valid and applicable occupational safety and accident prevention regulations.

⚠ WARNING

Risk of injury from falling from ladders, scaffolding or work platforms.

- Only use suitable and tested ladders, steps, scaffolding and work platforms.
- Work with care.

⚠ WARNING

Risk of poisoning when draining the media.

The unit may contain media that are hazardous to health, such as coolants.

- The drained media may only be filled and stored in approved containers.
- Work with care.
- Avoid skin and eye contact with the media, do not swallow media and observe the safety data sheets.
- Wear personal protective equipment.
- Absorb spills immediately.

⚠ WARNING

Risk of injury when dismantling electrical and thermal components.

- Only have disassembly work carried out by trained qualified staff.
- Before starting work, disconnect the installation from the central supply line.
- When dismantling, note that certain parts of the installation are pressurised.
- Fix the impellers of the fans.
- Work with care.
- Use only suitable means of transport when transporting installation parts.
- Use personal protective equipment at all times when working on the installation.
- Absorb spills immediately.

⚠ WARNING

Danger to health when removing the filter inserts.

- When removing filters, wear the personal protective equipment (dust mask).
- Use other protective equipment according to the work carried out.
- Avoid contact with the dust.

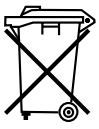
9.3 Disposal

⚠ WARNING

Risk of poisoning when disposing of the media.

The unit may contain media that are hazardous to health, such as coolants.

- Work with care.
- Avoid skin and eye contact with the media, do not swallow media and observe the safety data sheets.
- Wear personal protective equipment.
- When disposing of the media, comply with the relevant local environmental and recycling regulations in your country and community that are applicable at the time when the activity is undertaken.
- The drained media may only be filled and stored in approved containers.



Do not dispose of worn-out units, spent batteries or rechargeable batteries in domestic waste.
When disposing of the unit, operating equipment and accessories, proceed according to the relevant local environmental and recycling regulations in your country and community that are applicable at the time when the activity is undertaken.

10 Spare parts

ATTENTION

Only use original consumables and spare parts. This is the only way to ensure safe operation.

Otherwise the warranty will be voided.

A spare parts list can be found as part of the unit documentation.

ATTENTION

If third-party spare parts are installed or changes are made without consultation with the manufacturer, a new conformity assessment must be carried out by a qualified person. After carrying out the evaluation, it must be documented in accordance with the Machinery Directive.

The Declaration of Conformity and Incorporation are invalidated in the event of a modification to the AC unit that is not coordinated with AL-KO THERM.

The warranty may also be invalidated.

NOTE

The valid spare parts list can be found as part of the unit documentation created on the basis of the order.

AL-KO THERM GMBH	Phone:	(+49) 82 25 / 39 - 0
Hauptstraße 248-250	Fax:	(+49) 82 25 / 39 - 2113
D-89343 Jettingen-Scheppach	E-mail:	klima.technik@alko-air.com
Germany	Web:	www.alko-airtech.com
After Sales	Phone:	(+49) 82 25 / 39 - 2600
	E-mail:	airtech.after-sales@alko-air.com

11 Certifications

The following EC Declaration of Incorporation and EC Declaration of Conformity will be issued per order, according to their validity.

If both the order number and the position of the unit are specified, the issued document must be assigned to the respective unit.

11.1 EC Declaration of Incorporation conforming to 2006/42/EC

EG- EINBAUERKLÄRUNG

EC DECLARATION OF INCORPORATION
DÉCLARATION DE MONTAGE CE

Hersteller / *Manufacturer / Fabricant:* **AL-KO THERM GMBH I Hauptstraße 248-250 I 89343 Jettingen-Scheppach I Germany**

Im Sinne der EG- Maschinenrichtlinie 2006/42/EG, Anhang II, Teil 1, Abschnitt B
As defined in EC Machinery Directive 2006/42/EC, Annex II, Part 1, Section B
Au sens de la directive Machines CE 2006/42/CE, annexe II, partie 1, section B

Unvollständige Maschine */ Partly completed machinery / Machine incomplète:* **RLT**/Space air technical devices / Air d'espace les appareils echniques
Serie */ Series / Série:* AT4F
Auftrags-Nr. */ Order no. / N° de commande:* xxxxxxxxx **Position**/ *position/ la position:*

Hiermit erklären wir, dass die oben genannte unvollständige Maschine den folgenden EG/EU- Richtlinien entspricht:
We hereby declare that the above-mentioned partly completed machinery conforms to all relevant provisions of the following EC/EU directives:
Nous déclarons par la présente que le Machine incomplète susnommé répond à toutes les dispositions pertinentes de la directive CE/UE suivante:

Maschinenrichtlinie 2006/42/EG / *Machinery Directive 2006/42/EC / Directive Machines CE 2006/42/CE.*
Elektromagnetische Verträglichkeit 2014/30/EU / *Electromagnetic Compatibility 2014/30/EU / Compatibilité électromagnétique 2014/30/UE:*
Druckgeräterichtlinie 2014/68/EU / *Pressure Equipment Directive 2014/68/EU / Directive sur les appareils sous pression 2014/68/UE:*

Angewandte harmonisierte Normen / *Applied harmonized standards / Normes harmonisées appliquées:*

- DIN EN ISO 12100-1/-2, 2011-03	Sicherheit von Maschinen – Allgemeine Gestaltungsleitsätze – Risikobeurteilung und Risikominderung *Safety of machinery - General principles for design - Risk assessment and risk reduction* *Sécurité des machines – Principes généraux de conception – Appréciation et réduction du risque*
- DIN EN 60204-1, 2019-06	Sicherheit von Maschinen – Elektrische Ausrüstung von Maschinen – Teil 1: Allgemeine Anforderungen *Safety of machinery - Electrical equipment of machines - Part 1: General requirements* *Sécurité des machines – Equipement électrique des machines – Partie 1 : exigences générales*
- DIN EN ISO 13854, 2020-01	Sicherheit von Maschinen - Mindestabstände zur Vermeidung des Quetschens von Körperteilen *Safety of machinery - Minimum gaps to avoid crushing of parts of the human body* *Sécurité des machines – Distances minimales pour prévention des contusions de parties du corps humain*
- DIN EN ISO 13857, 2020-04	Sicherheit von Maschinen – Sicherheitsabstände gegen das Erreichen von Gefährdungsbereichen mit den oberen und unteren Gliedmaßen *Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs* *Sécurité des machines – Distances de sécurité empêchant l'entrée dans les zones dangereuses des membres supérieurs et inférieurs*
- DIN EN IEC 61000-6-1, 2019-11	Störfestigkeit für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe *Immunity standard for residential, commercial and light-industrial environments* *Résistance au brouillage pour le domaine d'habitation, les locaux commerciaux et professionnels ainsi que les petites exploitations*
- DIN EN IEC 61000-6-2, 2019-11	Störfestigkeit für Industriebereiche *Immunity standard for industrial environments* *Résistance au brouillage pour les zones industrielles*
- DIN EN IEC 61000-6-3, 2022-06	Störaussendung von Geräten in Wohnbereichen *Emission standard for equipment in residential environments* *Norme sur l'émission relative aux appareils utilisés dans les environnements résidentiels*
- DIN EN IEC 61000-6-4, 2020-09	Störaussendung für Industriebereiche *Emission standard for industrial environments* *Émission d'interférences pour les zones industrielles*
- DIN EN 378-2, 2018-04	Kälteanlagen und Wärmepumpen – Sicherheitstechnische und umweltrelevante Anforderungen – Teil 2: Konstruktion, Herstellung, Prüfung, Kennzeichnung und Dokumentation *Refrigerating systems and heat pumps - Safety and environmental requirements - Part 2: Design, construction, testing, marking and documentation* *Installations frigorifiques et pompes à chaleur – Exigences techniques de sécurité et pertinentes écologiquement – Partie 2 : construction, fabrication, contrôle, marquage et documentation*

Zusätzlich angewendete Normen / *Additional applied standards / Normes appliquées supplémentaires :*

- DIN EN 1886, 2009-07	Lüftung von Gebäuden – Zentrale raumlufttechnische Geräte – Mechanische Eigenschaften und Messverfahren *Ventilation for buildings - Air handling units - Mechanical performance* *Ventilation des bâtiments – Appareils centraux techniques à air conditionné – Propriétés mécaniques et procédés de mesure*
- DIN EN 13053, 2020-05	Lüftung von Gebäuden; Zentrale raumlufttechnische Geräte – Leistungskenndaten für Geräte, Komponenten und Baueinheiten *Ventilation for buildings - Air handling units - Rating and performance for units, components and sections* *Ventilation des bâtiments ; appareils centraux techniques à air conditionné – Données caractéristiques de puissance pour les appareils, les composants et les unités de montage*
- VDMA 24167, 1994-10	Ventilatoren – Sicherheitsanforderungen *Fans - Safety requirements* *Ventilateurs – Exigences de sécurité*
- VDI 6022 Blatt 1, 2018-01	Hygieneanforderungen an Raumlufttechnische Anlagen und -Geräte *Hygiene requirements for ventilation and air-conditioning systems and units* *Exigences hygiéniques applicables aux installations et appareils techniques à air conditionné*

Die Inbetriebnahme unseres Produktes bleibt so lange untersagt, bis festgestellt wurde, dass die Ausführung der Anlage/ Maschine, in welcher der Einbau erfolgen soll oder von dem es ein Teil sein wird, mit den entsprechenden Rechtsvorschriften übereinstimmt.
Our product is not cleared for commissioning and use until it has been determined that the product is going to be integrated into a facility/machine and/or is used as part of an assembly, which agree with all applicable laws and regulations.
La mise en service de ce produit est interdite tant qu'il n'a pas été constaté, que le modèle de l'installation/ la machine, dans lequel il doit être incorporé, ou dont il deviendra une partie, est conforme aux dispositions légales correspondantes.

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen:
Authorized representative in charge of the technical document compilation:
Personne autorisée à constituer le dossier technique
Anschrift siehe Hersteller / *see manufacturer's address above / Adresse, voir fabricant*

Jettingen-Scheppach, 02.12.2024

Leiter der Abteilung Entwicklung
Head of Development Department
Chef du département de développement

Stephan Hafner
Geschäftsführer / *Managing Director / Directeur géné*ra

11.2 EC Declaration of Conformity conforming to 2006/42/EC

EG-KONFORMITÄTSERKLÄRUNG

EC DECLARATION OF CONFORMITY
DÉCLARATION DE CONFORMITÉ CE

Hersteller / *Manufacturer / Fabricant:* **AL-KO THERM GMBH I Hauptstraße 248-250 I 89343 Jettingen-Scheppach I Germany**

Im Sinne der EG- Maschinenrichtlinie 2006/42/EG, Anhang II, Teil 1, Abschnitt A
As defined in EC Machinery Directive 2006/42/EC, Annex II, Part 1, Section A
Au sens de la directive Machines CE 2006/42/CE, annexe II, partie 1, section A

Maschine */ Machine / Machine:* **RLT**/Space air technical devices / Air d'espace les appareils techniques
Serie */ Series / Série:* AT4F
Auftrags-Nr. */ Order no. / N° de commande:* xxxxxxxxx **Position** */ position/ la position:*

Hiermit erklären wir, dass die oben genannte Maschine alle sicherheitstechnischen Anforderungen der folgenden anwendbaren EG/EU- Richtlinien erfüllt:
We hereby declare that the above-mentioned machine conforms to all relevant safety-provisions of the following EG/EC directives:
Nous déclarons par la présente que la machine susmentionnée corresponde à toutes les des exigences de sécurité pertinentes de la directive CE/UE suivante:

Maschinenrichtlinie 2006/42/EG / *Machinery Directive 2006/42/EC / Directive Machines CE 2006/42/CE:*
Elektromagnetische Verträglichkeit 2014/30/EU / *Electromagnetic Compatibility 2014/30/EU / Compatibilité électromagnétique 2014/30/UE:*
Druckgeräterichtlinie 2014/68/EU / *Pressure Equipment Directive 2014/68/EU / Directive sur les appareils sous pression 2014/68/UE:*

Angewandte harmonisierte Normen / *Applied harmonized standards / Normes harmonisées appliquées:*

- DIN EN ISO 12100-1/-2, 2011-03	Sicherheit von Maschinen – Allgemeine Gestaltungsleitsätze – Risikobeurteilung und Risikominderung *Safety of machinery - General principles for design - Risk assessment and risk reduction* *Sécurité des machines – Principes généraux de conception – Appréciation et réduction du risque*
- DIN EN 60204-1, 2019-06	Sicherheit von Maschinen – Elektrische Ausrüstung von Maschinen – Teil 1: Allgemeine Anforderungen *Safety of machinery - Electrical equipment of machines - Part 1: General requirements* *Sécurité des machines – Equipement électrique des machines – Partie 1 : exigences générales*
- DIN EN ISO 13854, 2020-01	Sicherheit von Maschinen - Mindestabstände zur Vermeidung des Quetschens von Körperteilen *Safety of machinery - Minimum gaps to avoid crushing of parts of the human body* *Sécurité des machines – Distances minimales de prévention des contusions de parties du corps humain*
- DIN EN ISO 13857, 2020-04	Sicherheit von Maschinen – Sicherheitsabstände gegen das Erreichen von Gefährdungsbereichen mit den oberen und unteren Gliedmaßen *Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs* *Sécurité des machines – Distances de sécurité empêchant l'entrée dans les zones dangereuses des membres supérieurs et inférieurs*
- DIN EN IEC 61000-6-1, 2019-11	Störfestigkeit für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe *Immunity standard for residential, commercial and light-industrial environments* *Résistance au brouillage pour le domaine d'habitation, les locaux commerciaux et professionnels ainsi que les petites exploitations*
- DIN EN IEC 61000-6-2, 2019-11	Störfestigkeit für Industriebereiche *Immunity standard for industrial environments* *Résistance au brouillage pour les zones industrielles*
- DIN EN IEC 61000-6-3, 2022-06	Störaussendung von Geräten in Wohnbereichen *Emission standard for equipment in residential environments* *Norme sur l'émission relative aux appareils utilisés dans les environnements résidentiels*
- DIN EN IEC 61000-6-4, 2020-09	Störaussendung für Industriebereiche *Emission standard for industrial environments* *Émission d'interférences pour les zones industrielles*
- DIN EN 378-2, 2018-04	Kälteanlagen und Wärmepumpen – Sicherheitstechnische und umweltrelevante Anforderungen – Teil 2: Konstruktion, Herstellung, Prüfung, Kennzeichnung und Dokumentation *Refrigerating systems and heat pumps - Safety and environmental requirements - Part 2: Design, construction, testing, marking and documentation* *Installations frigorifiques et pompes à chaleur – Exigences techniques de sécurité et pertinentes écologiquement – Partie 2 : construction, fabrication, contrôle, marquage et documentation*

Zusätzlich angewendete Normen / *Additional applied standards / Normes appliquées supplémentaires:*

- DIN EN 1886, 2009-07	Lüftung von Gebäuden – Zentrale raumlufttechnische Geräte – Mechanische Eigenschaften und Messverfahren *Ventilation for buildings - Air handling units - Mechanical performance* *Ventilation des bâtiments – Appareils centraux techniques à air conditionné – Propriétés mécaniques et procédés de mesure*
- DIN EN 13053, 2020-05	Lüftung von Gebäuden; Zentrale raumlufttechnische Geräte – Leistungskenndaten für Geräte, Komponenten und Baueinheiten *Ventilation for buildings - Air handling units - Rating and performance for units, components and sections* *Ventilation des bâtiments ; appareils centraux techniques à air conditionné – Données caractéristiques de puissance pour les appareils, les composants et les unités de montage*
- VDMA 24167, 1994-10	Ventilatoren – Sicherheitsanforderungen *Fans - Safety requirements* *Ventilateurs – Exigences de sécurité*
- VDI 6022 Blatt 1, 2018-01	Hygieneanforderungen an Raumlufttechnische Anlagen und -Geräte *Hygiene requirements for ventilation and air-conditioning systems and units* *Exigences hygiéniques applicables aux installations et appareils techniques à air conditionné*
- 1253/2014/EU	Ökodesignrichtlinie / *Ecodesign Directive / Directive de design écologique*

Bei einer mit uns nicht abgestimmten Änderung der Maschine verliert diese Erklärung ihre Gültigkeit.
Any modification of this machine without confirmation shall automatically annul this declaration.
En cas de modification de la machine non convenue avec nous, la présente déclaration perd sa validité.

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen:
Authorized representative in charge of the technical document compilation:
Personne autorisée à constituer le dossier technique
Anschrift siehe Hersteller / *see manufacturer's address above / Adresse, voir fabricant*

Jettingen-Scheppach, 02.12.2024

Leiter der Abteilung Entwicklung
Head of Development Department
Chef du département de développement

Stephan Hafner
Geschäftsführer / *Managing Director / Directeur général*

QUALITY FOR LIFE

3086448/December 2024

AL-KO THERM GMBH I Head Quarter I Hauptstraße 248 - 250 I 89343 Jettingen-Scheppach I Germany
Phone +49 8225 39-0 I Fax +49 8225 39-2113 I klima.technik@alko-air.com I **www.alko-airtech.com**