



Air handling unit

X-CUBE X2 / X-CUBE X2 compact



TROX[®] TECHNIK
The art of handling air

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Information on the transportation and installation manual

This transport and installation manual enables operating or service personnel to use the X-CUBE air handling unit (AHU) safely and efficiently.

The manual must be kept near the unit to be available for use at all times.

This transport and installation manual is intended for use by fitting and installation companies, operators, in-house technicians, technical staff or properly trained persons, and skilled qualified electricians or air conditioning technicians.

It is essential that these individuals read and fully understand this manual before starting any work. The basic prerequisite for safe working is to comply with the safety notes and all instructions in this manual.

The local regulations for health and safety at work and the general safety regulations for the area of application of the air handling unit also apply.

Illustrations in this transport and installation manual are mainly for information and may differ from the actual design of the air handling unit.

Other applicable documentation

In addition to these instructions, the following documents apply:

- Order-specific approval drawing
- Order-specific air handling unit data sheet from TROX
- Data sheets for components from other suppliers, if any
- Circuit diagram for air handling unit with controls
- Additional drawings, if any
- X-CUBE operating manual

TROX Technical Service

To ensure that your request is processed as quickly as possible, please keep the following information ready:

- Product name
- TROX order number
- Delivery date
- Brief description of the fault

Online	www.troxtechnik.com
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Limitation of liability

The information in this manual has been compiled with reference to the applicable standards and guidelines, the state of the art, and our expertise and experience of many years.

The manufacturer does not accept any liability for damages resulting from:

- Non-compliance with this manual
- Incorrect use
- Operation or handling by untrained individuals
- Unauthorised modifications
- Technical changes
- Use of non-approved replacement parts

The actual scope of delivery may differ from the information in this manual for bespoke constructions, additional order options or as a result of recent technical changes.

The obligations agreed in the order, the general terms and conditions, the manufacturer's terms of delivery, and the legal regulations in effect at the time the contract is signed shall apply.

We reserve the right to make technical changes.

Warranty claims

The provisions of the respective general delivery terms apply to warranty claims. For purchase orders placed with TROX GmbH, these are the regulations in section "VI. Warranty claims" of the Delivery Terms of TROX GmbH, see www.trox.de/en/.

Safety notes

Symbols are used in this manual to alert readers to areas of potential hazard. Signal words express the degree of the hazard.

Comply with all safety instructions and proceed carefully to avoid accidents, injuries and damage to property.

DANGER!

Imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

Potentially hazardous situation which, if not avoided, may result in death or serious injury.

CAUTION!

Potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE!

Potentially hazardous situation which, if not avoided, may result in property damage.

ENVIRONMENT!

Environmental pollution hazard.

Tips and recommendations



Useful tips and recommendations as well as information for efficient and fault-free operation.

Specific safety notes

The following symbols are used in safety notes to alert you to specific hazards:

Warning signs	Type of danger
	Warning - danger of crushing.
	Warning – hand injuries.
	Warning – high-voltage.
	Warning – danger of falling.
	Warning – suspended load.
	Warning – danger zone.

Additional markers

In order to highlight instructions, results, lists, references and other elements, the following markers are used in this manual:

Marker	Explanation
 1., 2., 3. ...	Step-by-step instructions
	Results of actions
	References to sections in this manual and to other applicable documents
	Lists without a defined sequence
[Switch]	Operating elements (e.g. push buttons, switches), display elements (e.g. LEDs)
'Display'	Screen elements (e.g. buttons or menus)

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1 Overview



Fig. 1: Sample unit X-CUBE X2 compact

- | | | | |
|---|---|---|----------------------------------|
| 1 | Connecting subframe for ducting | 4 | Mains isolator |
| 2 | Inspection access door, see table for symbols | 5 | Heat exchanger water connections |
| 3 | Touch panel | 6 | Base frame |

The X-CUBE air handling unit is shipped either fully assembled or in several delivery units (AHU casing units), depending on the construction and installation conditions. The respective delivery unit and installation position can be seen on the enclosed drawing.

The following table lists the components that can make up an air handling unit. The components actually used for a particular air handling unit are listed in the order-specific technical data sheet.

AHU casing units

Symbol	Description
	Multileaf dampers
	Filter
	Sound attenuator
	Centrifugal fan
	Cooling coil
	Heating coil
	Plate heat exchanger
	Rotary heat exchanger
	Run around coil system
	Hydraulic unit for run around coil system
	Humidifier

2 Safety

2.1 System owner's responsibility

System owner

The system owner is a natural or legal person who for commercial or business purposes owns or manages the air handling unit or allows third parties to use or operate it, but continues to bear legal responsibility for the safety of users, staff or third parties while the product is in use.

System owner's obligations

The unit is intended for commercial use. The system owner is therefore subject to the legal obligations of occupational health and safety regulations.

In addition to the safety notes in this manual, the applicable regulations for safety, accident prevention and environmental protection must also be complied with.

In particular:

- The system owner must establish on site a coherent fire protection strategy and include the air handling unit in this strategy.
- The system owner must establish on site a coherent lightning protection strategy and include the air handling unit in this strategy.
- The system owner must name responsible persons for transport, storage, assembly, installation, commissioning, transfer, disassembly and removal of the unit.
- The system owner must commission a skilled qualified electrician to create equipotential bonding.
- The system owner has to ensure that all individuals who handle or use the air handling unit have read and understood this manual.
- The system owner must provide the employees with the required personal protective equipment.
- The system owner must have all safeguards tested regularly to ensure that they are functional and complete.
- The system owner must ensure compliance with the national legal provisions.
- The system owner must have technical and hygiene tests carried out and documented before commissioning the air handling unit for the first time. The tests have to be repeated at regular intervals.

2.2 Personnel requirements



WARNING!

Danger of injury or risk of damage to property due to insufficiently qualified individuals!

Insufficiently qualified individuals are not aware of the risks involved in working with the air handling unit and are hence likely to put themselves or others into danger, causing severe or fatal injuries.

- Have any work carried out only by qualified personnel.
- Keep insufficiently qualified individuals away from the work area.

Crane driver

Crane drivers are physically and mentally able to operate a crane on their own.

Crane drivers are qualified to operate a crane and have proven the required skillset to the system owner.

Crane drivers are commissioned by the system owner to move units from the delivery truck to the installation location. Crane drivers are commissioned in writing if the crane is a mobile crane.

Crane drivers have to be at least 18 years old.

Forklift driver

Forklift drivers are qualified to operate driver-operated forklift trucks; they are commissioned in writing by the system owner to operate such a truck.

Forklift drivers are responsible for moving pallets.

HVAC technician

HVAC technicians are individuals who have sufficient professional or technical training in the field they are working in to enable them to carry out their assigned duties at the level of responsibility allocated to them and in compliance with the relevant guidelines, safety regulations and instructions. HVAC technicians are individuals who have in-depth knowledge and skills related to HVAC systems; they are also responsible for the professional completion of the work under consideration.

HVAC technicians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on HVAC systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

Network administrator

Network administrators design, install, configure and maintain the IT infrastructure in companies or organisations.

Skilled qualified electrician

Skilled qualified electricians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on electrical systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

2.3 Personal protective equipment**Description of personal protective equipment****Hearing protection**

Hearing protection protects against hearing damage resulting from noise exposure.

Industrial safety helmet

Industrial safety helmets protect the head from falling objects, suspended loads, and the effects of striking the head against stationary objects.

Protective clothing

Protective clothing is close-fitting, with low tear resistance, close-fitting sleeves, and no projecting parts.

Protective gloves

Protective gloves protect hands from friction, abrasions, punctures, deep cuts, and direct contact with hot surfaces.

Safety harness

A safety harness protects people from a fall when they are working at height. You are at risk from a fall if the task is at height and if there is no railing in place.

When you put on a safety harness, connect it via an energy-absorbing lanyard to a suitable anchor point.

Safety harnesses must only be used by individuals who have been specifically trained to use them.

Safety shoes

Safety shoes protect the feet against crushing, falling parts, and from slipping on slippery ground.

2.3.1 Residual risks**Suspended loads****DANGER!****Danger of death due to suspended loads!**

Falling loads may cause serious injury or death.

Therefore:

- Never walk under suspended loads.
- Only move loads under supervision.
- Observe the specifications for the intended lashing points.
- Do not attach the lifting gear to protruding machine parts or lugs on attached components
- Ensure that the lifting gear is secure.
- Only use approved hoisting devices and lifting gear with sufficient load-bearing capacity.
- Do not use any frayed or worn ropes and belts.
- Do not place ropes or belts near sharp edges or corners; do not knot or twist.
- Place the load on the ground before leaving the workplace.

Industrial trucks

WARNING!

Danger to life from industrial trucks!

Objects and other loads could fall in an uncontrolled manner from industrial trucks during transport and cause serious injuries or even death. There is also the risk that people will not be seen and could thus be run over by the vehicle driver.

- Industrial trucks may only be operated by trained vehicle drivers (e.g. forklift drivers).
- People should only pass industrial trucks when the vehicle driver has signalled that they have seen them.
- Only approved industrial trucks with sufficient load-bearing capacity may be used.
- Materials should never be transported in the vicinity of people or the zones occupied by people.

Electric current

DANGER!

Danger of death due to electric current!

Danger of electric shock! Do not touch any live components! Damaged insulation or damaged parts are a life threatening hazard.

- Have work on the electrical system carried out only by skilled qualified electricians.
- Have work on the electrical system carried out only by skilled qualified electricians.
- If the insulation is damaged, disconnect the power supply immediately and have the insulation repaired.
- Before you start working on electric systems and equipment, switch off the supply voltage and secure it against being switched on accidentally. Comply with the 5 safety rules:
 - Disconnect.
 - Secure it against being switched on accidentally.
 - Ensure that no voltage is present.
 - Connect to the earth; short circuit connection.
 - Either cover nearby parts that carry a voltage or install barriers.
- Do not bypass or disable any circuit breakers. Be sure to maintain the correct current rating when you replace a circuit breaker.
- Ensure that live parts do not come into contact with moisture. Moisture can cause a short circuit.

Dirt and objects lying around

CAUTION!

Risk of injury from falling as a result of dirt or objects lying around!

Dirt and objects lying around can lead to the risk of slipping and tripping. Injuries can be caused by falling.

- Work areas should always be kept clean.
- Objects that are no longer required should be removed from the work area, particularly those that are near the floor.
- Tripping hazards that cannot be avoided should be marked with yellow and black marking tape.

Tools

CAUTION!

Risk of injury as a result of the negligent handling of tools!

Negligent handling of tools can lead to crushing or cuts.

- Tools must be handled carefully and as intended.
- The weight must be taken into account when transporting tools.
- Protective gloves and safety shoes should be worn.

Rotating parts

WARNING!

Risk of injury from rotating parts!

Rotating parts in the fan can cause serious injuries.

- Do not reach into or handle the moving impeller wheel during operation.
- Do not open inspection access doors and covers during operation.
- Ensure that the impeller wheel is not accessible during operation.
- Observe the run down time! Check that no parts are moving before you open an inspection access door or cover.
- Switch off the unit and secure it against being switched back on again before starting any work on moving fan components. Wait until all parts have come to a standstill.

Noise**WARNING!****Hearing damage due to noise!**

The noise level in the work area can cause severe hearing damage.

- Always wear hearing protection while working.
- Only remain in the hazardous area if absolutely necessary.

Measures in the event of accidents

- Trigger an emergency stop immediately, and put the isolator into the “0” position if necessary.
- Implement first aid measures.
- Rescue individuals from the hazardous area.
- Inform the responsible person at the operation site.
- Notify the emergency services.
- Clear access paths for rescue vehicles.

Crushing hazard.**WARNING!****Crushing hazard from movable parts!**

There is an increased risk of crushing on casing units, doors, panels and components of the device.

- Never reach between moving parts.
- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

Inspection access doors slamming shut**WARNING!****Risk of crushing from doors slamming shut**

Inspection access doors may slam shut by the wind or if someone pushes them inadvertently, resulting in serious injury to the head and limbs.

- Secure each inspection access door with a hold open device.
- Secure inspection access doors without a hold open device against closing by suitable means.
- Do not reach between the door and door frame.
- Wear protective gloves and a hard hat when you open an inspection access door.

2.3.2 Behaviour in the event of hazardous situations or accidents**Preventative measures**

- Always be prepared for accidents or fire!
- Keep first aid equipment (first aid kit, blankets, etc.) and fire extinguishers close at hand.
- Familiarise personnel with accident reporting, first aid and rescue equipment.
- Keep access paths for rescue vehicles clear.

3 Transport and storage

3.1 Delivery of the air handling unit

3.1.1 Complete and partial units

Upon delivery, check the air handling unit for transport damage and completeness, see *Chapter 3.2 'Delivery check' on page 12*.

Depending on its size, the air handling unit is shipped either fully assembled or in parts, with the individual components or casing units screw-fixed to square edge timber frames or disposable pallets.

The number of parts is shown on a drawing on the package.



External components may be shipped unassembled to protect them from getting entangled with transport slings while being moved. These components have to be properly installed and sealed by others.

3.1.2 Symbols on the packaging

The packaging carries the following marks and symbols. Be sure to follow them when you are moving the unit.



The packaging may also carry other symbols, notes, and information. These must also be followed.

Otherwise the manufacturer will not accept any liability.



See the notes on shipping damage on the packaging or in the shipping papers.

For any claims it is necessary that you follow the procedure below. In each of the following cases do contact TROX before you start installing a unit.

The packaging has been damaged

- Unpack the goods in the presence of the person who has delivered the goods and have them confirm the damage on the shipping order.
- Photograph the damage.
- Report the damage to TROX immediately.

No external damage to packaging, contents damaged.

- Photograph the damage.
- Report the damage to TROX immediately in writing.
- Note that shipping damage must be reported within four days of delivery.

Accessories



Fig. 2: Accessories

Packages with this sticker contain AHU accessories.

3.2 Delivery check

Check delivered items immediately after arrival for transport damage and completeness. In case of any damage or an incomplete shipment, contact the shipping company and your supplier immediately. If any parts are missing, have the driver confirm them on the consignment note.

3.3 Moving packages

3.3.1 Safety notes regarding transport

Improper transport equipment

WARNING!

Risk to life from using improper transport equipment!

If packages are lifted without adequate transport equipment and if they are not properly secured, they may fall off and lead to fatal injuries.

- Move components only in the position in which they are to be installed.
- Stand clear of suspended loads.
- Do not move additional loads on top of a package.
- Use only the intended lashing points.
- Make sure that no load is imposed on pipes, ducts or cables.
- Use only approved lifting gear and slings that are suitable and sufficient for the load to be carried.
- Do not tie ropes and chains or make knots or place them on sharp edges.
- Use lifting equipment only to lift packages or units, not to push or pull them.
- Ensure that ropes, belts and chains do not twist.
- Ensure that transport equipment has been correctly assembled, fastened and secured before you use it to lift anything.
- Secure all doors, dampers and panels.
- Move packages without any jerky movements and put them down when you leave your workplace.
- Lifting eyes are designed for one-time use only and not for permanently suspending loads.
- Transport tubes are designed for one-time use only and not for permanently suspending loads.

 2.3.1 'Residual risks' on page 9

Warning: AHU casing units may tip over



WARNING!

Risk of injury from AHU casing units tipping over!

Tall AHU casing units with a small footprint, e.g. rotary heat exchangers, may easily tip over and therefore pose an increased risk during unloading, transportation and installation.

Be sure to take adequate precautions:

- Use additional means to secure the casing units, e.g. ratchet straps (by others).
- Use only lifting and transport gear designed for the required load.
- Keep the casing units secured against shifting and tipping over until installation is complete.

Unbalanced loads and centre of gravity

WARNING!

Risk of injury from falling or toppling loads!

Loads may be unbalanced, i.e. the centre of gravity may not be obvious. If the load is not properly attached to the lifting equipment, it may topple and fall. Falling or toppling loads can cause serious injuries.

- Note that the centre of gravity is marked on each package.
- When you use a crane to move loads, ensure that the centre of gravity of the load is directly beneath the crane hook.
- Lift any load carefully and keep an eye on it to see whether it will stay in place. If required, change the lashing point(s).

Sticker indicating the centre of gravity

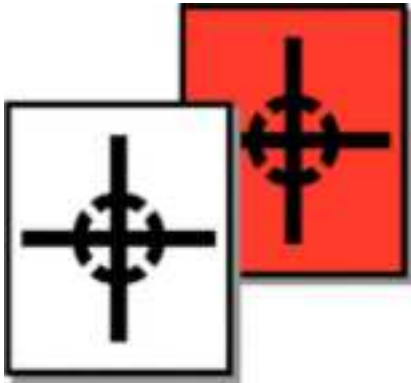


Fig. 3: Shipping stickers

Stickers on the packaging indicate the centre of gravity (Fig. 3).

Sharp edges, sharp corners and thin sheet metal parts

CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts of the heat exchanger or of the cooling or heating coil may cause cuts or grazes.

- Be careful when working on these components.
- Wear protective gloves, safety shoes and a hard hat.

Damage to goods being moved

NOTICE!

Risk of damage to property due to the incorrect handling or lifting of units!

If you handle or move packages incorrectly, they may topple or fall. This can cause considerable damage to property.

- Do not put down packages hard and do not knock against them with force. Watch out for protruding parts.
- When you are moving units for outdoor installation, be careful that the thin metal roof is not damaged by the lifting gear.

3.3.2 Moving packages with a forklift or pallet truck

Air handling units differ in weight and may have different lashing points. See the order-specific technical documents for details.

Personnel:

- Forklift driver

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety shoes

NOTICE!

Risk of damage to property from forklifts or pallet trucks!

Take proper precautions when you use a forklift or pallet truck to move or lift parts or components of an air handling unit as otherwise they may be damaged.

- If you want to use a forklift to lift a package without a base frame, you need to protect the casing units properly.



Fig. 4: Carrying load with a forklift

1. ▶ Drive the forklift forward until the forks (Fig. 4 /3) are fully between the square edge timber sections (Fig. 4 /2) and protrude from underneath the base frame (Fig. 4 /1) on the opposite side.
2. ▶ Ensure that the load cannot tip.
3. ▶ Slowly lift the load and start moving.

3.3.3 Moving packages with a crane

Using transport tubes

Use only the factory lashing points when moving AHU casing units with transport tubes. Transport tubes are part of the supply package. If several AHU units are to be moved, you will have to reuse the transport tubes.

If a unit has to be moved with different equipment, contact TROX beforehand to discuss the details.

If you have to move AHU casing units at a later stage and do not have the original transport tubes any more, you may use other tubes with the following properties:

Seamless steel tube, S235JR+AR (St 37-2, EN 10025), wall thickness of 5 mm.

Select the right transport tubes for the casing unit weight and width using the tables below.

Diameter of the transport tubes

Outer diameter [mm]	Weight of AHU casing unit [kg]	
	Europe	United Kingdom
48.3	≤ 1500	≤ 960
60.3	≤ 2000	≤ 1590
76.1	≤ 3000	≤ 2650

Weights apply to two transport tubes.

Length of the transport tubes

Width of AHU casing unit (inside dimension) [mm]	Length of transport tubes [mm]
612	1013
918	1319
1224	1625
1530	1931
1836	2237

The length of transport tubes for intermediate dimensions can be calculated as follows:

Length = overall width of AHU casing unit + 401 mm

Personnel:

- Crane driver

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Safety shoes
- Protective gloves



WARNING!

Danger of death from the fall of AHU casing units.

If you overload lashing points or lifting gear, the load may fall down. You or others could be killed.

- Use all the lashing points provided.
- Use only adequate lifting gear and slings.
- Stand clear of suspended loads.

The number of drilled holes in the base frame (Fig. 5 /6) indicates the number of transport tubes (Fig. 5 /1) to be used.

- Select the lashing points based on the number of transport tubes you use, Fig. 5

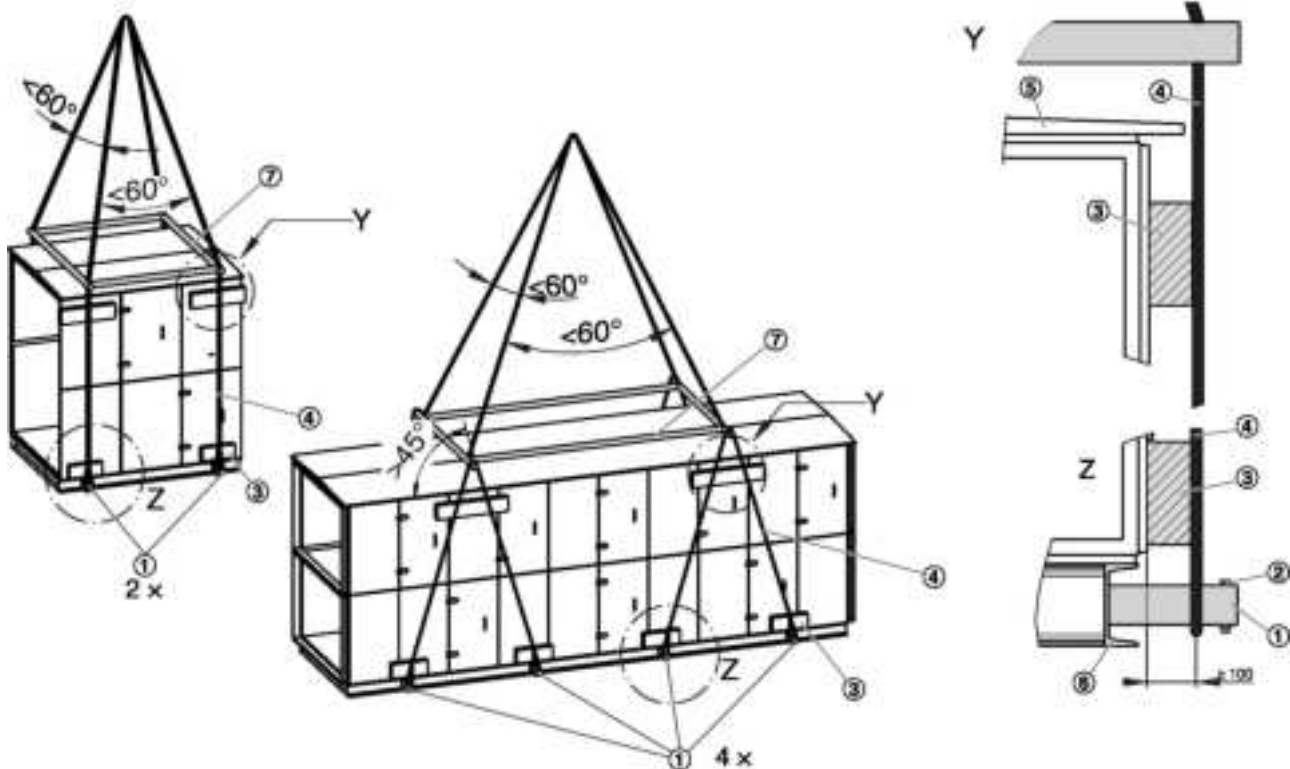


Fig. 5: Lashing points with two or four transport tubes

1. ▶ Remove the plugs from the drilled holes in the base frame (Fig. 5 /6) of the AHU casing unit.
2. ▶ Push transport tubes (Fig. 5 /1) through the drilled holes in the base frame.
Secure the transport tubes with screws (Fig. 5 /2).

3. ▶ Place the slings (Fig. 5 /4) around the ends of the transport tubes.

Position slings between the base frame (Fig. 5 /6) and the screws (Fig. 5 /2).

Protect the edges with wood blocks (Fig. 5 /3). If a unit with a roof (Fig. 5 /5) is to be moved, use wood blocks that are thick enough to provide a distance of 100 mm between the sling and the casing unit.

Spread the slings near the roof with a suitable device (Fig. 5 /7), e.g. a spreader beam.

Note:

- Do not spread slings by more than 60°.
- Ensure that the slings cannot damage the AHU casing unit.
- Suspend (distribute) the load symmetrically, i.e. in such a way that its centre of gravity is beneath the crane hook.

! NOTICE!

Risk of damage to property due to the incorrect handling or lifting of units!

Take proper precautions when you use a crane to move or lift parts or components of an air handling unit as otherwise they may be damaged.

- Protect the edges of the AHU casing units with wood blocks.
- Spread the slings (wire ropes or chains) near the roof with a suitable device, e.g. a spreader beam.

4. ▶ Slowly lift the load and start moving.

Transport on transport brackets

Personnel:

- Crane driver

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Safety shoes
- Protective gloves



WARNING!

Danger of death from the fall of AHU casing units.

If you overload lashing points or lifting gear, the load may fall down. You or others could be killed.

- Use all the lashing points provided.
- Use only adequate lifting gear and slings.
- Stand clear of suspended loads.

The number of transport brackets on the AHU casing unit (Fig. 6 /1) determines the number of lashing points to be used.

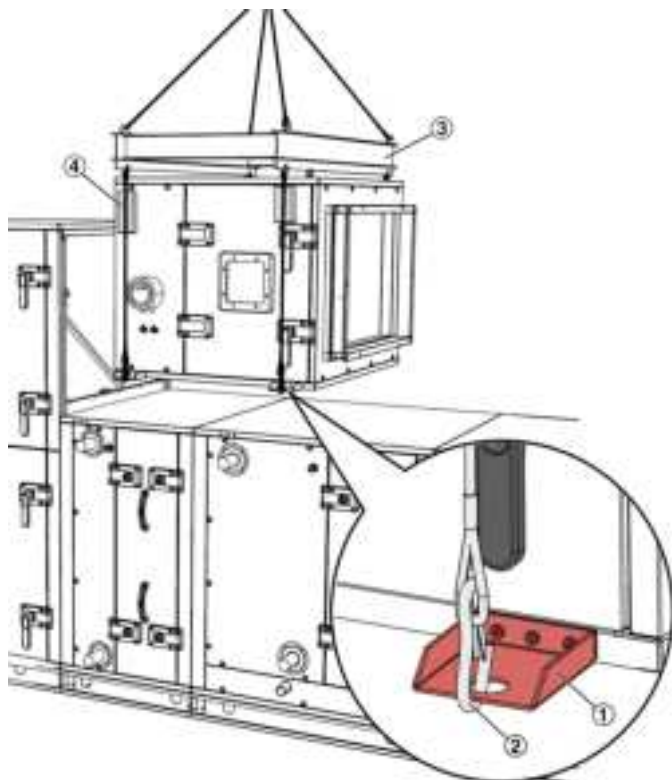


Fig. 6: Travel stop on transport brackets

1. ▶ Hook slings (Fig. 6 /2) into transport brackets.

! NOTICE!

Risk of damage to property due to the incorrect handling or lifting of units!

Take proper precautions when you use a crane to move or lift parts or components of an air handling unit as otherwise they may be damaged.

Note:

- Suspend (distribute) the load symmetrically, i.e. in such a way that its centre of gravity is beneath the crane hook.
- Spread the slings (wire ropes or chains) near the roof with suitable spreading devices, e.g. a spreader beam (Fig. 6 /3).
- Do not spread slings by more than 60°.
- Ensure that the slings cannot damage the AHU casing unit. Protect the edges of the AHU casing units with wood blocks (Fig. 6 /4) for example.

2. ▶ Slowly lift the load and start moving.

3.4 Storage and functional integrity

3.4.1 Bearing

! NOTICE!

Risk of damage to property due to corrosion!

Insufficient ventilation due to film packaging can result in condensation and, hence, oxidation on galvanised surfaces, e.g. white rust.

- Remove film packaging immediately after delivery.
- Store all units in a dry, well-ventilated place.

In the case of Sendzimir-galvanised units, corrosion may occur on the cut edges. Reddish or whitish discolouration of the cut edge does not indicate problematic corrosion. Corrosion protection is still guaranteed. This does not indicate a reduction in quality and there are no grounds for complaint.

Please note the following storage conditions:

- Do not store outdoors.
- Store in a dry and dust-free place that is not exposed to sunlight.
- Storage temperature: -10 °C to +50 °C; avoid sudden/major fluctuations in temperature.
- Provide unpackaged units with protective packaging and ensure sufficient ventilation in order to prevent condensation.
- Seal openings in the units to ensure that no dust or vermin can get inside.
- Do not expose the units to aggressive operating fluids.

- The storage location must be level and have sufficient load-bearing capacity.
- If storing the units for more than 3 months, refer to the information on functional integrity,  on page 19.

Note!

If there are storage instructions on the packaging, these instructions must be followed as well.

3.4.2 Functional integrity of the unit components

When storing or shutting down the units or if commissioning is to be carried out at a later date (units out of operation for more than 3 months), take the following measures to ensure their functional integrity.

- Rotating or moving components such as fans, rotary heat exchangers, multileaf dampers, actuators, valves or pumps should be rotated/moved on a monthly basis.
- In the case of belt-driven components, slacken the belts.
- Check the general condition of all parts and of the packaging. Refresh corrosion protection, if necessary.
- Document any measures taken.

In the case of frequency inverters, EC controllers (period without supply voltage >1 year), additional measures may be necessary. Please refer to the relevant manufacturer documentation.

3.5 Unpacking

Unless packaging or the contents have been damaged while in transit, remove the packaging only when you are ready to start installation  3.2 'Delivery check' on page 12.



ENVIRONMENT!

Note on disposing of single-use packaging

The packaging is purely transport packaging, which has been reduced to the absolute minimum with regard to transport and unloading.

Packaging materials can, in many cases, be reconditioned and recycled.

- Dispose of packaging materials in an environmentally friendly manner in accordance with the local waste disposal regulations.
- If necessary, employ a specialist disposal company to dispose of the packaging.

3.5.1 Removing transport protection devices

Always move AHU casing units with the transport protection devices in place; remove transport protection devices only when the unit has reached its final position.

Transport tubes

If the AHU has been moved with transport tubes, remove them from the base frame; the openings will be closed as part of the assembly procedure,  30.

Transport protection for AHU casing units

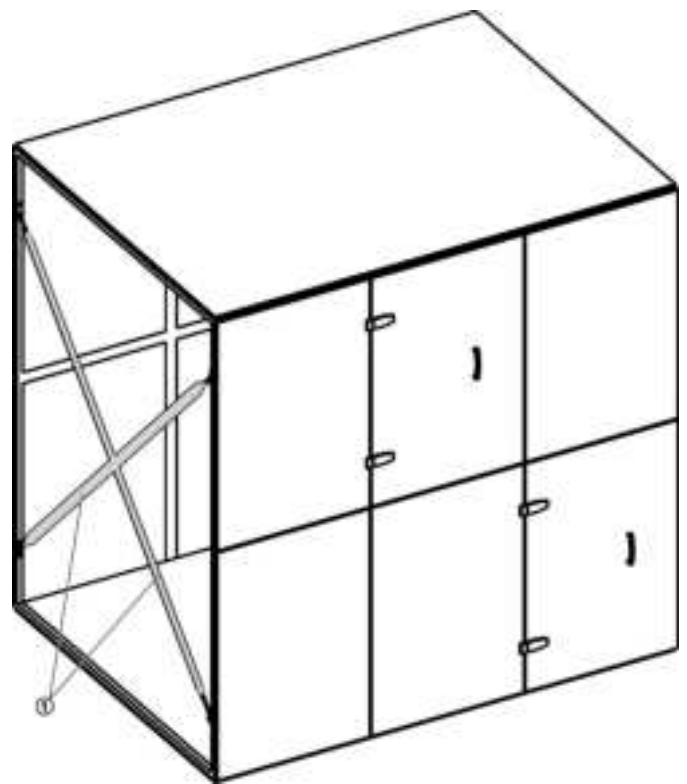


Fig. 7: Transport straps

- ▶ Cut the transport straps (Fig. 7 /1) and remove them completely.

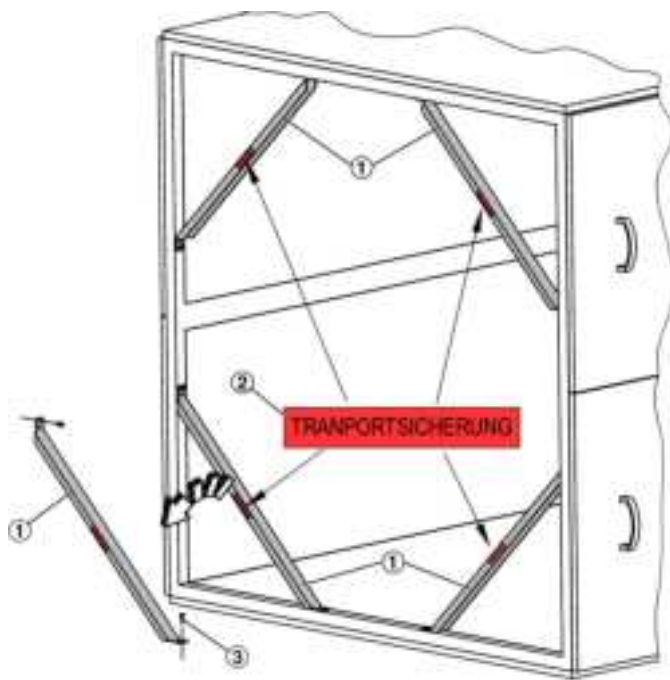


Fig. 8: Cross bars

1. ▶ Remove the cross bars (Fig. 8 /1) that are marked with a red sticker (Fig. 8 /2).

Note: Do not remove any of the painted cross bars that do not carry a sticker!

2. ▶ Then close the drilled holes in the frame with screws (Fig. 8 /3).

Transport protection device for the fan (only with X-CUBE)

The **X-CUBE Compact** only has EC fans installed in it which do not have any transport protection brackets because they are screwed to the casing wall.

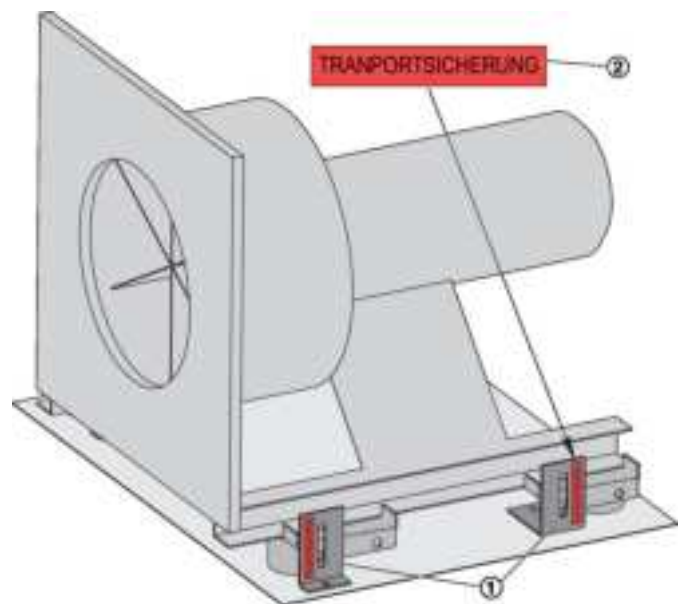


Fig. 9: Transport protection brackets

1. ▶ Remove the brackets (Fig. 9 /1) that are marked with a red sticker (Fig. 9 /2).
2. ▶ Then close the drilled holes in the floor of the AHU casing with screws and washers.

Transport protection device Vibration Baseframe

Air handling units with Vibration Baseframe have special transport protection devices between the base frame and the unit. These must be removed before commissioning, as otherwise the sound insulation will not work.

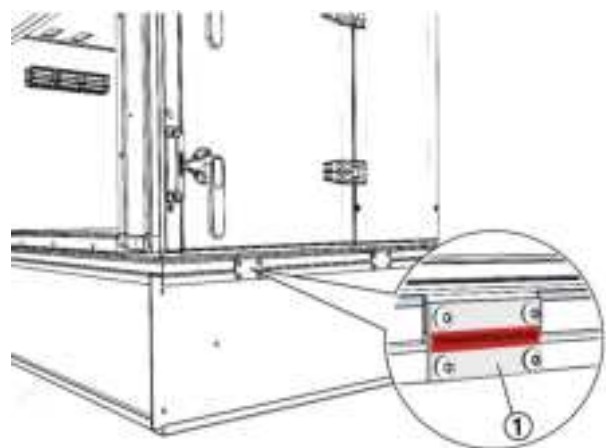


Fig. 10: Transport protection device on units with Vibration Baseframe

1. ▶ Unscrew screws on the transport protection devices (Fig. 10 /1) using tool (TX30) and remove the metal sheets.
2. ▶ Then screw the screws back into the unit.

4 Setup and assembly

If an air handling unit is shipped in several parts, you have to erect and assemble it on site. The arrangement of the AHU casing units is given on the order-specific approval drawing.

Conformity assessment

If components or devices which cannot in themselves perform a specific application (partly completed machinery) are incorporated into fully functional machinery, the individual who performs the incorporation or assembly is responsible for the conformity assessment, for creating the declaration of conformity and for attaching the CE mark.

4.1 Safety instructions

Setup and assembly



WARNING!

Risk to life from incorrect setup and assembly!

The incorrect setup and assembly of AHU casing units can lead to potentially fatal situations and cause considerable damage to property. Incorrect setup and assembly will also impair the function of the unit.

- Air handling units must only be set up and assembled by HVAC technicians.

Working at height



WARNING!

Risk of a fall when you work at height!

Working at height without using any fall protection equipment, or using unsuitable or damaged equipment to get up to where you work at height, may lead to yourself or others falling from height; people on the ground may be at risk from falling parts or tools. This can cause serious or even fatal injuries.

- Only use equipment that is suitable, stable and strong enough for the job, maintained and checked regularly.
- Stop materials or objects from falling.
- Wear safety shoes, protective clothing and a hard hat.
- Wear a safety harness.

Interconnecting units and systems



WARNING!

Risk of injury from interconnecting different units or systems!

Connecting an air handling unit to other units or systems (e.g. ductwork, pumps, refrigeration systems) can lead to dangerous situations and eventually cause serious or even fatal injuries.

- If you have to connect other units or systems to the air handling unit, connect them professionally.
- The system owner/HVAC contractor is responsible for the planning and installation of any additional safeguards.

Sharp edges, sharp corners and thin sheet metal parts



CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts of the heat exchanger or of the cooling or heating coil may cause cuts or grazes.

- Be careful when working on these components.
- Wear protective gloves, safety shoes and a hard hat.

Inspection access doors slamming shut



WARNING!

Risk of crushing from doors slamming shut

Inspection access doors may slam shut by the wind or if someone pushes them inadvertently, resulting in serious injury to the head and limbs.

- Secure each inspection access door with a hold open device.
- Secure inspection access doors without a hold open device against closing by suitable means.
- Do not reach between the door and door frame.
- Wear protective gloves and a hard hat when you open an inspection access door.

Crushing hazard.

WARNING!

Crushing hazard from movable parts!

There is an increased risk of crushing on casing units, doors, panels and components of the device.

- Never reach between moving parts.
- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

Damage to inspection access doors

NOTICE!

Physical damage to inspection access doors

Do not open inspection access doors which are hinged on one side if their width is ≥ 1000 mm or more!

The closures can be damaged due to the weight and the leverage forces that occur.

In the case of inspection access doors from a width of ≥ 1000 mm, always open all closures and remove the door from the air handling unit.

Store doors safely where they are protected against damage!

4.2 Installation location, requirements

DANGER!

Risk of injury from an unsuitable installation location!

Do not install the AHU in a location that can be accessed by everybody.

AHUs may have lockable doors, yet a risk of injury, vandalism, burglary etc. remains.

Install the AHU in a location that can only be accessed by authorised persons.

4.2.1 Requirements for indoor installation

Installation room

Air handling units designed for indoor installation have to be installed in a room that meets the following requirements:

- The room has been designed in compliance with the applicable building regulations and is suitable for the technical systems to be installed. National standards for plant rooms may also apply.
- The installation room has to be

- clean
- dry
- free from conductive dust particles
- free from strong electromagnetic fields
- free from aggressive atmospheres
- free from frost
- fitted with a functioning drainage system

- There is sufficient clearance for installing, operating, servicing, and repairing the AHU and all its parts.
 - The maintenance access has to be at least as deep as the unit.
 - The maintenance access must be wide enough so that all inspection access doors can be opened with an opening angle of 90° .
- The structure on which the air handling unit is to be installed must be suitable for the weight and have a level surface (see the order-specific data sheet for the air handling unit).
- Do not use the air handling unit as a structural element or as a roof for a building.
- Do not use the air handling unit in potentially explosive atmospheres.

Escaping water

NOTICE!

Risk of damage to property from escaping water!

If the water system is not tight, water may escape and cause considerable damage to property.

- Ensure that liquids are channelled away and to a collection device.

Installation room foundation

The installation room foundation must fulfil the following requirements:

- It is horizontal, flat and robust, made of concrete; alternatively, a support structure made of steel may be used.
- The frequency of the support structure, particularly of a steel structure, is sufficiently different from the excitation frequency of movable components, such as fans, motors, pumps or refrigerant condensers.
- For air handling units with a condensate drain, the support structure is at least as high as the drain trap, see  34
- If additionally structure-borne noise is to be attenuated (e.g. by rubber or elastomer sheets underneath the air handling unit), be sure to exactly align all AHU casing units (check for door closure, properly sealed joints).

4.2.2 Requirements for outdoor installation

Installation location

For outdoor installation please note:

- Do not use the air handling unit in potentially explosive atmospheres.
- The installation location has to be
 - free from conductive dust particles
 - free from strong electromagnetic fields
 - free from aggressive atmospheres
 - fitted with a functioning drainage system
- The structure on which the air handling unit is to be installed must be suitable for the weight and have a level surface (see the order-specific data sheet for the air handling unit).
- There is sufficient clearance for installing, operating, servicing, and repairing the AHU and all its parts. The maintenance access has to be at least as deep as the unit.
- Make sure that the installation location meets local regulations to prevent the fall of people, and of tools and other objects.
- Use suitable fall arrest equipment.
- Prevent unauthorised individuals from accessing AHU casing units.
- Make sure that authorised individuals can access AHU casing units safely.
- Keep the structural properties in mind and make sure the maximum roof load is not exceeded; do not neglect the effects of weather on the unit (rain, snow, wind, sun etc.).
- Only a skilled qualified professional must connect the air handling unit to an external switch cabinet and prevent the cables from the effects of weather (rain, snow, wind, sun etc.).
- All operating fluid pipes and hoses and the AHU components to which they are connected must be frost-proof.
- Do not use the air handling unit as a structural element or as a roof for a building.

Foundation of the outdoor installation area

- The information regarding the foundation of the installation room applies, ☞ *'Installation room foundation' on page 22*
- For roof installation, check the load capacity and support structure of the roof; consult a structural engineer if necessary.
- The entire air handling unit must be supported by a continuous steel structure.
- The steel girders must be designed for a maximum deflection of $L/500$ under load (L = girder length). A maximum deflection of 10 mm under load must not be exceeded.
- Waterproof the edge of the roof under the air handling unit and also any connections penetrating the roof.

- Insulate the plinth structure (by others) to prevent condensation.
- In areas with heavy snowfall, choose an installation location where snow will not affect the operation of the air handling unit. Make sure that the support structure is high enough.

Escaping water

! NOTICE!

Risk of damage to property from escaping water!

If the water system is not tight, water may escape and cause considerable damage to property.

- Ensure that liquids are channelled away and to a collection device.

4.3 Preventing vibration and structure-borne noise

If the air handling unit is equipped with an anti-vibration frame (Vibration Baseframe - AVBF optional), no special measures are required for insulation of structure-borne noise.

In the case of air handling units without anti-vibration frames, underlays for insulation of vibration and structure-borne noise can be used to reduce vibration transmission to the support structure:

- For installation on level ground with no special requirements regarding insulation of structure-borne noise, we recommend decoupling the foundation from the air handling unit, for example using rubber or elastomer sheets.
- For noise insulation, compare the requirement to the sound power level of the air handling unit (see order-specific data sheet for the air handling unit) and have the necessary measures determined by an acoustics engineer.

! NOTICE!

Risk of damage to the AHU

Anti-vibration elements or a noise insulating layer must not affect the structural safety of the AHU. Ensure the following:

- Use a sufficient number of anti-vibration elements and noise insulating layers and place them correctly as otherwise the frame may sag.
- Keep in mind that the various AHU casing units differ in weight; this must not lead to any height differences in the overall unit.

We recommend you to have noise insulating layers (including material and layout plan) selected and sized by an expert company.

4.4 Setting up and assembling the air handling unit

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Hearing protection
- Protective gloves
- Safety shoes
- Safety harness

4.4.1 Setting up the AHU or AHU casing units

4.4.1.1 Setting up the AHU or AHU casing units

Placement of AHU casing units

The arrangement of the individual AHU casing units is shown in the drawings on the individual delivery units.

Installation accessories

Installation accessories are packed separately in an accessory pack which is normally located in the fan chamber.

1. ▶ Assemble the AHU casing units as closely as possible to the installation site in accordance with the installation sequence, Fig. 11. Also pay attention to the local interfaces, e.g. to drainage and water connections.
2. ▶ Remove all foil packaging.

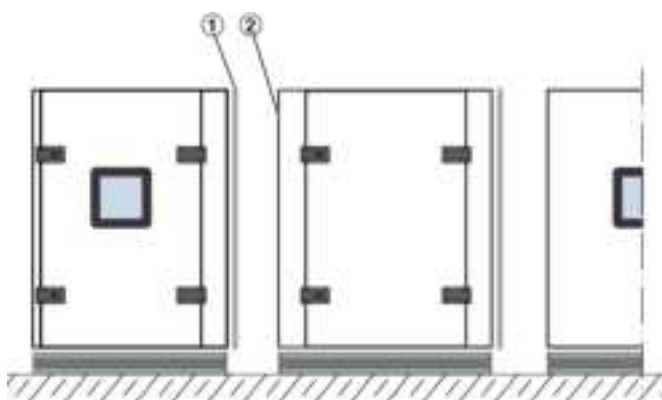


Fig. 11: Seals on AHU casing units

3. ▶ Perimeter seals (Fig. 11 /1) are fitted at the connection points of the AHU casing units. The seal is only located on one AHU casing unit in each case, the casing unit to be connected to it has no seal (Fig. 11 /2).

Check that the seals are complete and intact and that they seal properly.

Deformed seals

Compressed seals will recover fully to their original state about 60 minutes after the transport protection devices have been removed.

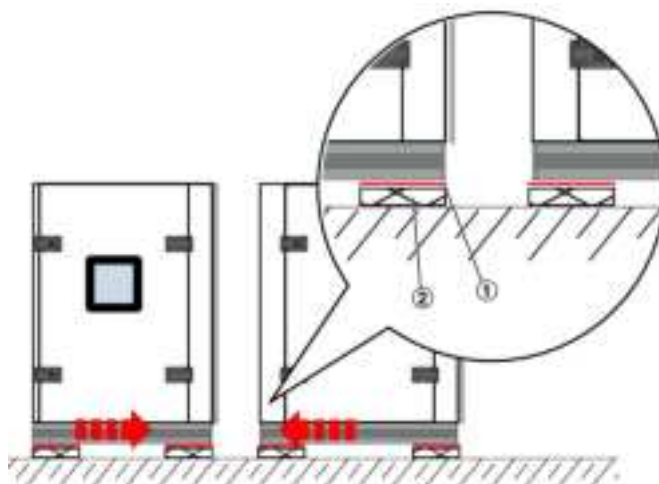


Fig. 12: Use of slide plates for easy positioning

4. ▶

Units with anti-vibration frames (optional)

If the air handling unit is equipped with an anti-vibration frame (Vibration Baseframe - AVBF optional), no special measures are required for insulation of structure-borne noise. This installation step can be omitted in this case.

If the air handling unit is installed on a surface with a high coefficient of friction (e.g. rubber or elastomer sheets), positioning can be made considerably easier by using slide plates.

To do this, insert the slide plates (Fig. 12 /1) provided by the customer between the base frame and the surface (Fig. 12 /2).

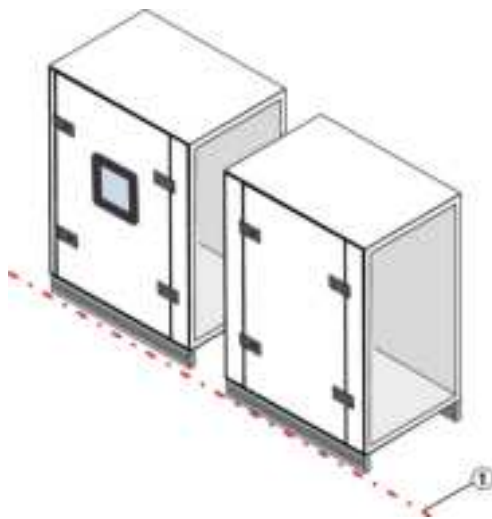


Fig. 13: Aligning AHU casing units

5. ▶ Align the AHU casing units so that they are flush with one another (Fig. 13 /1).

Air handling units with X-CUBE Control:

6. ▶ Before you push the AHU casing units together, insert the internal cables of each unit into the cable ducts of the next casing unit; for more information see ↗ Chapter 5.7 'Wiring' on page 41 .

With base frame

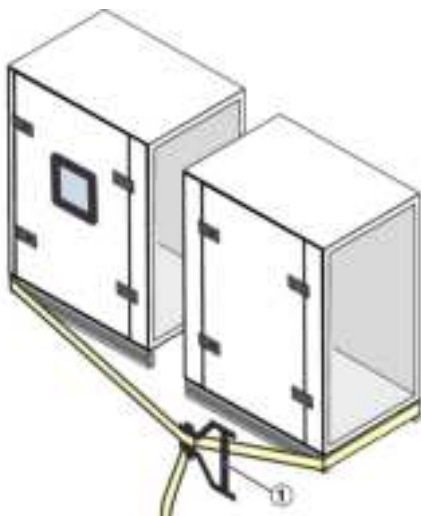


Fig. 14: Attaching a ratchet strap, with base frame

7. ▶ Attach a ratchet strap to the base frames of two AHU casing units (Fig. 14).

Tighten the ratchet strap.

- ⇒ The AHU casing units come closer together as you tighten the strap around the base frames.

Without base frame

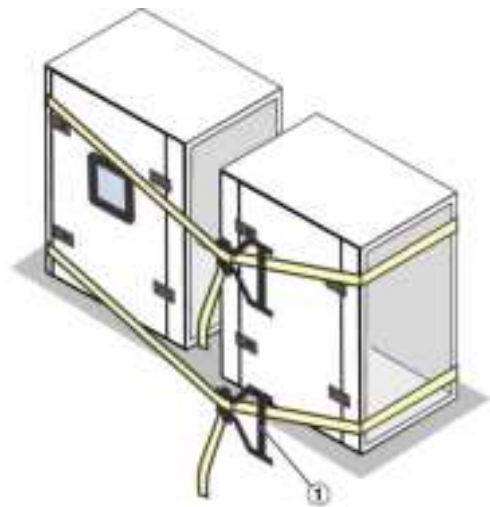


Fig. 15: Attaching a ratchet strap, without base frame

8. ▶ Attach one ratchet strap each at the top and bottom of the housing of 2 AHU casing units.
9. ▶ Tighten the ratchet straps alternately.
- ⇒ The AHU casing units come closer together as you tighten the strap.

4.4.2 Assembling AHU casing units

Joining AHU casing units with screws/bolts

! NOTICE!

Risk of damage to property from incorrect assembly!

Be sure to assemble the AHU casing units correctly as otherwise the condensate drain may be damaged.

- Protect the condensate drain from damage.

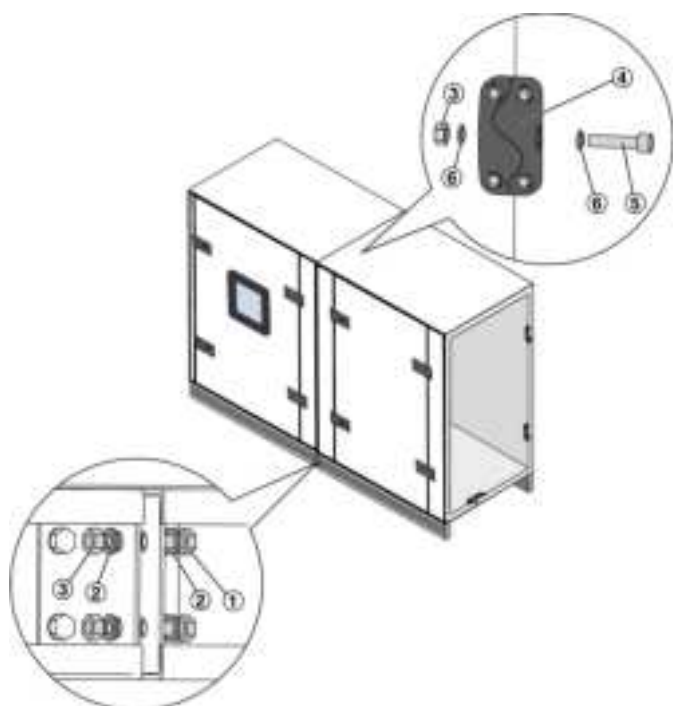


Fig. 16: Joining the base frames with screws/bolts

- ① Hexagon head screws
- ② Washers
- ③ Nuts
- ④ Module connectors
- ⑤ Allen screws
- ⑥ Schnorr® washers

- ▶ Screw the AHU casing units evenly to the end faces of the base frames and to the casing unit connectors.

Installing AHU casing units on top of each other

Do not start assembling the upper units until you have completed assembly of the lower units, including screw-fixing the module connectors and the base frame.

Follow the assembly instructions carefully as otherwise the unit may become damaged, the casing units may start shifting or, if the unit is installed outdoors, water may get into the unit.

- Factory drilled holes indicate where the lower and upper AHU casing units have to be joined. Align and fix the casing units according to these holes.
- Be sure to use all of the fixing points. If an assembly point is difficult to access, check if it is possible to assemble the units in a different order.
- Ensure that the position is correct based on the screw joints on the operating side.
- Ensure that no water can get into the unit at the factory provided joints.
- If in doubt, consult TROX.

Without intermediate frame

- ▶ When the installation of the lower casing units is completed, place the first upper casing unit with lifting gear, e.g. a crane, in the appropriate installation position (see enclosed drawing), & 'Transport on transport brackets' on page 18. If there are several upper AHU casing units, install them one after another before putting on additional casing units.

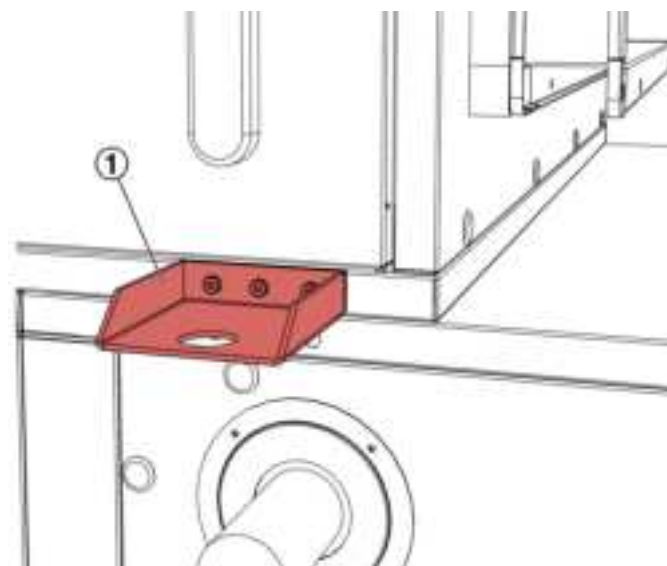


Fig. 17: Removing transport brackets

- ▶ Remove the transport brackets from the upper AHU casing unit (Fig. 17 /1).
- ▶ If there are several AHU casing units, connect them together using casing unit connectors, (Fig. 16 /4).

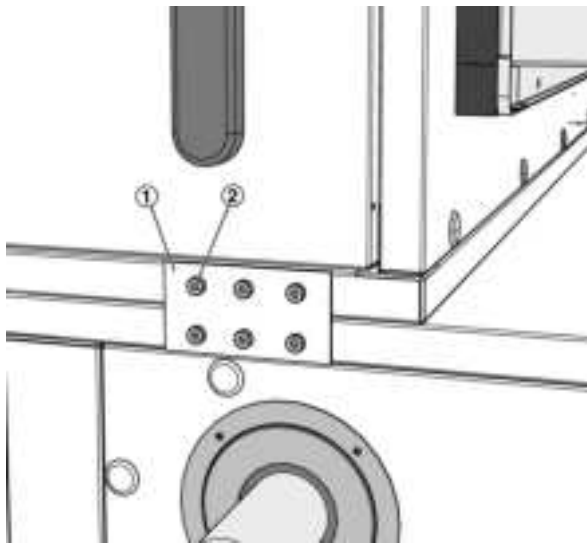
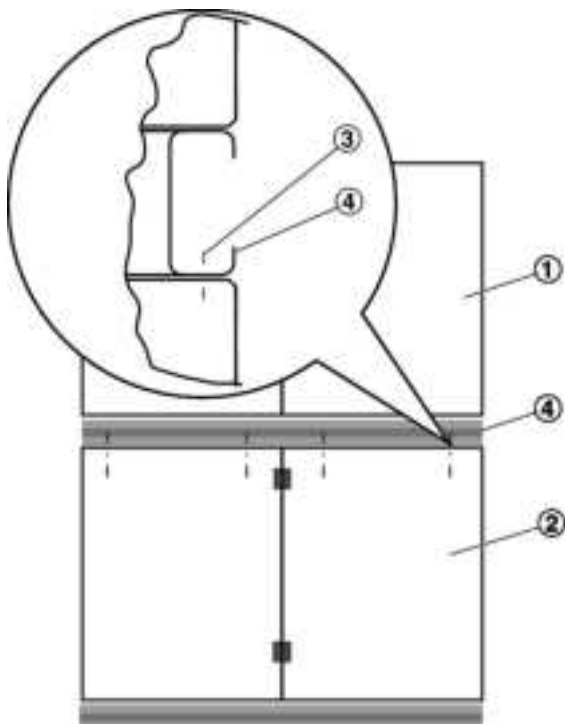


Fig. 18: Connecting AHU casing units

4. ▶ Connect upper and lower AHU casing units with connecting sheet (Fig. 18 /1) and socket head screws M6 (Fig. 18 /2).

With intermediate frame

5. ▶ When the installation of the lower casing units is completed, place the first upper casing unit with lifting gear, e.g. a crane, in the appropriate installation position (see enclosed drawing), ⚠ *'Using transport tubes' on page 15* . If there are several upper AHU casing units, install them one after another before putting on additional casing units.



6. ▶ Screw-fix (3) the intermediate frame (4) of the upper casing unit to the ceiling panel of the lower unit (2).

Installing the noise insulating connector

If the noise insulating connector has been supplied separately, install it once the AHU has been erected and assembled. Depending on the AHU construction variant the noise insulating connector has to be attached to the panel or to a multileaf damper.

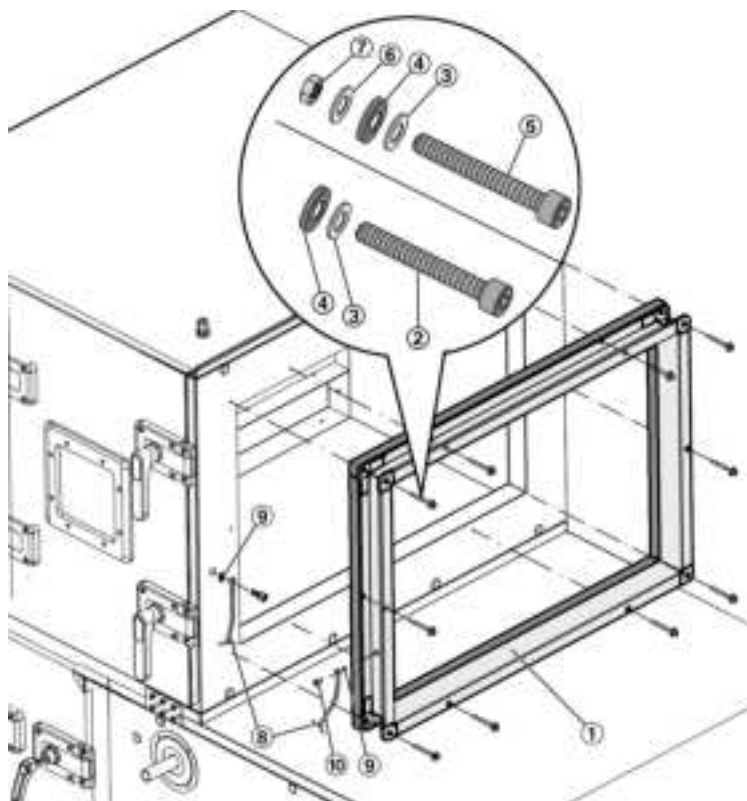


Fig. 19: Installing the noise insulating connector

Supplied assembly material

No.	Description	Part no.			
		Panel		Multileaf damper	
		Galvanised steel	Stainless steel	Galvanised steel	Stainless steel
①	Noise insulating connector				
②	Thread forming socket cap head screw M6 × 40	A00000055910	A00000055911	–	–
③	Washer Ød 6.4	M332AA3	M333AA3	M332AA3	M333AA3
④	Rubber seal 17 × 6.5 × 3	M338BD0			
⑤	Socket cap head screw M6 × 40	–	–	A00000018868	A00000056190
⑥	Washer Ød 6.4	–	–	M332AF9	M333AC3
⑦	Nut M6	–	–	M332AD6	M323AA3
⑧	Ground cable	A00000026651			
⑨	Lock washer, serrated	M332KB4	A00000045194	M332KB4	A00000045194
⑩	Pan head screw M6 × 12	M852AC6			
⑪	Socket cap head screw M6 × 30	M852AC4			

1. ▶ Place the noise insulating connector (Fig. 19 /1) on the air handling unit with the perimeter seal facing down; fix it with thread forming screws (Fig. 19 /2), rubber seals (Fig. 19 /4) and washers (Fig. 19 /3).

Attaching the noise insulating connector to a multileaf damper

If the noise insulating connector is to be attached to a multileaf damper, fix it with the supplied socket cap head screws (Fig. 19 /5), rubber seals (Fig. 19 /4), washers (Fig. 19 /3 and 6) and nuts (Fig. 19 /7).

2. ▶ Fix one eye of the ground cable (Fig. 19 /8) with a pan head screw M6 × 12 (Fig. 19 /10) and a serrated lock washer (Fig. 19 /9) to the noise insulating connector.

NOTICE!

Electrical conductivity

For electrical conductivity the serrated lock washer needs to be fitted between the eye of the ground cable and the coated surface.

3. ▶ Fix the other eye of the ground cable with a socket cap head screw M6 × 30 (Fig. 19 /11) and a serrated lock washer through the panel sheet to the tubular frame of the air handling unit.

4.4.3 Additional assembly steps for outdoor units

Connecting the roof segments

Air handling units for outdoor installation require the following additional assembly steps:

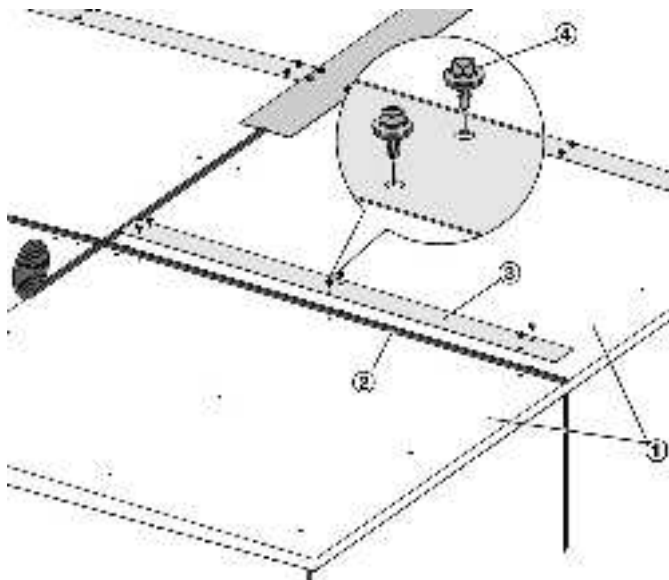


Fig. 20: Joining roof segments

1. ▶ Seal all joints between the roof segments (Fig. 20 /1) with self-adhesive joint sealing tape (Fig. 20 /2). Follow the tape manufacturer's instructions for use. Attach the cover strips (Fig. 20 /3) and fix them with self-drilling screws (Fig. 20 /4).

NOTICE!

Remove the eye nuts where the casing units are to be joined such that you can actually join the roof segments. Do not remove the other eye nuts; they have to remain in place to prevent the ingress of rain into the unit.

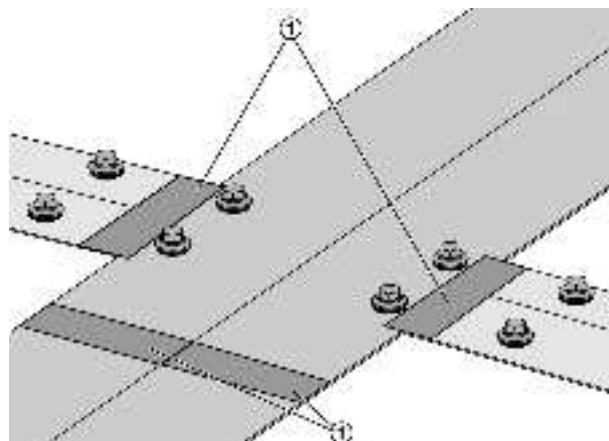


Fig. 21: Sealing the joints

2. ▶ Seal the joints (Fig. 21 /1) between the cover strips with the supplied adhesive strips (100 x 40 mm).

Make sure that all surfaces are clean, free from grease, and dry. Clean the surfaces, if necessary.

Stacked units (step design)

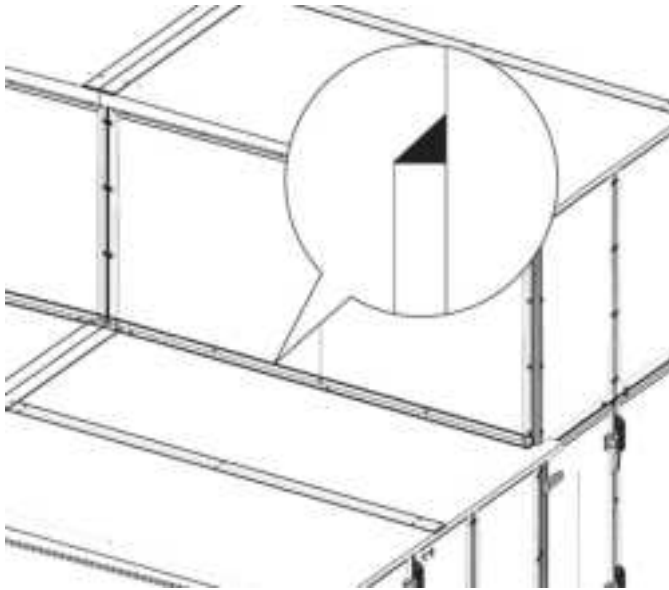


Fig. 22: Step design

3. ▶ Fix the connecting angle section for the roof segment with self-drilling screws and seal it with sealant.

Attaching the weather hood

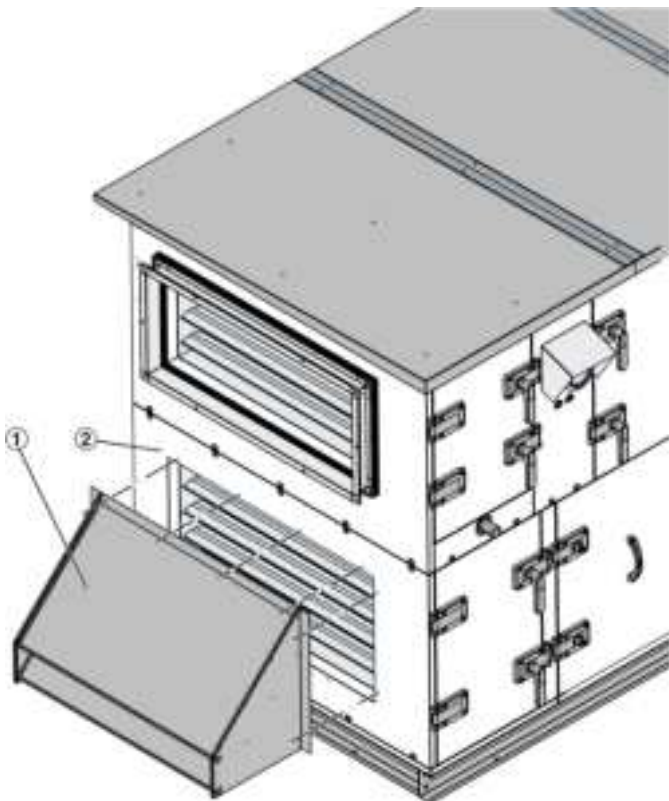


Fig. 23: Positioning the weather hood

- ▶ Position the weather hood (Fig. 23 /2) flush with the hole pattern on the panel (Fig. 23 /1) and screw on with pan head screws (M6x12).

Fitting base frame plugs

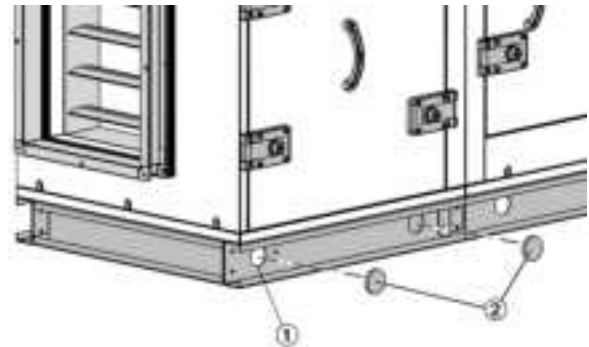


Fig. 24: Fitting plugs

- ▶ Seal the transport openings (Fig. 24 /1) in the base frame of the air handling unit with the plugs (Fig. 24 /2) provided.

Fixing cover strips to the intermediate frame

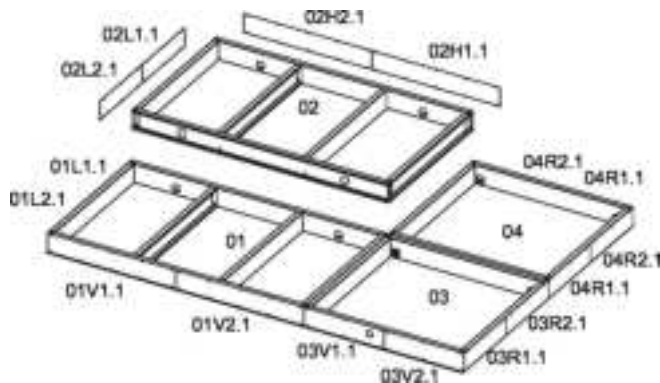


Fig. 25: Cover strip coding

1. ▶

! NOTICE!

Risk of water damage from incorrect assembly!

If units with an intermediate frame are installed outdoors, missing cover strips or incorrect assembly may lead to the ingress of water.

To prevent the ingress of water into the intermediate frame and hence into the unit, seal the intermediate frame with cover strips.

Fix the cover strips immediately after the assembly steps described above. If you do not fix the cover strips immediately, water may get into the unit and damage the components.

Each cover strip carries a code indicating its position (see table).

No. of the intermediate frame	Side code		Number (left → right)
01 ... 99	V	Front = operating side	1.1 ... 9.1
	H	Rear	
	L	Left	
	R	Right	

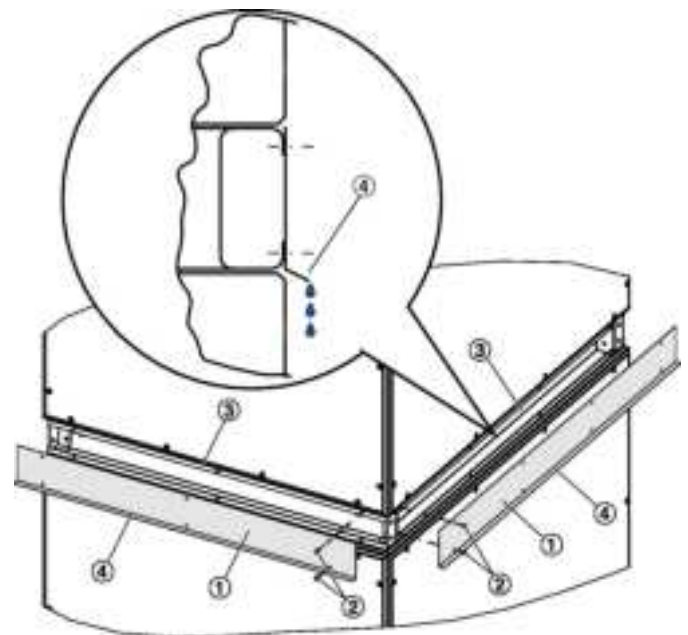


Fig. 26: Fixing cover strips

- 1 Cover strip for the intermediate frame
- 2 Thread forming pan head screws M6 x 12 (M852AC6)
- 3 Intermediate frame
- 4 Drip edge

2. ▶ Use pan head screws to attach the cover strips to the intermediate frame.

Important: Fix the cover strips in such a way that the drip edge is at the bottom. Ensure that the drip edge faces outwards.

⇒ This will prevent water from getting into outdoor units with an intermediate frame.

Installing ducts

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety shoes

1. ▶ Ensure precise fit and avoid distortion when you connect the ducts.

Note: Any load on the noise insulating connector may impair the tight fit. Connect the duct in such a way that no loads are imposed on the connector; if necessary, slightly re-tighten the screws on the connector.

2. ▶ Insulate ducts (including flexible connectors and connecting frames).

3. ▶ For outdoor units: Protect ducts (including spigots and connecting frames) against the effects of weather.

4.4.4 Installing accessories

Install any supplied accessories (e.g. pressure transducers) and any accessories provided by others (e.g. actuators, frost sensors) according to the manufacturers' instructions.

5 Installation

5.1 Safety notes regarding installation

Incorrect installation



WARNING!

Risk to life from incorrect installation!

Incorrect installation can lead to potentially fatal situations and cause considerable damage to property.

- Only a skilled qualified electrician must connect the power supply.
- Any other installation job has to be carried out by an HVAC technician.

Inspection access doors slamming shut



WARNING!

Risk of crushing from doors slamming shut

Inspection access doors may slam shut by the wind or if someone pushes them inadvertently, resulting in serious injury to the head and limbs.

- Secure each inspection access door with a hold open device.
- Secure inspection access doors without a hold open device against closing by suitable means.
- Do not reach between the door and door frame.
- Wear protective gloves and a hard hat when you open an inspection access door.

Crushing hazard.



WARNING!

Crushing hazard from movable parts!

There is an increased risk of crushing on casing units, doors, panels and components of the device.

- Never reach between moving parts.
- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

Hot surfaces



WARNING!

Risk of injury from hot surfaces!

The surfaces of components can get very hot during operation. Skin contact with hot surfaces causes severe skin burns.

- Professionally insulate pipes that connect condensers or heating coils.

Interconnecting units and systems



WARNING!

Risk of injury from interconnecting different units or systems!

Connecting an air handling unit to other units or systems (e.g. ductwork, pumps, refrigeration systems) can lead to dangerous situations and eventually cause serious or even fatal injuries.

- If you have to connect other units or systems to the air handling unit, connect them professionally.
- The system owner/HVAC contractor is responsible for the planning and installation of any additional safeguards.

Sharp edges, sharp corners and thin sheet metal parts



CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts of the heat exchanger or of the cooling or heating coil may cause cuts or grazes.

- Be careful when working on these components.
- Wear protective gloves, safety shoes and a hard hat.

5.2 Before installation

Before installation

- Have all the applicable documents at hand,
 & 'Other applicable documentation' on page 3
- Ensure that the installation requirements are met, see the order-specific data sheet for the air handling unit.
- Have all the required tools ready.

5.3 Connecting the condensate drain

Electric current

WARNING!

Danger of death due to electric current!

If electrical components come into contact with water, e.g. from a leak, you could be seriously or even fatally injured. Water can also cause damage to the air handling unit.

- Lay drainage pipes in such a way that they cannot be accidentally damaged by mechanical impact or by heat.

Height of drain trap

NOTICE!

Risk of leakages due to incorrect installation!

Do not connect the condensate drain to the sewerage system without a drain trap or with an unsuitable drain trap as this may result in air getting into the AHU.

- Use a suitable drain trap to connect the AHU to the sewerage system.
- Do not connect the drain trap to the drainage pipe; the water from the drain trap should flow to a gully.
- Use a different drain trap for each condensate drain. Do not connect condensate drains with each other.
- A distance from the floor must be maintained at the drain trap of the negative pressure side.

Calculate the height of a drain trap as shown below.

Symbol:

- | | |
|--------|---|
| P | - Pressure inside the air handling unit [Pa]; be sure to use a positive value for calculations; take the final differential pressure (filter etc.) into consideration |
| 1.5 | - Safety factor to compensate for pressure fluctuations in the system such as those resulting from rapidly closing dampers (applies only to positive pressure) |
| R | - Distance R [mm]; minimum distance between condensate drain (centre line) and floor on the positive pressure side. |
| X + 60 | - Distance X + 60 [mm]; minimum distance between condensate drain (centre line) and floor on the negative pressure side |
| H | - Distance H [mm]; minimum distance between base frame lower edge and floor |
| A | - Distance A [mm]; distance between base frame lower edge and condensate drain (centre line); depends on the base frame (GR), see table |

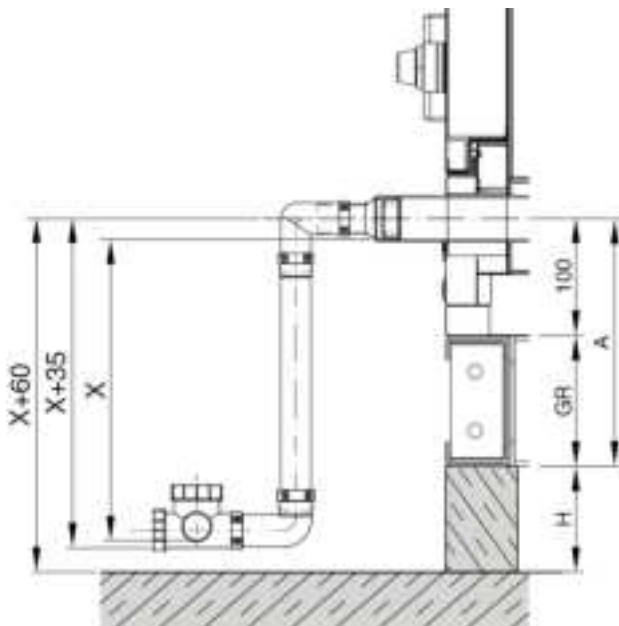
Negative pressure (extract air)


Fig. 27: Drain trap for negative pressure in the unit

Calculation to be used for negative pressure (2900 Pa max.):

- $X = P / 10$
- $H = X + 60 - A$

Base frame construction	Acoustic decoupling	GR [mm]	A [mm]
110	Without	110	210
	With	135	235
200	Without	200	300
	With	225	325
300	Without	300	400
	With	325	425

Calculation example

Given data:

P - 1800 Pa

GR - 110

A - 210

$X = 1800 \text{ Pa} / 10 = 180 \text{ mm}$

$H = 180 + 60 - 210 \text{ mm} = 30 \text{ mm}$

If the calculation value is negative, no additional installation height H is required.

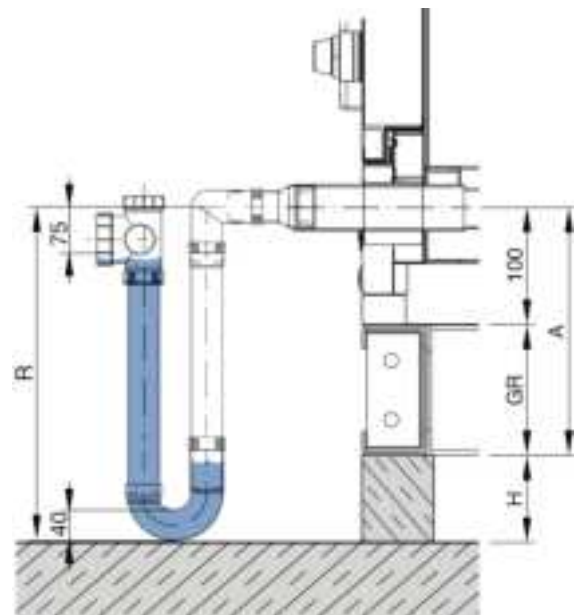
Positive pressure (supply air)


Fig. 28: Drain trap for positive pressure in the unit

Calculation to be used for positive pressure (1630 Pa max.):

- $R = P \times 1.5 / 10 + 115 (40 + 75)$
 $H = R - A$
- Always cut or extend pipes by the same length. Do not cut a pipe by more than 155 mm.; R has to be at least 215 mm.

Calculation example

Given data:

P - 1500 Pa

GR - 110

A - 210

$R = 1500 \text{ Pa} \times 1.5 / 10 + 115 \text{ mm} = 340 \text{ mm}$

$H = 340 - 210 = 130 \text{ mm}$

Drain trap, connecting

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety shoes

! NOTICE!

Risk of damage to property from incorrect pipe connections!

Take care to connect the pipes correctly as otherwise the pipes and the drain trap may be damaged beyond repair.

- Connect pipes in such a way that they are not affected by vibration and that no loads are imposed on them.
- If an AHU is installed outdoors, use suitable pipes and protect them from frost.

Drain trap connection dimensions

Outer diameter of drainage pipe - 40 mm

1. ▶ Calculate the height of the drain trap as shown above.

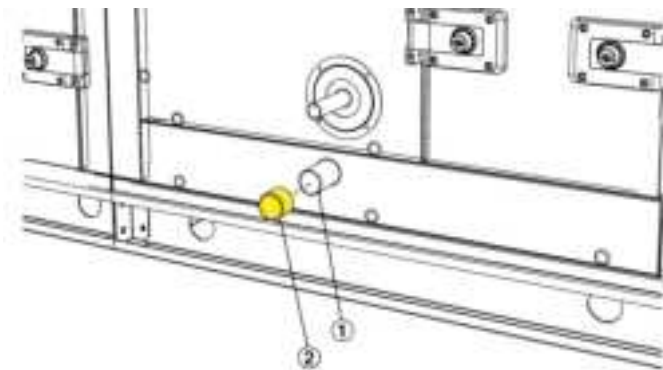


Fig. 29: Condensate drain

2. ▶ Remove the protective cap (Fig. 29 /2) from each drain (Fig. 29 /1) of the condensate drip tray.

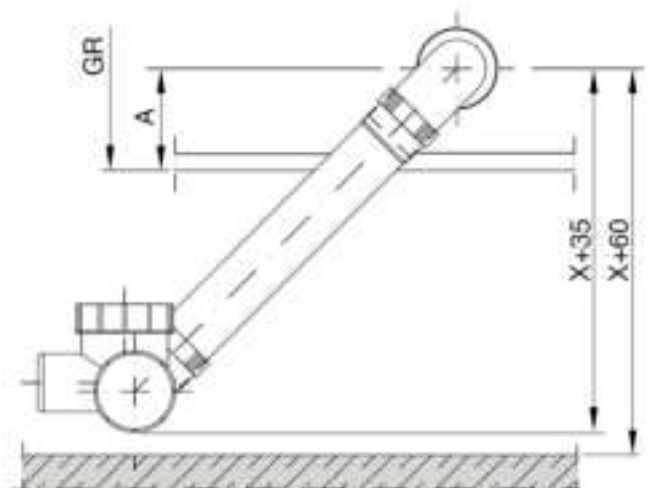


Fig. 30: Sloped pipe of a drain trap for negative pressure

3. ▶ Adjust the height of the drain tap based on the above calculation. Drain traps for negative pressure: Instead of shortening the pipe, you can install the drain trap so that it slopes.
4. ▶ Connect a drain trap to each condensate drain (Fig. 29 /1).

Do not connect the drain trap to the drainage pipe; the water from the drain trap should flow to a gully.

Air handling units to be installed outdoors or in areas at risk of frost require frost protection for the drain trap, see Appendix D 'Installing a frost protection device for the drain trap' on page 82 .

5.4 Connecting the heating coil/cooling coil

Electric current

! WARNING!

Danger of death due to electric current!

If electrical components come into contact with water or a water glycol mixture, e.g. from a leak, you could be seriously or even fatally injured. Water can also cause damage to the air handling unit.

- Lay connecting cables in such a way that they cannot be accidentally damaged by mechanical impact or by heat.
- Do not lay connecting cables across electrical components or switch cabinets as people may become entangled in them.

Connect heat exchangers in a counter flow arrangement unless a parallel flow arrangement has been specified by the manufacturer. Only a counter flow arrangement ensures that the calculated capacity is achieved.



If you have to attach brackets or fasteners to the AHU panels or frame, use only those specially approved for your AHU as otherwise there is a risk of leakages.

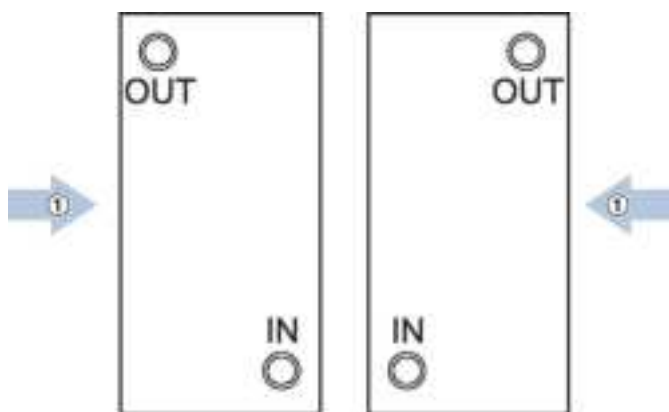


Fig. 31: Exemplary illustration of the heat exchanger connections in a counter flow arrangement

1 Airflow direction



Stickers on the connection side of the heat exchangers indicate the flow (Fig. 31 /IN) and return connections (Fig. 31 /OUT) for a counter flow arrangement.

In special constructions of the heat exchanger, these stickers may not show the correct type of connection. The heat exchangers must always be connected in a counter flow arrangement. For questions on the connections, please contact the unit manufacturer.

Connect slide-out heat exchangers and droplet eliminators with bends and detachable connections as otherwise you will not be able to withdraw them.

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Hearing protection
- Protective clothing
- Protective gloves
- Safety shoes

! NOTICE!

Risk of damage to property from incorrect pipe connections!

Take care to connect the heat exchanger pipes correctly as otherwise the pipes may twist or become subject to adverse effects. This may eventually damage the heat exchanger beyond repair.

- Connect pipes in such a way that the heat exchanger is not affected by vibration and that no loads are imposed on it.
- If there is too much weight on a water pipe (by others), support the water pipe.
- Do not use the connection point of the heat exchanger as a fixing point for other parts.
- When you tighten thread connections, be sure to use a suitable tool (e.g. water pump pliers) to counter the tightening force as otherwise you may inadvertently damage the parts.
- If an AHU is installed outdoors, use suitable pipes and protect them from frost.
- Ensure that no air gets trapped in the pipes.

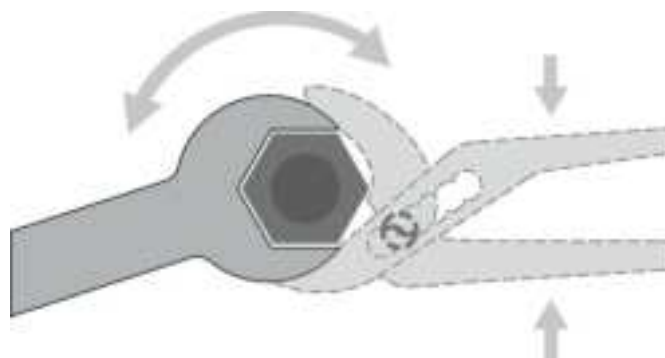


Fig. 32: Using water pump pliers to counter the tightening force

1. ► Hold the threaded pipe tail of the heat exchanger with water pump pliers (Fig. 32 /2).
2. ► Hold the threaded pipe tail with the pliers while you use a spanner (hexagonal profile, Fig. 32 /1) to connect the heat exchanger to the pipework (pipework by others).

Connect the steam heat exchanger

Ventilation device

For optimum ventilation of the heat exchanger, we recommend that you install suitable air separators at the highest points of the system (e.g., above the air handling unit), which reduce the airflow velocity by increasing the cross section and can thus be ideally used for deaerating glycol systems.

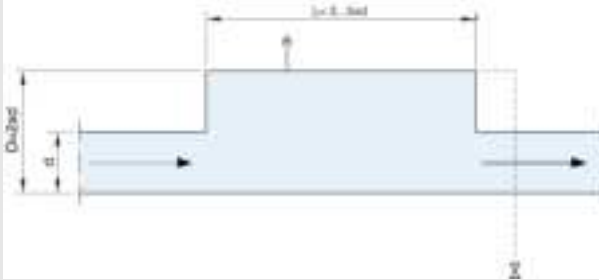


Fig. 33: Air separator with cross section enlargement

5.5 Connect the steam heat exchanger

Hot surfaces

WARNING!

Risk of injury from hot surfaces!

Steam heat exchangers are operated with temperatures of >100 °C. Contact with surfaces of the heat exchanger causes severe skin burns.

Before performing any work on the heat exchanger, the supply of steam must be interrupted and you must ensure that the surface temperature has cooled down to room temperature, e.g. using an infrared thermometer.

DANGER!

Risk of leakage due to escaping steam

If steam is released due to leakages, the supply of steam to the heat exchanger must be stopped immediately.

The heat exchanger must be fully emptied before repair work can be carried out. The steam is subject to high pressure; if the steam escapes due to a leakage, a hot steam jet can occur that can cause severe scalds.

Connect steam heat exchangers in a counter flow arrangement unless a parallel flow arrangement has been specified by the manufacturer. Only a counter flow arrangement ensures that the calculated capacity is achieved.

i.

If you have to attach brackets or fasteners to the AHU panels or frame, use only those specially approved for your AHU as otherwise there is a risk of leakages.

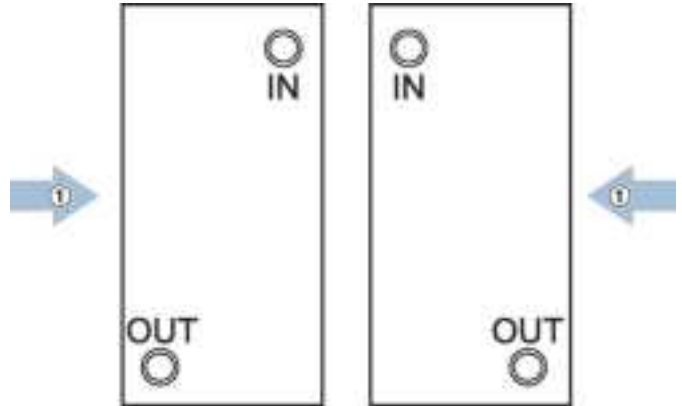


Fig. 34: Exemplary illustration of the steam heat exchanger connections in a counter flow arrangement.

1 Airflow direction

i.

Stickers on the connection side of the heat exchangers indicate the flow (Fig. 34 /IN) and return connections (Fig. 34 /OUT) for a counter flow arrangement.

In special designs of the heat exchanger, these stickers may not show the correct type of connection. The heat exchangers must always be connected in a counter flow arrangement.

For steam-operated heat exchangers, the return connection must be located at the bottom so that any condensate that occurs can be properly dissipated. For questions on the connections, please contact the unit manufacturer.

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Hearing protection
- Protective clothing
- Protective gloves
- Safety shoes

! NOTICE!**Risk of damage to property from incorrect pipe connections!**

Take care to connect the heat exchanger pipes correctly as otherwise the pipes may twist or become subject to adverse effects. This may eventually damage the heat exchanger beyond repair.

- Connect pipes in such a way that the heat exchanger is not affected by vibration and that no loads are imposed on it.
- If there is too much weight on a water pipe (by others), support the water pipe.
- Do not use the connection point of the heat exchanger as a fixing point for other parts.
- If an AHU is installed outdoors, use suitable pipes and protect them from frost.

5.6 Connecting the run around coil system

The proper connection of the pipework between the heat exchangers of the AHU and the hydraulic unit is carried out by the customer.

Connect heat exchangers in a counter flow arrangement as only a counter flow arrangement ensures that the calculated capacity is achieved. Use only suitable parts and materials and use only the marked connection points to connect the hydraulic unit.



If you have to attach brackets or fasteners to the AHU panels or frame, use only those specially approved for your AHU as otherwise there is a risk of leakages.

Setting up and connecting the hydraulic unit**Personnel:**

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Hearing protection
- Protective clothing

- Protective gloves
- Safety shoes
- Safety harness

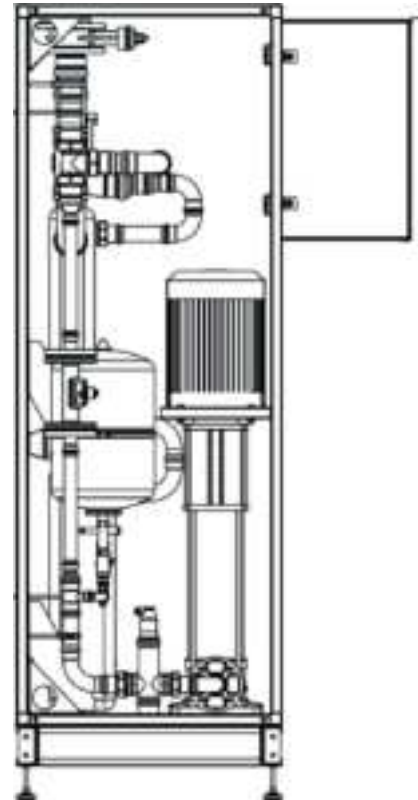


Fig. 35: Setting up the hydraulic unit

- ▶ Install the hydraulic unit so that it is parallel to the wall and floor.
- ▶ Alignment of the hydraulic unit

using leveling feet (optional)	- Adjust the feet of the hydraulic unit so that it is level (use a 19 mm wrench).
without feet	- Level out floor unevenness using materials provided by others, e.g. rubber or elastomer sheets.

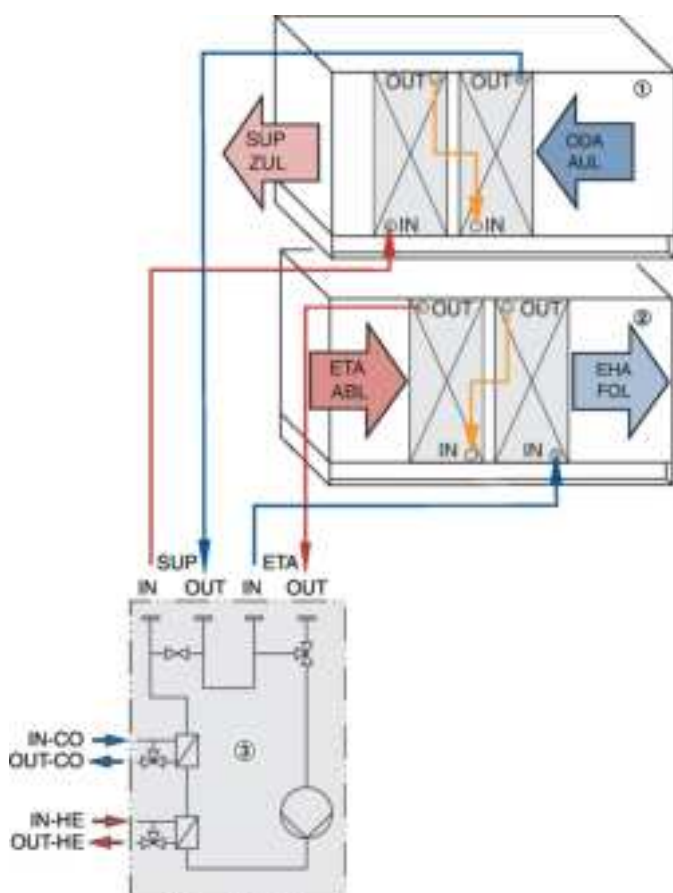


Fig. 36: Hydraulic system connection (example)

- ① Supply air unit
- ② Extract air unit
- ③ hydraulic unit
- IN Flow
- OUT Return

3. ▶ Connect the heat exchanger with the hydraulic unit (Fig. 36).

If there are several heat exchangers in airflow direction, connect the pipes in series.

The position of the connection points is given in the order-specific approval drawing.

If you are in doubt about the position of any pipes to be connected, please get in touch with our Technical Service.

Heat exchanger connection

Connection on hydraulic unit	Heat exchanger Air handling unit	Description
IN-ETA	IN	Flow – extract air
OUT-ETA	OUT	Return – extract air
IN-SUP	IN	Flow – supply air

Connection on hydraulic unit	Heat exchanger Air handling unit	Description
OUT-SUP	OUT	Return – supply air

4. ▶ Run-around coil systems with external feeding: Make the required connections (Fig. 36).

Connections for external feeding

Connection on hydraulic unit	External feeding
IN-CO	Water flow – cooling
OUT-CO	Return – cooling
IN-HE	Water flow – heating
OUT-HE	Return – heating

Ventilation device

For optimum ventilation of the heat exchanger, we recommend that you install suitable air separators at the highest points of the system (e.g., above the air handling unit), which reduce the airflow velocity by increasing the cross section and can thus be ideally used for deaerating glycol systems.

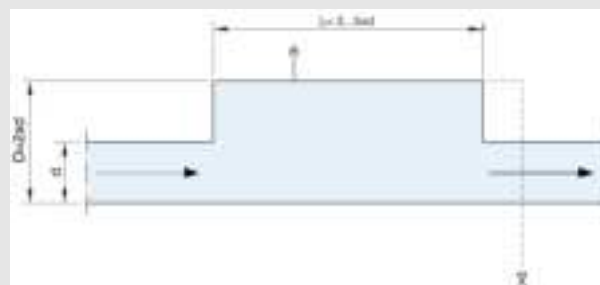


Fig. 37: Air separator with cross section enlargement

5.7 Wiring

Air handling units with X-CUBE Control are factory wired. The functions of all electronic parts, sensors, actuators, etc. are tested before shipment. If a unit has to be disassembled into AHU casing units for shipment or for moving to the final installation location, the cables are disconnected (before shipment) at suitable interfaces and either pushed back into the cable ducts or rolled up. The wiring is shown in the wiring diagram (see switch cabinet).



Fig. 38: Example of separate cables

- 1 Pull wire for pulling in cables without separation
- 2 Bus cable
- 3 Lighting
- 4 Anti-frost thermostat

Interface connections

Component	Connection	Job
X-CUBE Control - Bus black cable with black M12 plug connection - Lighting grey cable with black M12 plug connection	 M12 plug connections	Plug the connectors together straight and tighten by hand. Then tighten the screw connections by 90° with the open-end spanners (securing against working loose).
X-CUBE Control sensors - Anti-frost thermostat black cable with black 3-pin M8 plug connection - Duct smoke detector 1 black cable with black 4-pin plug connection - Duct smoke detector 2 black cable with red 4-pin plug connection	 M8 plug connector	Plug M8 plug connections together straight.
Fans with < 13 A power consumption are pluggable.	 5-pin power plug connector	plug together straight and close retainer (protection against working loose).
Fans > 13 A, double fans or fan arrays	No discontinuities, rolled-up cables	Route the cables through the intended cable routes and connect them to the switch cabinet according to the circuit diagram.
Rotary heat exchanger	 3-pin power plug connector	plug together straight and close retainer (protection against working loose).
Shut-off dampers with spring return actuator torque > 20 Nm	No discontinuities, rolled-up cables	Route the cables through the intended cable routes and connect them to the switch cabinet according to the circuit diagram.



None of the other regulation and control components are designed to be pluggable. The rolled-up cables must be routed through the intended cable routes and connected to the switch cabinet according to the circuit diagram.

Connecting cables



Fig. 39: Connection of the cables

1. ▶ Place the AHU casing units as close together as possible so that you can connect the cables.
Note: If there is not much space, you can also connect the cables inside the AHU casing unit.
2. ▶ First run the cables in sections through the air handling unit to the switch cabinet without discontinuities, see wiring diagram. Where cables have to be pulled in, e.g. behind heat recovery units, a pull wire is provided for pulling in the cable.
3. ▶ Then connect the separate cables according to the type of plug and the colours of the cable and plug, & 'Interface connections' on page 42. Connect only cables with the same code.
4. ▶ When you push the AHU casing units together, feed the cables into the mesh cable trays and be careful to not damage any cables.

5.8 Connecting the air handling unit to the power supply

Electrical connection

**DANGER!****Danger of death due to electric current!**

Danger of electric shock! Do not touch any live components!

- Only a skilled qualified electrician must connect the power supply.
- For air handling units with integral controls use the circuit diagram in this manual, & 'Other applicable documentation' on page 3
- Lay connecting cables in such a way that they cannot be accidentally damaged by mechanical impact or by heat.
- Bridge all non-conductive joints, such as connecting frames, flexible connectors and anti-vibration elements, with an equipotential bonding cable.
- Earth the air handling unit according to the state of the art.
- Secure all connections so that they cannot come loose.
- When you connect any electrical components, follow the manufacturers' specifications, the local regulations and codes of good practice (DIN/VDE), and the general recommendations for avoiding electromagnetic interference,
- If an AHU is installed outdoors, do not neglect the effects of weather on the unit (rain, snow, wind, sun etc.).



If you have to attach brackets or fasteners to the AHU panels or frame, use only those specially approved for your AHU as otherwise there is a risk of leakages. Avoid screw joints that pierce the outer shell of the unit; if you cannot avoid them, then at least seal them to prevent the ingress of water. The minimum protection level is IP 65.

1. ▶

**Units with controls**

The electrical circuit diagrams and terminal plans can be found in the circuit diagram included in the supply package.

Connect the electrical components, such as the electric air heater, electric motor, and actuator.

2. ▶ Include the air handling unit in the equipotential bonding arrangement.
3. ▶ Test protective conductors and insulation resistance to EN 60204 (VDE 0113). Take the appropriate safety precautions!

5.9 Integrating the air handling unit with the central BMS

It is the duty of the system owner/HVAC contractor to integrate the air handling unit with the building services and to ensure conformity, ☞ 'System owner's obligations' on page 8 and ☞ 'Conformity assessment' on page 21 .

5.10 Connecting the controls to your PC or local network

Network or PC

Air handling units with optional integral controls are fitted with a touch panel on which the configuration and control parameters of the unit are displayed. This allows you to view all measured values and to enter setpoint values.

You can use a computer with a web browser instead of the touch panel to display the unit configuration. To do so, connect the air handling unit to a PC or integrate it with a network using the TCP/IP interfaces.



Further information on this can be found in the X-CUBE Control operating instructions.

5.10.1 X-CUBE controller CX8090

Integration with the network, setting the IP address

Personnel:

- Skilled qualified electrician
- Network administrator

For more information refer to

https://infosys.beckhoff.com/content/1031/cx8090/html/cx8090_title.htm?id=1470

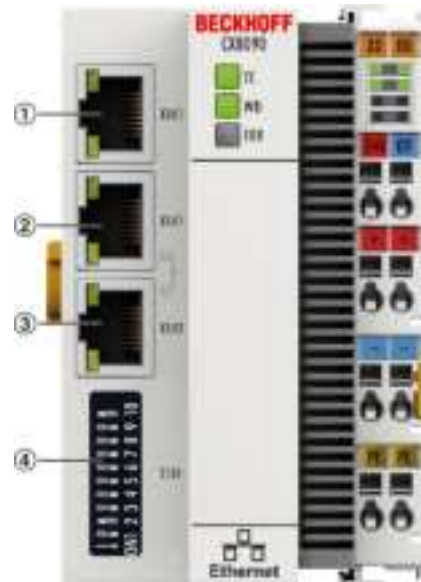


Fig. 40: X-CUBE controller CX8090, network connections

- ① X001 - Port for the X-CUBE touch panel and for the TROX Service
- ② X101 - Port for BMS computer
- ③ X102 - Port for another X-CUBE unit (e.g. daisy chain) or another BMS computer
- ④ DIP switch

Connection: Use network cables with RJ45 plugs (at least cat. 5).

Factory set network address – X001

IP address	192.168.0.200
Subnet mask	255.255.255.0
Standard gateway	192.168.0.1

Setting the IP address for connection X101/102

1. ► Set the DIP switch according to the table.

DIP switch	Setting
1...8	ON
9 and 10	OFF

For more information:

https://infosys.beckhoff.com/content/1031/cx8090/html/cx8090_dip_switch.htm?id=1492

After you have set the DIP switch, you have to restart the computer. To do so, switch off circuit breaker 11Q1 in the switch cabinet. Wait until all LEDs on the computer are OFF. Switch the circuit breaker on again in order to restart the computer.



Fig. 41: Cerhost software download

2. ► Go to <http://infosys.beckhoff.com/> and search for cerhost, then download the software and install it on a PC or notebook.
3. ► Use a network cable to connect to port X001 the PC or notebook on which you have installed 'Cerhost'. If the port is already being used, e.g. for the touch panel, pull out the cable.
4. ► Start 'Cerhost'.
⇒ The starting screen is displayed.

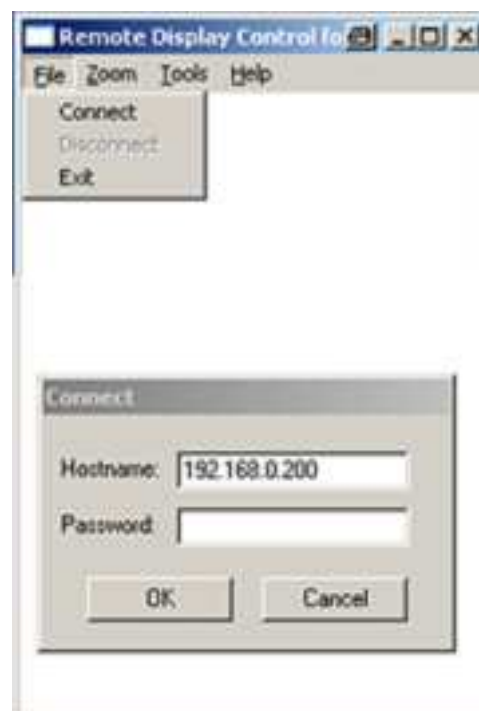


Fig. 42: File menu

5. ► Go to the 'File' menu and select 'Connect'.

In the 'Connect' window enter IP address 192.168.0.200 and confirm your entry with OK.

- ⇒ When the connection has been established, a window opens and the script is executed.

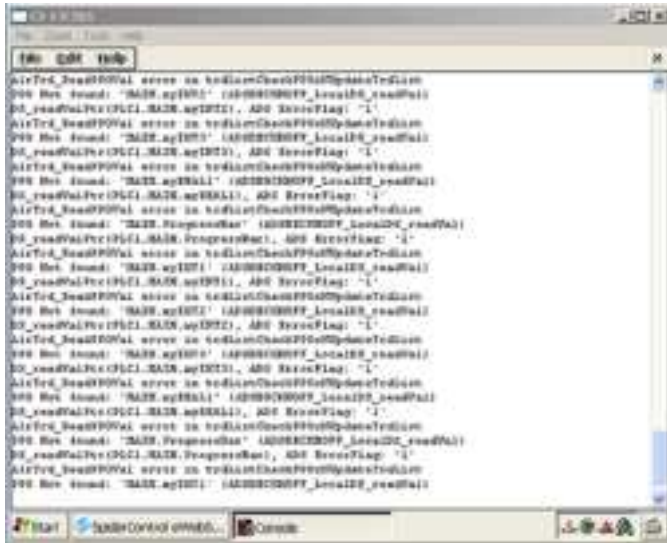


Fig. 43: Script window



Fig. 44: Start menu

6. ▶ Go to the Start menu and select 'Control Panel'.



Fig. 45: Control panel

7. ▶ In the 'Control Panel' window click on 'Network and Dial-up Connections'.

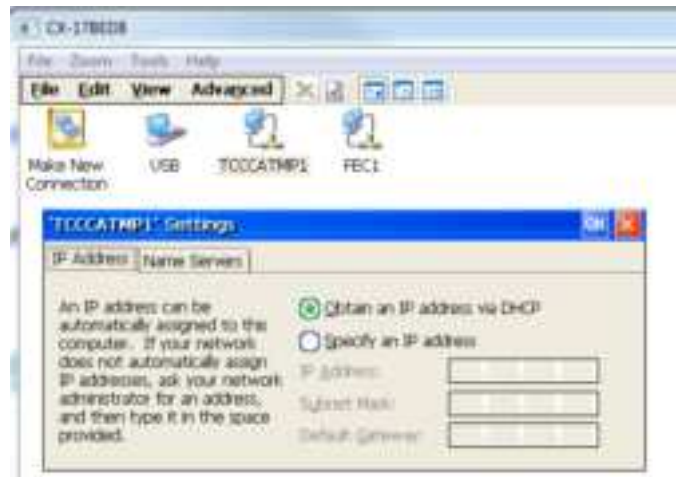


Fig. 46

8. ▶ In the next window select 'TCCCAMTMP1'.

The "TCCCAMTMP1 Ethernet Driver" Setting' window opens.

Select 'Specify an IP address' and enter the required network settings.

Confirm your entries with 'OK' and close the 'Control Panel' window.

The new settings are immediately active; you need not restart the computer.

9. ▶ Remove the network cable from port X001 and connect the touch panel again.

Connect the BMS computer to port X101.

You can use port X102 as described above.

5.10.2 X-CUBE controller CX9020

Integration with the network, setting the IP address

Personnel:

- HVAC technician
- Skilled qualified electrician
- Network administrator

For more information refer to

https://infosys.beckhoff.com/content/1031/cx9020_hw/index.html?id=1759



Fig. 47: X-CUBE controller CX9020, network connections

- ① X000 - Port for the touch panel
- ② X001 - Port for a BMS computer or for another X-CUBE unit (e.g. daisy chain)

Connection: Use network cables with RJ45 plugs (at least cat. 5).

2. ▶ Use a network cable to connect to port X000 the PC or notebook on which you have installed 'Cerhost'. If the port is already being used, e.g. for the touch panel, pull out the cable.
3. ▶ Start 'Cerhost'.
⇒ The starting screen is displayed.

Factory set network address – X000 / X001

IP address	192.168.0.200
Subnet mask	255.255.255.0
Standard gateway	192.168.0.1

Setting the IP address for X000 and X001



Fig. 48: Cerhost software download

1. ▶ Go to <http://infosys.beckhoff.com/> and search for cerhost, then download the software and install it on a PC or notebook.



Fig. 49: File menu

4. ▶ Go to the 'File' menu and select 'Connect'.

In the 'Connect' window enter IP address 192.168.0.200 and confirm your entry with OK.

⇒ When the connection has been established, a window opens and the script is executed.

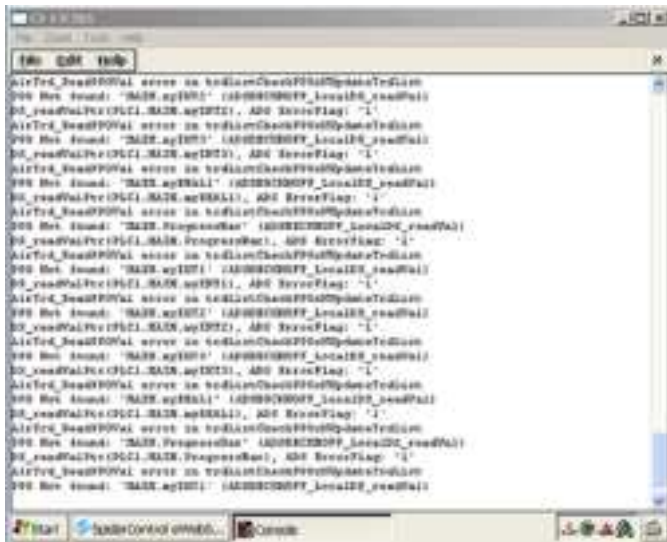


Fig. 50: Script window



Fig. 51: Start menu

5. ▶ Go to the Start menu and select 'Control Panel'.



Fig. 52: Control panel

6. ▶ In the 'Control Panel' window click on 'Network and Dial-up Connections'.

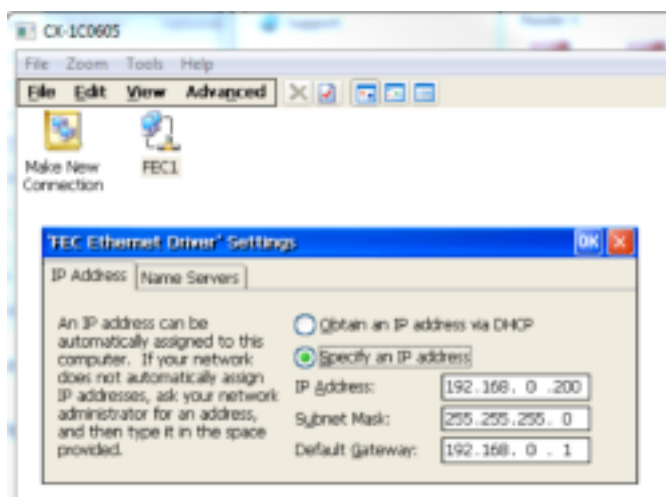


Fig. 53

7. ▶ In the next window select 'FEC1'.

The "FEC Ethernet Driver Settings" window opens.

Select 'Specify an IP address' and enter the required network settings.

Confirm your entries with 'OK' and close the 'Control Panel' window.

The new settings are immediately active; you need not restart the computer.

8. ▶ Remove the network cable from port X000 and connect the touch panel again.

! NOTICE!

Touch panel address

The IP address applies to both ports, i.e. X000 and X001. If you change the IP address, you have to enter the new address also on the touch panel.

Connect the BMS computer or another X-CUBE unit to port X001.

Setting the IP address for the touch panel

Personnel:

- HVAC technician

Factory set network address for the touch panel

IP address	192.168.0.199
Subnet mask	255.255.255.0

Standard gateway 192.168.0.1



Fig. 54: Starting screen

1. ▶ After you have changed the network settings you need to restart the computer. To do so, switch off circuit breaker 11Q1 in the switch cabinet. Wait until all LEDs on the computer are OFF. Switch the circuit breaker on again in order to restart the computer.

On the starting screen select 'Settings...'.



Fig. 55: Password entry

2. ▶ Touch the entry field (*) to display the keyboard. Enter the password ++-- (PlusMinusPlusMinus) and confirm your entry with 'OK'.



Use the shift key to enter + (plus).



Fig. 56: Settings

3. ▶ In the 'Settings' window select 'OS Settings...'.

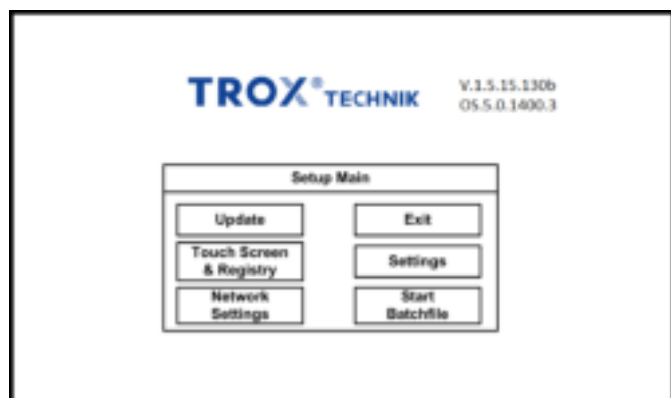


Fig. 57: Setup Main

4. ▶ In the 'Setup Main' window select 'Network Settings'.

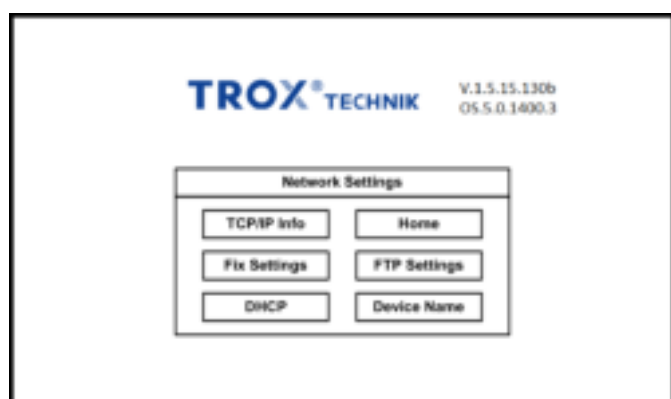


Fig. 58: Network Settings

5. ▶ In the 'Network Settings' window select 'Fix Settings'. Enter the password +--+ again.

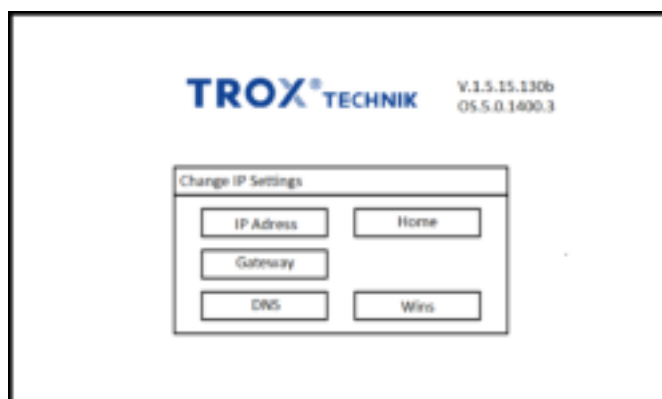


Fig. 59: Change IP Settings

6. ▶ In the 'Change IP Settings' window select 'IP Address'.



Fig. 60: IP Address

7. ▶ In the 'IP Address' window enter the new IP address and subnet for the touch panel. Confirm your entries with 'OK'. In the 'Change IP Settings' window (Fig. 59) select 'Gateway'.

Network addresses and settings

The network addresses (IP, subnet and gateway) have to be the same as the settings on controller CX9020.



Fig. 61: Gateway

8. ▶ In the 'Gateway' window enter the new gateway settings. Confirm your entries with 'OK'. In the 'Change IP Settings' window (Fig. 59) select 'Home' and accept that changes are saved.



Fig. 62: Settings

9. ▶ The 'Settings' window opens. Enter the IP address for controller CX9020 `http://xxx.xxx.xxx.xxx/trox.html` and confirm your entries with 'Save'. Select 'Quit' to close the menu.

The touch panel now uses the new settings to connect to the controller.



If no connection to the controller can be made, briefly interrupt the supply voltage to be able to see the 'starting screen' again. On the 'starting screen' select 'Settings'. Check and change settings if necessary.

6 Initial commissioning

6.1 Safety notes regarding initial commissioning

Incorrect initial commissioning

WARNING!

Risk to life from incorrect initial commissioning!

Incorrect initial commissioning can lead to potentially fatal situations and cause considerable damage to property.

- Only skilled qualified electricians must work on the electrical system and on motors.
- All other initial commissioning steps must be carried out by an HVAC technician.

Inspection access doors on the discharge side

CAUTION!

Risk of injury from a strong airflow on the discharge side of fans!

When you open an inspection access door on the discharge side of the fan, the velocity and pressure of the airflow may cause the door to suddenly swing open until it is caught by the safety catch. You could be injured.

- Be careful when you open inspection access doors on the discharge side.

Sharp edges, sharp corners and thin sheet metal parts

CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts of the heat exchanger or of the cooling or heating coil may cause cuts or grazes.

- Be careful when working on these components.
- Wear protective gloves, safety shoes and a hard hat.

Inspection access doors slamming shut

WARNING!

Risk of crushing from doors slamming shut

Inspection access doors may slam shut by the wind or if someone pushes them inadvertently, resulting in serious injury to the head and limbs.

- Secure each inspection access door with a hold open device.
- Secure inspection access doors without a hold open device against closing by suitable means.
- Do not reach between the door and door frame.
- Wear protective gloves and a hard hat when you open an inspection access door.

Crushing hazard.

WARNING!

Crushing hazard from movable parts!

There is an increased risk of crushing on casing units, doors, panels and components of the device.

- Never reach between moving parts.
- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

Damage to inspection access doors

NOTICE!

Physical damage to inspection access doors

Do not open inspection access doors which are hinged on one side if their width is ≥ 1000 mm or more!

The closures can be damaged due to the weight and the leverage forces that occur.

In the case of inspection access doors from a width of ≥ 1000 mm, always open all closures and remove the door from the air handling unit.

Store doors safely where they are protected against damage!

6.2 Before initial commissioning

The air handling unit has been erected, assembled, and installed according to this manual.

Before initial commissioning, check the casing and the following parts for damage and correct position:

- Inspection access doors and openings
- Seals
- Handles and levers

- Connections
- Inspection windows
- Panels

Before initial commissioning:

- Remove protective film, if any
- Check the unit for leakages
- Check inspection access doors and openings for function
- Set up the centrifugal fan, ☞ 'Set up the centrifugal fan' on page 54
- Insert the filters, ☞ 'Filters, inserting' on page 55
- Set up the heating coil/cooling coil, ☞ 'Commissioning the heating coil/cooling coil' on page 56
- Set up the multileaf dampers, ☞ 'Setting up multileaf dampers' on page 58
- Set up the sound attenuator, ☞ 'Setting up sound attenuators' on page 59
- Set up the rotary heat exchanger, ☞ 'Setting up the rotary heat exchanger' on page 59
- Set up the run around coil system, ☞ 'Commissioning the run around coil system' on page 57
- Set up the plate heat exchanger, ☞ 'Setting up the plate heat exchanger' on page 60
- Remove the protective caps from the condensate drains and connect the drain trap, ☞ Chapter 5.3 'Connecting the condensate drain' on page 34
- Clean the air handling unit, ☞ Operating manual, Maintenance.

6.3 Setting up and adjusting AHU casing units

6.3.1 Centrifugal fan

Operating point

The control system calculates the operating point and sets the default setpoint value for the fan.

During commissioning ensure that the following values are not exceeded:

- Maximum fan speed
- Minimum fan speed
- Motor rating

Do not change the clearance between the rotor and the bellmouth inlet.

Pressure measuring devices

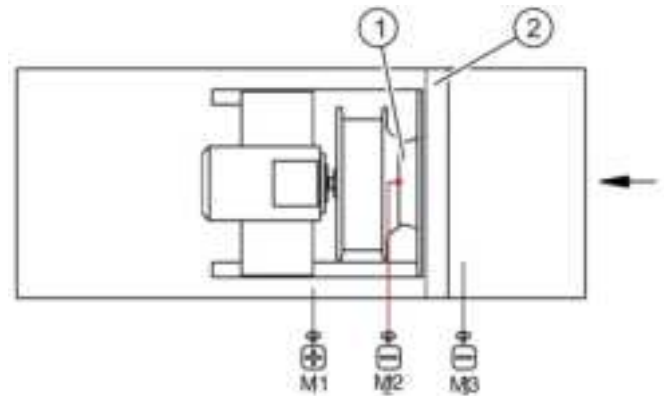


Fig. 63: Pressure measurement point

- 1 Bellmouth inlet
- 2 Partitioning panel
- M1 Pressure measurement point in the fan chamber
- M2 Pressure measurement point on the bellmouth inlet
- M3 Pressure measurement point in front of the partitioning panel

The fans may be factory fitted with pressure measuring devices (optional). The following pressure values are measured at the pressure measurement point (Fig. 63 /M2) in the bellmouth inlet (Fig. 63 /1), the pressure measurement point (Fig. 63 /M1) in the fan chamber, and the pressure measurement point (Fig. 63 /M3) in front of the partitioning panel.

Pressure	Determined from
Static fan pressure increase	Differential pressure between M1 and M3
Effective pressure (Δp_w) of the fan	The differential pressure between M2 and M3 is used to calculate the volume flow rate.

Calculation of the volume flow rate

$$\dot{V} = k \cdot \sqrt{\Delta p_w}$$

The K value is given on the TROX fan rating plate on the air handling unit.

This value may be different from the K value on the rating plate from the fan manufacturer (which should not be used for the calculation).

Set up the centrifugal fan

WARNING!

Risk of injury from the incorrect handling and operation of fans!

Incorrect handling, e.g. reaching into rotating parts, can lead to serious injuries.

- Do not reach into the moving fan or tamper with it.
- The fan does not stop immediately! Check that no parts are moving before you open an inspection access door.
- Do not put a damaged or defective fan into operation.
- Do not exceed a fan's maximum capacity, e.g. when there are strong vibrations or against a closed multileaf damper.
- Switch off the system before you start working on movable fan parts and secure it against accidentally being switched on again. Wait until all parts have come to a standstill.

Switch off the system before you start working on movable fan parts and secure it against accidentally being switched on again. Wait until all parts have come to a standstill.

Switch off the AHU before you start working on movable fan parts and secure it against accidentally being switched on again. Wait until all parts have come to a standstill.

Switch off the system before you start working on movable fan parts and secure it against accidentally being switched on again. Wait until all parts have come to a standstill.

WARNING!

Risk of fire from damaged fan parts!

Grinding rotors or overheating bearings can cause a fire and eventually serious or even fatal injuries.

- Do not put a damaged or defective fan into operation.
- The power consumption must not exceed the specified nominal current.
- Make sure that the maximum motor speed is not exceeded.

Personnel:

- Skilled qualified electrician

Protective equipment:

- Protective clothing
- Hearing protection
- Industrial safety helmet
- Protective gloves
- Safety shoes

1. ▶ Remove the red transport protection devices from the fan.
2. ▶ Check the fan for shipping damage, imbalance, corrosion and contamination.
3. ▶ Check ducts and fan for foreign matter.
4. ▶ Turn the rotor manually to check that it moves freely.



The clearance between the rotor and the bellmouth inlet may have changed due to vibrations during transport. Check before commissioning that the distance between the inner edge of the rotor and the outer surface of the bellmouth inlet is the same everywhere.

5. ▶ Tighten all fixing screws.
6. ▶ Check the bearings and relubricate them if necessary.
7. ▶ Make sure that the multileaf dampers are open,  'Setting up multileaf dampers' on page 58.
8. ▶ Check the direction of rotation of the fan by switching on the motor for a moment.



Nominal motor power of 3 kW and higher: star delta start.



In units with a fan with asynchronous motor, the arrow indicating the direction of rotation can be found on the fan casing.

In units with an EC fan, the fan will automatically start in the correct direction of rotation.

9. ▶ You can change the direction of rotation by swapping the terminal connections.
10. ▶ Ensure that the unit has been correctly earthed.
11. ▶ Close all inspection access doors on the air handling unit  Operating manual.
12. ▶ Measure the power consumption with the inspection access doors closed and compare it with the nominal current.



If the power consumption exceeds the value given on the motor rating plate, switch off the fan immediately.

13. ▶ Check the function of the anti-vibration elements.

14. ▶ Moving towards the operating point, check whether the fan is running smoothly and with minimal vibration only.



If you can see or hear the fan vibrating, switch off the air handling unit, ☎ Contacting the TROX Technical Service .

15. ▶ Measure the volume flow rate.
⇒ The centrifugal fan has been set up.

6.3.2 Filter

Filters, inserting

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety shoes



- *Filters may become contaminated due to construction work in the building which is why we recommend that you replace all filters after the construction phase and initial commissioning.*
- *Do not operate the air handling unit without a filter.*
- *One spare filter element should always be available so that the air handling unit does not have to be switched off. Store filters in a dry place, free from dust, so that they will not be contaminated or damaged. Do not use filters beyond the use before date. Original TROX filters carry a sticker on the frame with both the use before date and information on how to order replacements.*

1. ▶ Ensure that the filters are intact.



Defective filters may become torn while in use and will then no longer be effective.

2. ▶ Remove any dust from all parts that are in upstream direction before the filter.



Clean the air handling unit and ventilation ducts before you install any filter of class F9 or higher.

3. ▶ Fit filters into the installation subframe and fix them with the clamping elements. Make sure that they are tightly seated.
⇒ The filter has been set up.

6.3.3 Heating coil/cooling coil

Heat transfer fluids with glycol



WARNING!

Health risk from heat transfer fluids that contain glycol!

The heat transfer fluids in the heating coil, cooling coil and run around coil system contain glycol, which can damage your health if it comes into contact with your skin, if you swallow it or if you inhale the vapour or mist.

- Avoid contact with heat transfer fluids that contain glycol.
- Work must only be carried out by skilled qualified refrigeration technicians, HVAC technicians or the ☎ TROX Technical Service .
- Do not eat, drink or smoke while handling heat transfer fluids that contain glycol.
- Wash your hands when you interrupt or finish your work.
- If you have come into contact with a heat transfer fluid that contains glycol, follow the first aid instructions given on the safety data sheet for the heat transfer fluid.
- When you have to handle a heat transfer fluid that contains glycol, wear the personal protective equipment specified in the safety data sheet for the heat transfer fluid.

Commissioning the heating coil/cooling coil

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety shoes



Ensure that the maximum pressure values given in the technical data are not exceeded.

Use appropriate measures to protect the water system from frost. Frost protection can be achieved with a water glycol mixture or with a special anti-frost thermostat.



Optimum ventilation

For the best possible ventilation, we recommend installing on-site ventilation equipment at the highest point of the system; see  on page 36.

1. ▶ Ensure that the flow and return connections are correct.
2. ▶ Check that fittings are correctly installed.
3. ▶ Flush the system to remove any contamination.
4. ▶ Open vents (unless automatic vents have been installed).



Evaporators: As soon as you open the heat exchanger connection, the contained nitrogen shield gas content should escape with a hissing sound. The absence of this sound indicates a leak which has to be fixed before commissioning.

5. ▶



For glycol water mixtures we recommend ready-to-use formulations. See the order-specific air handling unit data sheet from TROX for the mixing ratio.

The correct mixing ratio is important:

- Too much glycol will impair performance
- Too little glycol may lead to frost damage

Only use one of the following glycols for the air handling unit:

- Propylene glycol
- Ethylene glycol

Slowly pour the heat transfer fluid into the heat exchanger at the lowest point in the system. As you fill the system, check that all external and internal screw joints and connections are tight.

6. ▶ Vent the heating coil/cooling by opening the upper spigot and the bleed screw.



If the air heater is not properly vented, air bubbles may form and impair the performance.

7. ▶ Close any vents.
8. ▶ Clean the condensate drip tray and drain.
9. ▶ Set up the droplet eliminator.
10. ▶ Fill the drain trap with water.

! NOTICE!

Risk of damage to property!

- When you tighten thread connections, be sure to use a suitable tool (e.g. water pump pliers) to counter the tightening force as otherwise you may inadvertently damage the parts.

11. ▶ Check the flange screw joints and tighten them if necessary.

⇒ The heating coil/cooling coil has been set up.

6.3.4 Electric air heater

Personnel:

- Skilled qualified electrician

Protective equipment:

- Protective clothing
- Hearing protection
- Industrial safety helmet
- Protective gloves
- Safety shoes

In air handling units with X-CUBE Control (controls), both the temperature monitoring and the safety temperature limiter operate independently of one another to ensure that no inadmissible overheating occurs at the electric air heater.

For air handling units with on-site controls, on-site measures must be taken to prevent impermissible temperature excesses. The manufacturer documentation must be observed for this purpose, see attachment.



CAUTION!

Protection against overheating

The electric air heater must be installed so that the heating elements cannot start up before the intended air volume flow is reached. The electric air heater must be put out of operation as soon as the volume flow rate is reduced to a level that is not permitted or the fan is switched off.

To prevent a temperature excess that is not permitted, two temperature-limiting devices must be installed in the air handling unit independently of each other (temperature monitor and safety temperature limiter).

6.3.5 Run around coil system

The run around coil system must only be put into operation after the entire system has been professionally connected and checked (both hydraulic and electrical systems). These checks have to be recorded, and the results have to be available at the time of commissioning.

Heat transfer fluids with glycol



WARNING!

Health risk from heat transfer fluids that contain glycol!

The heat transfer fluids in the heating coil, cooling coil and run around coil system contain glycol, which can damage your health if it comes into contact with your skin, if you swallow it or if you inhale the vapour or mist.

- Avoid contact with heat transfer fluids that contain glycol.
- Work must only be carried out by skilled qualified refrigeration technicians, HVAC technicians or the  TROX Technical Service.
- Do not eat, drink or smoke while handling heat transfer fluids that contain glycol.
- Wash your hands when you interrupt or finish your work.
- If you have come into contact with a heat transfer fluid that contains glycol, follow the first aid instructions given on the safety data sheet for the heat transfer fluid.
- When you have to handle a heat transfer fluid that contains glycol, wear the personal protective equipment specified in the safety data sheet for the heat transfer fluid.

Commissioning the run around coil system

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety shoes



Ensure that the maximum pressure values given in the technical data are not exceeded.

Use appropriate measures to protect the water system from frost. Frost protection can be achieved with a water glycol mixture or with a special anti-frost thermostat.

Optimum ventilation

For the best possible ventilation, we recommend the installation of ventilation equipment by others at the highest point of the system, see  'Setting up and connecting the hydraulic unit' on page 39.

1. ▶ Ensure that the flow and return connections are correct.
2. ▶ Check that fittings are correctly installed.
3. ▶ Flush the system to remove any contamination.
4. ▶ Check the run around coil system for leaks.
5. ▶ Open vents (unless automatic vents are installed).
6. ▶



For glycol water mixtures we recommend ready-to-use formulations. See the order-specific air handling unit data sheet from TROX for the mixing ratio.

The correct mixing ratio is important:

- Too much glycol will impair performance
- Too little glycol may lead to frost damage

Only use one of the following glycols for the air handling unit:

- Propylene glycol
- Ethylene glycol

Slowly pour the heat transfer fluid into the heat exchanger at the lowest point in the system. As you fill the system, check that all external and internal screw joints and connections are tight.

7. ▶ Vent the heating coil/cooling by opening the upper spigot and the bleed screw.



If the air heater is not properly vented, air bubbles may form and impair the performance.

8. ▶ Close any vents.
9. ▶ Clean the condensate drip tray and drain.
10. ▶ Set up the droplet eliminator.
11. ▶ Fill the drain trap with water.

NOTICE!

Risk of damage to property!

- When you tighten thread connections, be sure to use a suitable tool (e.g. water pump pliers) to counter the tightening force as otherwise you may inadvertently damage the parts.

12. ▶ Check the flange screw joints and tighten them if necessary.

⇒ The run around coil system has been set up.

6.3.6 Multileaf dampers

Movable parts of multileaf dampers



WARNING!

Crushing hazard from movable parts!

Closing multileaf dampers may crush your hands and arms.

- Do not reach between the damper blades.
- Prevent access to crush points: Either install dampers on ducts or use fixed guards.
- Before you open an inspection access door, switch off the air handling unit and secure it against being switched on accidentally.

Setting up multileaf dampers

Set the AHU control system in such a way that the fan does not operate against a closed damper.

TROX does not accept liability for damages resulting from incorrect operation. To prevent damage due to pressure surges from fire dampers, pressure relief dampers should be installed.



TROX cannot guarantee leak-free dampers if the actuators are provided and installed by others.

Powered dampers

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety shoes

- ▶ Adjust the linkage in such a way that the angle of rotation is 90° and the dampers close completely.

⇒ Powered multileaf dampers have been set up.

Coupled dampers (for plate heat exchanger)**Personnel:**

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety shoes

1. ▶ Check that the friction locking of the linkage is correct.
2. ▶ Check the direction of rotation direction and ensure that the blades fully open and close.
3. ▶ Check that all screw joints and connections are tight.
 - ⇒ The coupled multileaf dampers have been set up.

6.3.7 Sound attenuator**Setting up sound attenuators**

The splitter filling is made of non-combustible absorption material to DIN 4102.

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety shoes

- ▶ Check splitters for damage and contamination.
 - ⇒ The sound attenuator has been set up.

6.3.8 Rotary heat exchanger** WARNING!****Risk of injury from rotating parts!**

Incorrect handling, e.g. reaching into rotating parts, can lead to serious injuries.

Never reach into or tamper with the storage mass

- Switch off the system before you start working on movable parts of the rotary heat exchanger and secure it against accidentally being switched on again. Wait until all parts have come to a standstill.
- Do not put a damaged or defective rotary heat exchanger into operation.

Adjusting the rotary heat exchanger

The storage mass of the rotary heat exchanger is factory set. You may have to adjust the storage mass to the actual installation conditions, see  *Appendix A 'Adjusting the storage mass' on page 71*.

Setting up the rotary heat exchanger**Personnel:**

- HVAC technician

Protective equipment:

- Protective clothing
- Hearing protection
- Industrial safety helmet
- Protective gloves
- Safety shoes



Ensure that permitted values for parameters such as temperatures or differential pressure are not exceeded.

1. ▶ Check whether the system has been correctly installed.
2. ▶ Inspect the rotary heat exchanger for foreign matter.
3. ▶ Check that the rotor moves freely.



*See the manufacturer's documentation  *Appendix A 'Adjusting the storage mass' on page 71*.*

4. ▶ Check the rotation direction of the rotor and change it on the motor controller, if necessary. Follow the manufacturer's operating instructions.



If the heat exchanger includes a purge sector, the rotating storage mass passes from the extract air via the purge sector to the supply air.

5. ▶ Check that the control module functions correctly.
6. ▶ Check the drive belt tension.
7. ▶ Setting up the drive equipment,  *'Setting up the drive equipment' on page 60*.

8. ▶ Check that the seals are tight; readjust them, if necessary.



See the manufacturer's documentation
Appendix A 'Adjusting the storage mass'
on page 71.

⇒ The rotary heat exchanger has been set up.

Setting up the drive equipment

Personnel:

- Skilled qualified electrician

Protective equipment:

- Protective clothing
- Hearing protection
- Industrial safety helmet
- Protective gloves
- Safety shoes

We recommend that you check the tension of the drive belt regularly during the first 400 hours of operation.

1. ▶ Open the inspection access panel on the indicated corner of the rotor casing.
2. ▶ Check whether the drive belt has sufficient tension; if necessary, shorten the belt as follows:

Shortening the drive belt

3. ▶ Open the lock.
4. ▶ Shorten the belt as required.
5. ▶ Close the lock.
6. ▶ Close the inspection access panel.

Checking the motor

7. ▶ Ensure that the motor is securely fixed.
- ⇒ The drive equipment has been set up.

! NOTICE!

Risk of damage to property from extreme pressure drop!

An extreme pressure drop between the supply air and extract air flows can damage the heat exchanger.

- Ensure that the maximum differential pressure (approx. 1000 Pa, depending on unit design) is not exceeded.
- Check differential pressure on pressure monitors according to the specified intervals.

- ▶ Check and, if necessary, clean the plate heat exchanger to remove foreign matter and contamination.

⇒ The plate heat exchanger has been set up.

6.3.9 Plate heat exchanger

Setting up the plate heat exchanger

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Protective gloves
- Safety shoes

6.3.10 Humidifier

Setting up the humidifier

Personnel:

- HVAC technician

Protective equipment:

- Protective clothing
- Industrial safety helmet
- Hearing protection
- Protective gloves
- Safety shoes



The position of the droplet eliminator cassettes may have changed due to vibrations during transport.

If there are gaps between the cassettes, mist from the humidifier module could get into the unit and accumulate to water.



1. ▶ Check the position of each droplet eliminator cassette of the humidifier. If there is a gap between any two cassettes, adjust the position of the cassettes.

The droplet eliminator cassettes are arranged in two rows, staggered one behind the other, so the gap dimensions on the upstream and downstream sides of the humidifier must be checked. It may be necessary to disconnect ducts to get access to the cassettes.

2. ▶

NOTICE!

Be sure to comply with the humidifier manufacturer's instructions for commissioning.

3. ▶ Check water connections and water pipes installed in the air handling unit for leaks. Retighten the screw connections in case of leaks.

⇒ The humidifier is now ready for use.

6.3.11 Electrical system

Personnel:

- Skilled qualified electrician

Protective equipment:

- Protective clothing
- Hearing protection
- Industrial safety helmet
- Protective gloves
- Safety shoes

Before commissioning, the electrical system has to be tested according to IEC 60364-6 (VDE 0100-600). As part of this test, all contacts have to be checked for correct seating. This applies in particular to motor terminal blocks, fuses, local isolators etc.

6.4 Starting the air handling unit

6.4.1 Before you start the AHU

Before you switch on the air handling unit, make sure that the following requirements have been met:

- Has the air handling unit been checked for damage?
- Have the transport protection devices been removed?
- Have the filters been inserted?
- Have all inspection access doors and openings been closed?
- Have all ducts in the AHU been connected?
- Have the AHU and the connected ducts been tested for any leaks?
- Has the interior of the air handling unit been cleaned?
- Have all drain traps been filled with water?
- Does the supply of power and of operating fluids meet all requirements?
- Has all the safety equipment been installed? Does it work properly?
- Have all the electrical connections been made and secured according to the relevant national standards?
- Has the heating coil/cooling coil been correctly connected and filled?
- Has the centrifugal fan been set up?
- Have the multileaf dampers been set up?
- Has the sound attenuator been set up?
- Has the rotary heat exchanger been set up?
- Has the run around coil system been correctly filled?
- Has the plate heat exchanger been set up?
- Are the environmental conditions for correct use being met?

6.4.2 Starting

Personnel qualified to start the air handling unit

Only specially trained individuals must start the air handling unit.

Follow the instructions in the operating manual for the air handling unit.

If the unit is not fitted with integral controls, i.e. if the controls have been supplied by others, follow the instructions of the supplier.

7 Removal and disposal

7.1 Safety notes regarding disassembly and disposal

Incorrect disassembly

DANGER!

Risk to life from incorrect assembly and disassembly!

Incorrect assembly or disassembly can result in risks to life and limb and in environmental hazards.

- Before you start disassembly, professionally disconnect all electrical cables.
 - Only a skilled qualified electrician must disconnect the power supply.
 - Ensure that no voltage is present.
- Before you start disassembly, correctly drain all operating fluids.
 - Disconnect operating fluid pipes and hoses.
 - Ensure that operating fluids are disposed of correctly.
- If you have any questions regarding disassembly, refer to the assembly instructions in this manual.

Pay attention to the component manufacturers' documentation.
- Only trained specialist personnel must remove any components.
- If necessary, use additional personal protective equipment for outdoor installations, e.g. a safety harness.

Improper transport equipment

WARNING!

Risk to life from using improper transport equipment!

If packages are lifted without adequate transport equipment and if they are not properly secured, they may fall off and lead to fatal injuries.

- Move components only in the position in which they are to be installed.
- Stand clear of suspended loads.
- Do not move additional loads on top of a package.
- Use only the intended lashing points.
- Make sure that no load is imposed on pipes, ducts or cables.
- Use only approved lifting gear and slings that are suitable and sufficient for the load to be carried.
- Do not tie ropes and chains or make knots or place them on sharp edges.
- Use lifting equipment only to lift packages or units, not to push or pull them.
- Ensure that ropes, belts and chains do not twist.
- Ensure that transport equipment has been correctly assembled, fastened and secured before you use it to lift anything.
- Secure all doors, dampers and panels.
- Move packages without any jerky movements and put them down when you leave your workplace.
- Lifting eyes are designed for one-time use only and not for permanently suspending loads.
- Transport tubes are designed for one-time use only and not for permanently suspending loads.

🔗 2.3.1 'Residual risks' on page 9

Unbalanced loads and centre of gravity

WARNING!

Risk of injury from falling or toppling loads!

Loads may be unbalanced, i.e. the centre of gravity may not be obvious. If the load is not properly attached to the lifting equipment, it may topple and fall. Falling or toppling loads can cause serious injuries.

- When you use a crane to move loads, ensure that the centre of gravity of the load is directly beneath the crane hook.
- Lift any load carefully and keep an eye on it to see whether it will stay in place. If required, change the lashing point(s).

Crushing hazard.

WARNING!

Crushing hazard from movable parts!

There is an increased risk of crushing on casing units, doors, panels and components of the device.

- Never reach between moving parts.
- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

Inspection access doors slamming shut

WARNING!

Risk of crushing from doors slamming shut

Inspection access doors may slam shut by the wind or if someone pushes them inadvertently, resulting in serious injury to the head and limbs.

- Secure each inspection access door with a hold open device.
- Secure inspection access doors without a hold open device against closing by suitable means.
- Do not reach between the door and door frame.
- Wear protective gloves and a hard hat when you open an inspection access door.

Sharp edges, sharp corners and thin sheet metal parts

CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts of the heat exchanger or of the cooling or heating coil may cause cuts or grazes.

- Be careful when working on these components.
- Wear protective gloves, safety shoes and a hard hat.

ENVIRONMENT!

Risk of harm to the environment due to incorrect disposal of goods and packaging!

Incorrect disposal can harm the environment.

- Have electronic waste, electronic components and operating fluids (refrigerant, compressor oil, lubricants etc.) disposed of by an approved specialist disposal company.

7.2 Disassembly

Personnel:

- HVAC technician
- Skilled qualified electrician

Protective equipment:

- Industrial safety helmet
- Protective clothing
- Hearing protection
- Protective gloves
- Safety shoes

1. ▶ Disconnect electrical cables.
Ensure that no voltage is present.
2. ▶ Remove all operating fluids.
Properly dispose of all operating fluids.
3. ▶ Disconnect operating fluid pipes and hoses.
4. ▶ Open all module connectors and base frame connectors.
5. ▶ Remove the various unit components.
Use suitable transport equipment to move unit components away from the site.

7.3 Disposal

If no return or disposal agreement is in place, any disassembled components should be disposed of by an approved specialist disposal company.

Components that are no longer required should be recycled:

- Scrap the metals.
- Take plastic parts to be recycled.
- Dispose of other components and waste in a suitable manner, i.e. depending on their material properties.

Electrical and electronic components

Electrical and electronic components can contain materials and substances that are hazardous to health and the environment and which must not get into household and commercial waste.

As electrical and electronic components may also contain recyclables (e.g. precious metals), they must be provided for recycling or disposal by a specialist disposal company.

Chemicals

Chemicals (solvents, cleaning agents, operating fluids, etc.) affect the air, soil, water, and human health in various ways. In some cases, valuable substances can be extracted from them.

Chemicals must therefore not get into the air, soil, sewerage system, surface water or groundwater.

Commission an approved specialist disposal company to recover or dispose of chemicals.

Refrigerant R-410A

Refrigerants may contain substances that are toxic and hazardous to the environment, or which release hazardous decomposition products. These must not be released into the environment. Commission a specialist disposal company to dispose of hazardous substances and materials.

Coolant, glycol

Coolants may contain substances that are toxic and pose a hazard to the environment. They must not be released into the environment. Commission a specialist disposal company to dispose of hazardous substances and materials.

Batteries

Battery components are toxic and pose a hazard to the environment. Batteries must not be disposed of with domestic waste. Batteries must only be disposed of by locally approved specialist companies.

Lubricants

Lubricants such as greases and oils contain toxic substances. They must not be released into the environment. Commission a specialist disposal company to dispose of hazardous substances and materials.

Compressor oil

Compressor oil must not enter sewerage systems or bodies of water. Commission a specialist disposal company to dispose of hazardous substances and materials.

8 Glossary

Exhaust air – EHA

Air that flows from an internal space to the outside.

Extract air – ETA

Air that flows out of a conditioned room.

HVAC technician

HVAC technicians are individuals who have sufficient professional or technical training in the field they are working in to enable them to carry out their assigned duties at the level of responsibility allocated to them and in compliance with the relevant guidelines, safety regulations and instructions. HVAC technicians are individuals who have in-depth knowledge and skills related to HVAC systems; they are also responsible for the professional completion of the work under consideration.

Indoor air – IDA

Air in a conditioned internal space.

ODA – Outdoor air

Untreated air that flows through an inlet into the air handling unit or a building.

Recirculated air – RCA

Extract air that is reconditioned in the air handling unit and supplied to an internal space again.

Secondary air – SEC

Air that is conditioned and then supplied to the same room from which it was extracted.

Skilled qualified electrician

Skilled qualified electricians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on electrical systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

Skilled qualified refrigeration technicians

Skilled qualified refrigeration technicians have been trained in the field of refrigeration engineering, and they know the relevant standards and guidelines. Evidence of the relevant experience claimed must be available. Skilled qualified refrigeration technicians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on refrigeration systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

Supply air – SUP

Air that is supplied to a conditioned internal space; it is also conditioned air that enters an air handling unit.

Transfer air – TRA

Air that flows from one conditioned internal space to another conditioned internal space.

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Appendix



Supplier documentation

The necessary documentation for the components from third-party manufacturers is included in the attachment. You are welcome to contact us if important information is missing, and you can request that we provide it. Contact ☎ 'TROX Technical Service' on page 3

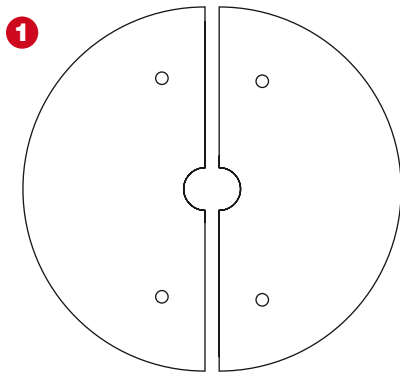
A Adjusting the storage mass

Montageanleitung Mounting Instructions

Ausrichtung der Speichermasse
Adjustment of storage mass

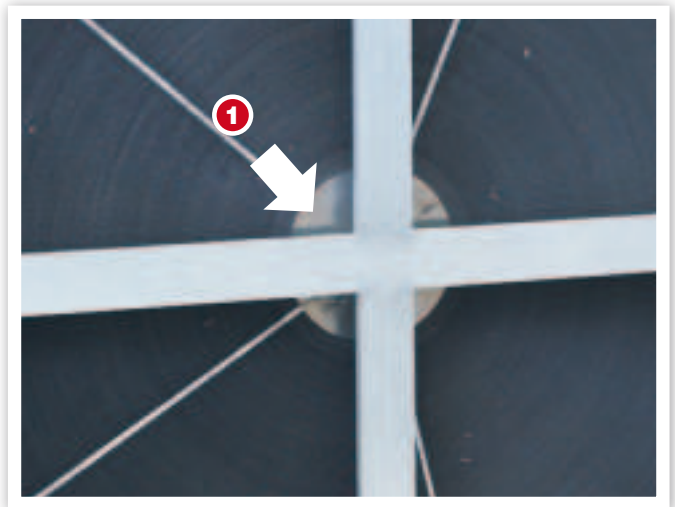
Um die Speichermasse auf der Antriebswelle zu justieren, müssen auf beiden Seiten des Rotors die Staubdeckel entfernt werden.

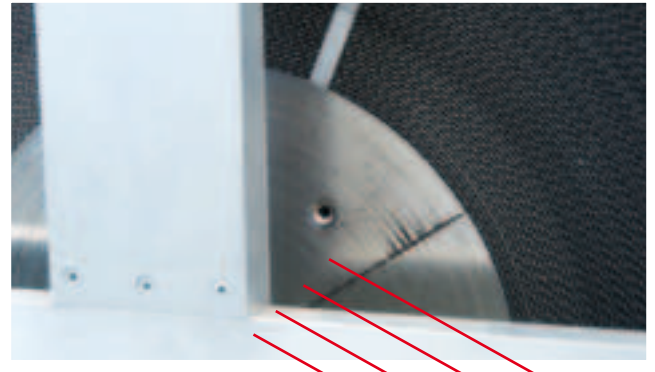
To reposition the the matrix on the drive shaft, on both sides of the rotor the hub caps have to be removed.



Der Staubdeckel besteht aus zwei Teilen und ist mit je 2 Schrauben befestigt, welche mit einem Imbusschlüssel (Größe 2,5) zu lösen sind.

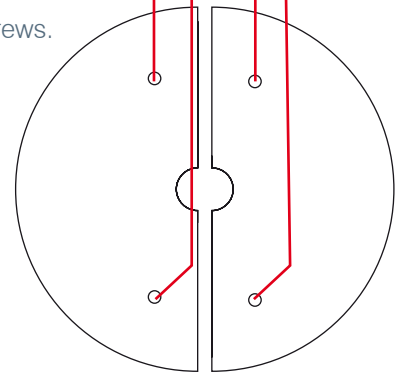
The hub cap consists of two parts and is fixed with 2 allen screws per part which need a 2.5 mm allen key.





Dazu alle 4 Schrauben lösen.

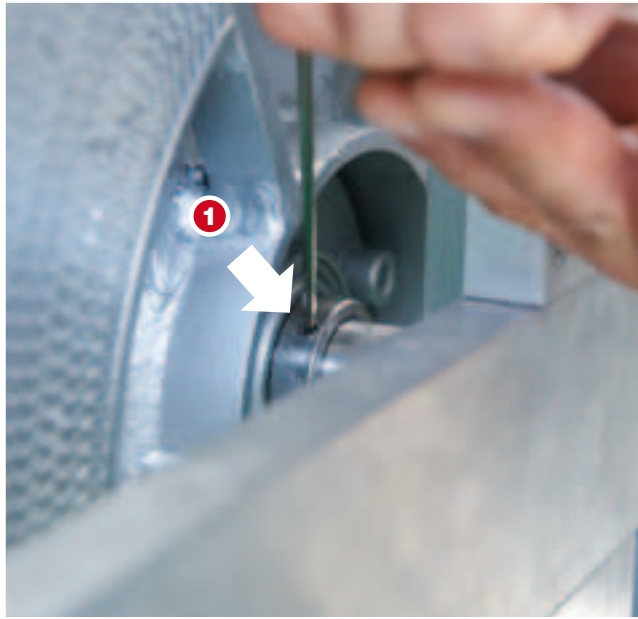
For this, loosen all 4 screws.



Die beiden Staudeckelteile entfernen. Der Lagerbereich liegt nun offen. Dieser Vorgang ist auf der gegenüberliegenden Seite des Rotors zu wiederholen.

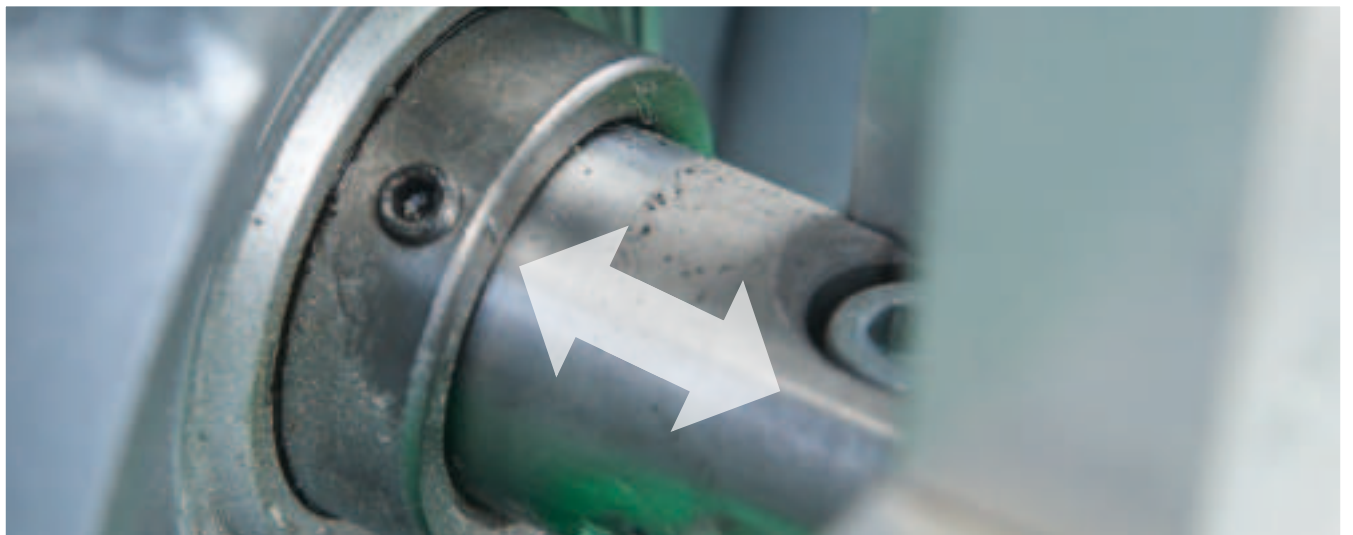
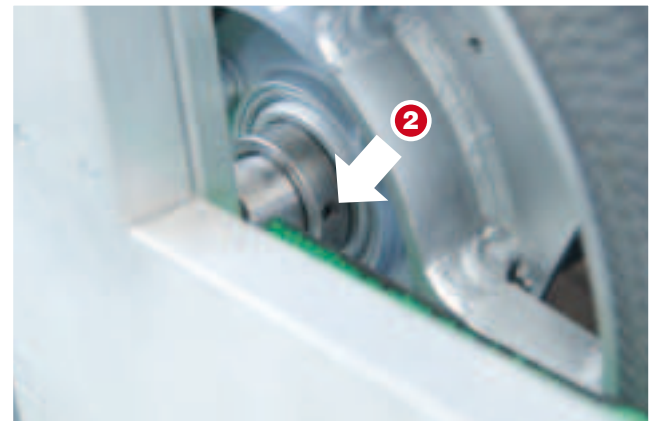
Remove both parts of the hub cap. The bearings are now accessible. Repeat this procedure on the opposite side of the rotor.





Beide Mardenschrauben (1) und (2) am Lager lösen. Dieses auch auf der gegenüberliegenden Seite des Rotors wiederholen.

Loosen both set screws, (1) and (2). Repeat this procedure on the opposite side of the rotor.



Nun kann die Speichermasse auf der Welle entsprechend justiert werden. Lässt die Speichermasse sich nicht bewegen, kann diese vorsichtig mit leichten Schlägen gelöst werden. Verwenden Sie dazu ein Holzkant. Nach erfolgreicher Justierung sind auf beiden Seiten des Rotors die Lagerschrauben anzuziehen und die Staubdeckel wieder zu anzubringen.

Now the matrix can be moved on the shaft. If not, the matrix may be carefully released with light blows. Use a square timber. After successful repositioning, re-apply bearing screws and hub cap.

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B Adjusting the storage mass RRU eco



- 11 -

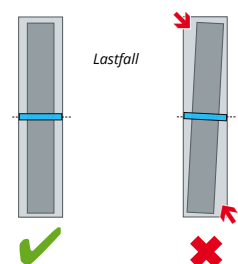


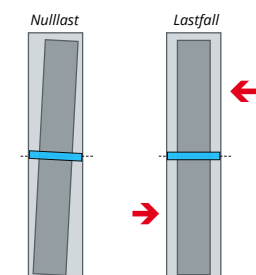
Abb.8: Im Lastfall muss die Speichermasse zentriert im Gehäuse rotieren. Ist das nicht der Fall, können Leckagen entstehen.

Die Befestigung des Rotorgehäuses mit dem Klimagerät ist vor Inbetriebnahme des Rotors zu prüfen. Der Freilauf der Speichermasse muss im Lastfall gewährleistet sein. Gegebenfalls ist der Rotor dazu in der horizontalen, als auch in der vertikalen Lage vorjustieren.

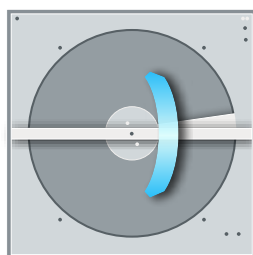
Grundsätzlich gilt, dass keine Kräfte in den Rahmen eingeleitet werden dürfen, die dazu geeignet sind Schrägstellungen der Speichermasse im Gehäuse hervorzurufen. Deren Position im Gehäuse ist zu zentrieren. Die endgültige Justierung erfolgt nach Kontrolle der Voreinstellungen bei Betrieb mit laufenden Ventilatoren, sofern deren Druckerhöhung dies erforderlich macht. Der Rotor darf nicht in Schrägstellung betrieben werden.

Damit die Speichermasse unter Belastung im Gehäuse zentriert ist (Abb. 8), kann mittels Kugelscheibe/Kegelpfanne an den Speichermassenwellenden eine Schrägstellung von bis zu 3° eingestellt werden. Gehen Sie dazu wie folgt vor:

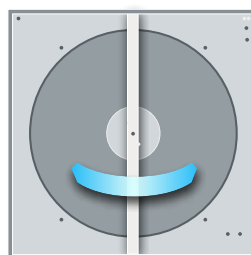
Ausrichten der Speichermasse im Gehäuse



(1) Die Speichermasse muss evtl. entsprechend dem Lastfall in eine Schrägstellung gestellt werden



(2) Neigung des Wärmerades bei einer horizontalen Luftstromtrennung



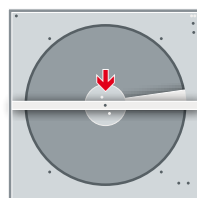
(3) Neigung des Wärmerades bei einer vertikalen Luftstromtrennung



(4) Lösen Sie die Befestigungsschrauben der Lagerabdeckung



(5) entfernen Sie die Lagerabdeckung mit der Bürstendichtung



(6) Position der zu lösenden Schrauben

Tab. 2
Drehmomente

Welle Ø [mm]	Schraubengröße	Schlüsselweite	Drehmoment
20	DIN933 M10x30-8.8	SW 17	53
30	DIN933 M12x35-8.8	SW 19	93

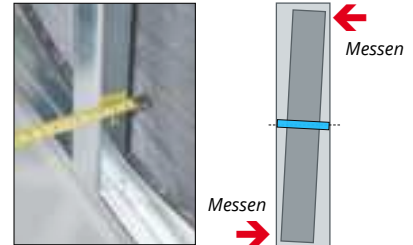
Horizontale Luftstromtrennung



(7) Lösen Sie die Sechskantschraube



(8) Neigen Sie die das Wärmerad vorsichtig. Beachten Sie dabei, dass die empfindliche Speichermasse nicht beschädigt wird.



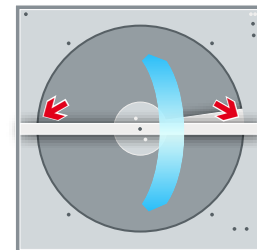
(9) Kontrollieren Sie die Schrägstellung durch Messen auf den gegenüberliegenden Seiten



(10) Ist das Wärmerad in die entsprechende Neigung gebracht, wird durch ein Festziehen der Sechskantschraube die Position fixiert (Drehmoment entnehmen Sie Tab. 2)



(11) Kontrollieren Sie die Zentrierung des Wärmerades in der horizontalen Gehäusemitte, Messpunkte siehe (9).



(12) ↑ Messpunkte zur Zentrierung
↪ Neigung des Wärmerades

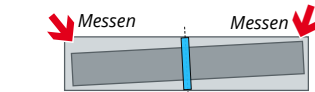
Vertikale Luftstromtrennung



(7) Lösen Sie die Sechskantschraube



(8) Neigen Sie die das Wärmerad vorsichtig. Beachten Sie dabei, dass die empfindliche Speichermasse nicht beschädigt wird.



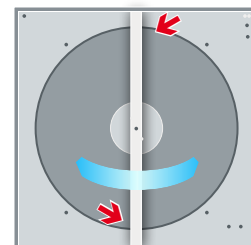
(9) Kontrollieren Sie die Schrägstellung durch Messen auf den gegenüberliegenden Seiten



(10) Ist das Wärmerad in die entsprechende Neigung gebracht, wird durch ein Festziehen der Sechskantschraube die Position fixiert (Drehmoment entnehmen Sie Tab. 2)



(11) Kontrollieren Sie die Zentrierung des Wärmerades in der vertikalen Gehäusemitte, Messpunkte siehe (9) auf beiden Seiten.



(12) ↑ Messpunkte zur Zentrierung
↪ Neigung des Wärmerades

C Rotor belt installation instructions



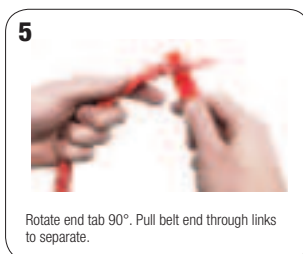
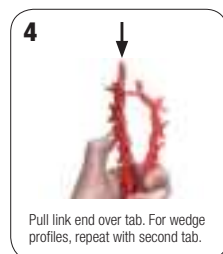
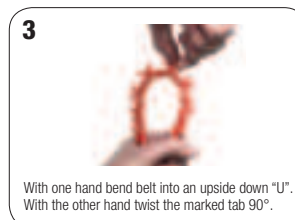
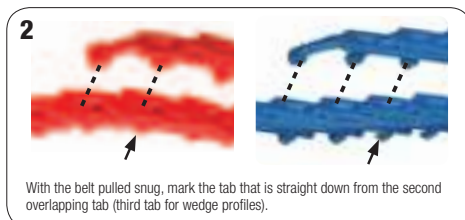
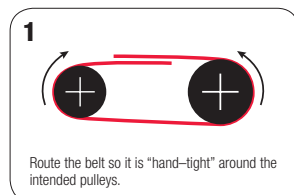
INSTALLATION INSTRUCTIONS NEW & IMPROVED for NO Re-tensioning

View the PowerTwist Drive installation video at: www.fennerdrives.com/videos

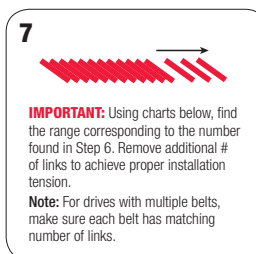
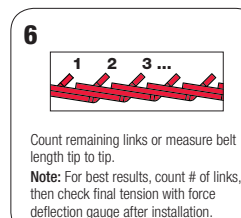
ENGLISH

SIZING THE BELT

HAND-TIGHT LENGTH



MAKE TO FINISHED LENGTH



OVER >>

LINK REMOVAL GUIDELINES

3L/O/Z Section			
Hand Tight # of Links	Belt Length*		# of Links to Remove
	inch	mm	
18 – 35	12.6 – 23.8	320 – 604	1
36 – 55	23.9 – 36.7	605 – 932	2
56 – 79	36.8 – 52.0	933 – 1320	3
80 – 101	52.1 – 66.1	1321 – 1678	4
102 – 127	66.2 – 82.7	1679 – 2100	5
128 – 150	82.8 – 97.5	2101 – 2476	6

A/4L/13 Section			
Hand Tight # of Links	Belt Length*		# of Links to Remove
	inch	mm	
25 – 34	20.2 – 27.3	513 – 693	1
35 – 58	27.4 – 45.2	694 – 1148	2
59 – 82	45.3 – 63.1	1149 – 1602	3
83 – 105	63.2 – 80.3	1603 – 2039	4
106 – 129	80.4 – 98.2	2040 – 2494	5
130 – 153	98.3 – 116.1	2495 – 2946	6
154 – 176	116.2 – 133.3	2947 – 3385	7
177 – 200	133.4 – 151.2	3386 – 3840	8
201 – 224	151.3 – 169.1	3841 – 4295	9
225 – 247	169.2 – 186.3	4296 – 4732	10
248 – 271	186.4 – 204.2	4733 – 5186	11
272 – 295	204.3 – 222.1	5187 – 5641	12

* Belt length is measured open-ended from belt tip to tip

B/5L/17 Section			
Hand Tight # of Links	Belt Length*		# of Links to Remove
	inch	mm	
29 – 34	29.6 – 34.9	751 – 886	1
35 – 58	35.0 – 58.0	887 – 1473	2
59 – 81	58.1 – 80.2	1474 – 2037	3
82 – 105	80.3 – 103.3	2038 – 2623	4
106 – 128	103.4 – 125.4	2624 – 3185	5
129 – 152	125.5 – 148.6	3186 – 3774	6
153 – 175	148.7 – 170.7	3775 – 4335	7
176 – 199	170.8 – 193.8	4336 – 4922	8
200 – 223	193.9 – 217.0	4923 – 5511	9
224 – 246	217.1 – 239.1	5512 – 6073	10
247 – 270	239.2 – 262.3	6074 – 6662	11
271 – 293	262.4 – 284.4	6663 – 7223	12
294 – 317	284.5 – 307.1	7224 – 7800	13

C/22 Section			
Hand Tight # of Links	Belt Length*		# of Links to Remove
	inch	mm	
48 – 67	63.4 – 88.3	1610 – 2242	3
68 – 86	88.4 – 113.2	2245 – 2874	4
87 – 105	113.3 – 138.1	2877 – 3506	5
106 – 125	138.2 – 164.3	3509 – 4172	6
126 – 144	164.4 – 189.1	4174 – 4804	7
145 – 164	189.2 – 215.3	4807 – 5470	8
165 – 183	215.4 – 240.2	5472 – 6102	9
184 – 202	240.3 – 265.1	6104 – 6734	10
203 – 222	265.2 – 291.3	6737 – 7400	11
223 – 241	291.4 – 316.2	7402 – 8032	12
242 – 260	316.3 – 341.1	8034 – 8664	13
261 – 280	341.2 – 367.3	8666 – 9329	14
281 – 299	367.4 – 392.2	9332 – 9962	15

3V/SPZ Section			
Hand Tight # of Links	Belt Length*		# of Links to Remove
	inch	mm	
<29	<18.0	<457	1
29 – 47	18.1 – 27.7	457 – 705	2
48 – 72	27.8 – 41.2	706 – 1048	3
73 – 96	41.3 – 54.2	1049 – 1378	4
97 – 120	54.3 – 66.9	1379 – 1700	5
121 – 144	67.0 – 80.1	1701 – 2037	6
145 – 168	80.2 – 92.8	2038 – 2359	7
169 – 192	92.9 – 106.1	2360 – 2696	8
193 – 217	106.2 – 119.4	2697 – 3032	9

SPA Section			
Hand Tight # of Links	Belt Length*		# of Links to Remove
	inch	mm	
<35	<30.2	<766	1
35 – 49	30.2 – 40.9	766 – 1040	2
50 – 69	41.0 – 56.2	1041 – 1429	3
70 – 86	56.3 – 69.3	1430 – 1761	4
87 – 104	69.4 – 83.1	1762 – 2111	5
105 – 122	83.2 – 96.9	2112 – 2462	6
123 – 139	97.0 – 109.9	2463 – 2793	7
140 – 157	110.0 – 123.7	2794 – 3144	8
158 – 175	123.8 – 137.5	3145 – 3494	9
176 – 193	137.6 – 151.3	3495 – 3845	10
194 – 211	151.4 – 165.2	3846 – 4196	11

5V/SPB Section			
Hand Tight # of Links	Belt Length*		# of Links to Remove
	inch	mm	
<47	<51.8	<1316	1
47 – 67	51.8 – 72.0	1316 – 1830	2
68 – 94	72.1 – 99.3	1831 – 2523	3
95 – 126	99.4 – 131.1	2524 – 3332	4
127 – 157	131.2 – 163.0	3333 – 4142	5
158 – 187	163.1 – 193.3	4143 – 4911	6
188 – 220	193.4 – 226.2	4912 – 5746	7

INSTALLATION

ENGLISH

MAKE BELT ENDLESS

8



Holding belt with tabs to the outside push end tab through two links (three links for wedge profiles). Twist tab 90° into place.

9



With your thumb twist second tab 90°. Push belt end down over tab with your opposite hand. For wedge profiles, repeat with remaining tab.

10



Ensure all tabs are fully turned and across the belt.

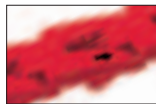
11



Rotate assembled belt so tabs are inside (facing down into the pulley groove).

INSTALL ON DRIVE

12



Determine direction of drive rotation. Belt must travel in the same direction as the direction arrow. Tabs will trail.

13 A: DRIVE



Fit the belt in the closest groove of the smaller pulley. Roll belt onto larger pulley by turning the drive slowly. The belt should feel tight. **DO NOT JOG THE MOTOR.** Once installed check to make sure the all tabs are in position and the belt is not twisted. For multiple belt drives, work belt from groove to groove.

If the installation with the recommended # of links removed is too difficult see 13B

13 B: WEDGE



Use the belt take up system to install to the proper tension: position the motor approximately in the middle of its range of travel (mark position), hand fit the belt removing the recommend # of links. Move motor forward reducing the center distance enabling easy installation of the belt(s). Return motor back to original marked position.

14



Using a force deflection gauge, check installation force and confirm it meets the requirements below.

FORCE DEFLECTION GUIDELINES

Force Required to Deflect Belt 1/64" per 1" (16 mm per 1m) Center Distance				
Belt Section	Installation		During Operation	
	lbs.	Kgf	lbs.	Kgf
3L/O/Z	4 – 4.5	1.8 – 2	3	1.3
A/4L/13	4 – 5	1.8 – 2.3	3	1.3
B/5L/17	7 – 8	3.3 – 3.7	6	2.8
C/22	13 – 15	6 – 6.9	10	4.6
3V/SPZ	5 – 6	2.3 – 2.8	4	1.8
SPA	6 – 7	2.8 – 3.3	5	2.3
5V/SPB	13 – 15	6 – 6.9	8	3.7

Note: If deflection force drops below specified force for Operation, remove links or adjust take-up until belt is back to Installation force.

Note: If take-up system is not available, links can be added to reduce the tension. If links are added the belt may have to be re-tensioned by removing the extra links between ½ hour and 24 hours running at full load.

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D Installing a frost protection device for the drain trap

INSTALLATION INSTRUCTIONS Antifreeze heating for Siphons (FSH)



Item No.: 24 (suction side, FSH-S)
Item No.: 25 (pressure side, FSH-D)

The antifreeze heating has been especially developed for the use in all common suction and pressure side type siphons with 1½" connection for AH units.

Description

In general the antifreeze heating consists of a flexible self-regulating and automatic power-limiting heating cable which is led through the siphon and energized automatically by a variably adjustable thermostat as soon as the set temperature is fallen below. Heating the cable prevents the siphon from freezing.

- ◀ For universal use in all 1½" siphons
- ◀ Easy retrofit
- ◀ Preassembled

Maintenance

The heating cable and the connection box must be checked in regular intervals for mechanical damages, and the electrical protection and function of the thermostat for their proper functioning.

The siphon should be checked for contamination at least twice a year and, if the air is heavily polluted (e.g. exhaust air from the kitchen), more frequently. It should be cleaned, if necessary.

Installation

Before installing the antifreeze heating (FSH) in suction-side siphons just remove the 1½" end cap marked "A" first; in pressure-side siphons the 90° elbow must be replaced by the supplied 1½" T-piece.

Then push the flexible heating cable into the direction of the arrow into the siphon (Fig. 2)

It can be necessary in the process to separate the siphon at the screwings marked "B" because the somewhat stiff point of the heating cable sticks there easily, and so it can be pulled through easily from the other side.

After the antifreeze heating has been screwed using the preassembled union nut the tightness of all screwed connections of the siphon must be checked.

Before pressure-side siphons can be taken into opera-

tion again after having been assembled they must be refilled with water!

They can be refilled through the newly inserted T-piece which must be closed afterwards using the previously removed end cap "A".

For suction-side siphons particular attention has to be paid that the ball of the non-return valve is not pushed up by the heating cable because otherwise the function of the siphon cannot be guaranteed.

Technical data

- ◀ Including connection box (IP 67) with integrated antifreeze thermostat for installation in the immediate environment of the siphon
 - ◀ Completely equipped with clamps for an easy connection to the existing electrical supply (3x 1,5mm²), 230 V UPS, max. 10 A
 - ◀ Electrical protection by use of a 30 mA residual-current-operated circuit-breaker (r.c.c.b.) provided by the customer
 - ◀ Self-regulating and power-limiting heating cable (70 cm, heated up to the connecting sleeve)
 - ◀ Power: 19 W/m (at +10°C) and 30W/m (at -25°C)
 - ◀ Protection class I, model with protective conductor
 - ◀ Completely watertight in the heated area, from connecting sleeve
 - ◀ Supply cable IP 54 (100 cm, unheated)
 - ◀ Admissible operating temperature -30°C to +55°C
 - ◀ Thermostat preset to +15°C
 - ◀ Hysteresis (switching difference): 6K ± 4K
- Example:* *required minimum temperature 5°C*
 Set point 15°C
- Resulting from:* *required minimum temperature 5°C +*
 maximum hysteresis 10K (6K + 41K)

Safety instructions

All safety and accident prevention regulations as well as the guidelines and standards of the country where the installation is carried out must be observed for installation and commissioning. Apart from that the VDE regulations, in particular VDE 0100 and VDE 0721,



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Fig. 1

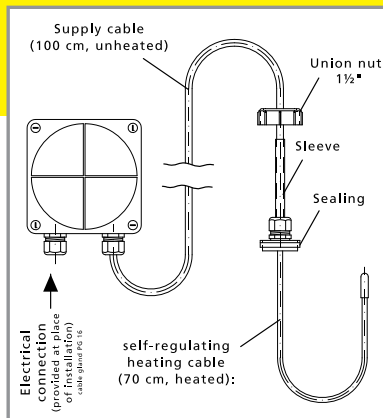
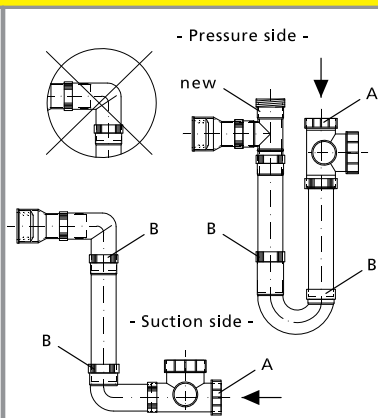


Fig. 2



Part 1 and Part 2 A3 as well as VDE 0254, have to be observed for the installation of the antifreeze heating. The antifreeze heating must only be installed by an authorised specialist. The electrical connection must only be carried out by an electrician in accordance with the electrical regulations.

Modifications to the heating cable are not allowed.

Damages at the heating cable can cause the ingress of humidity and dirt as well as arcing and a fire in the entire system. A heating cable damaged by fire can cause further fire damage when being switched on. Therefore such a heating cable must be taken out of operation immediately.

Intended use

Antifreeze heating for siphons for VAC plants. Assembly and connection must be carried out according to these instructions. Any use other than that which is intended shall not be allowed.

Instructions for the electrical connection

The heating cable of the antifreeze heating must never be shortened, not even on the PTC thermistor side. Excess cable lengths of the heating cable are to be led through the outlet in the condensate trough (necessary for example for shortened siphons). The heating cable is not to be fastened, but just inserted into the siphon and fixed with the screwing in such a way that the connecting sleeve is completely outside the siphon. The heating cable must not be brought into contact with sharp edges and be protected from mechanical damage.

the heating cable must not be crossed or touched anywhere. The heating cable is to be laid in such a way that no heat accumulation will be caused. The heating cable must not be led above or through combustible materials. The electrical protection and the protective

measures must have been provided on the installation side for which the use of a 30 mA residual-current-operated circuit breaker (r.c.c.b.) is mandatory. The exclusive use of miniature circuit breakers may not be enough to prevent the progression of arcs and can provide a fire hazard.

The heating cable of the antifreeze heating must be operated exclusively from the provided connection box with the built-in antifreeze thermostat to ensure that an operation is impossible at ambient temperatures > +5°C. An insulation test is required before the heating is taken into operation. Pipes used for cable laying must be included in the protective measures (grounding of pipes).

The circuit diagram is available as a free download on our homepage.

Repair

A damaged heating cable must never be repaired but be replaced by a new one.

Instructions for connection and installation

The connection box should be easily accessible but protected from mechanical damage. It should always be installed in such a way that the cable glands do not point upwards and the lid can be removed. The heating cable of the antifreeze heating must be laid between the connection box and the entry into the siphon in such a way that any mechanical damage will be prevented. No dragging is allowed at the heating cable gland and at the siphon intake..

E Electric air heater



Customer
Trox GmbH

Key Word

Person Resp.
Hr. S.Wiedemann

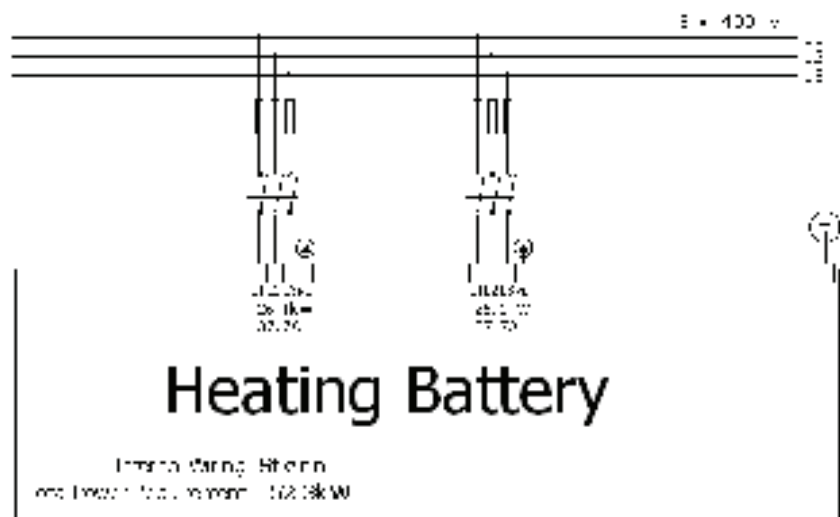
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89355/1

Quantity
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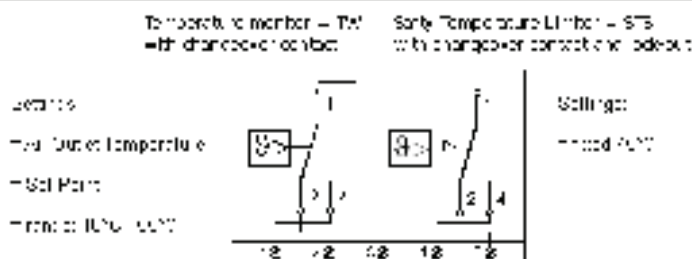
Date
13.03.2019

Circuit Diagramm

Heating Battery Embodiment Version 3.0.0.2



associated Thermostat Safety Temperature Limiter / Monitor AMHS 12 800



TM Model according to DIN EN 12077, in compliance with DIN EN ISO 780-3-4 and EN ISO 780-1

According to DIN VDE 0100-120 it is necessary to protect against overheating

Electric heating systems have to be built in a way that the heating elements can not be damaged by operation and the maximum allowed temperature of the heating elements is not exceeded. At the expense of the elements under a acceptable condition the heating elements of the heating battery have to be protected by separate temperature limiting installation, one as safety temperature limiter and the other as another temperature monitor, which prevent the overstepping of the allowed temperature of the air duct.



OPERATING INSTRUCTIONS

1. Operating Instructions for Air Heating Batteries

a, Technical Prerequisites for Putting into Operation

Prior to connecting the heating batteries it must be checked if the voltage indicated on the name plate agrees with the existing supply voltage. The heating batteries are connected together into one or more groups for switching purposes, and for three-phase supplies each switching group has three terminals, and for DC or AC supplies each switching group has two terminals and a terminal for earthing purposes for each switching group in addition. The parts of the housing or flange plates are made of metal and must also be earthed.

It is a general requirement that the electrical connection may be made by certified personnel only. The applicable regulations as per DIN 57100, part 420/VDE 0100, must also be complied with. The temperature safety limiter, temperature monitor, flow monitor and so forth must be controlled accordingly.

b, Putting into Operation

In the case of the embodiment with **cold air inlet** in line with types ERR/91 and ERRG/91 the heating element cables and the connecting bars are provided inside the duct. The air flowing through the heater cools the cable connections continuously thus reducing the heat in the IP 54 connection box. Therefore standard cables may be used.

In the case of very high final air temperatures or very unfavourable conditions (e.g. reduced air quantity or recirculated air operation depending on the method used) there may be temperatures existing in the connection box which are no longer suited to use standard, rubber-insulated cables (this decision can be taken by the customer only). In this case use high temperature resisting cables, e.g. silicone, teflon or fiberglass insulated cables.

Depending on the distance between the control box and the air heating battery it is recommended to mount separate connecting blocks in a short distance to the air heating battery with the aim to save running metres of heat resisting cables.

The correct manufacture of the current supply connections and both earthings (electrical connection and housing) must be checked prior to the test run.

On the occasion of a test run all parameters, e.g. air quantity, final air temperature and so forth (Technical Data Sheet refers), must be completely complied with. In unfavourable cases partial considerations of or deviations from the values prescribed by the manufacturer (Technical Data Sheet refers) may cause damage to or destruction of the air heating battery.

c, Normal Shut-Down Procedure

The shut-down procedure for fan and air heating battery shall be as such that the fan is still in operation for another five minutes to avoid overheating. For this reason the fan motor after-running is ensured with the help of a time-limit relay.

Also, existing thermostats must be set on site in accordance with the requirements requested for. For example, a temperature safety limiter is adjusted between 50°C and 60°C with a final air temperature of 40°C; this applies also to other final air temperatures.

d, Safety Shut-Down in the Case of Power Failure

Depending on the operation conditions and in the case of voltage failure the surface of the heating rods can be heated up by 50°C to 70°C. It can hardly be expected that the air heating battery will be damaged. At worst, it may be necessary to replace a filter or a plastic cover.

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e, Regulations for the Use of Control and Adjustment Devices

On principle, there are 4 parameters to be observed for the control of a heat battery made by VOLTA:

- quantity of air;
- air intake or air exhaust temperature;
- operating voltage or current resulting thereof;
- use of operating groups (performance distribution).

If the air exhaust temperature is required to be changed or if the air intake temperature changes a control can be achieved by switching on or switching off one or more operating groups without changing the quantity of the air. If the quantity of air changes (to less than approx. 70-80 per cent of the quantity of air defined for each heat battery embodiment) this may be balanced only by a voltage control (less current required). For technical reasons the switching off of one or more operating groups will not lead to success. If these instructions recommended by the manufacturer are not complied with this may result in a partly or completely destruction of an air heating battery.

f, Operating Conditions

Air heating batteries are single piece productions which are produced for special customer operating conditions and in accordance with the dimensions provided and requested for by our customer. On delivery of the air heating batteries a complete documentation (Operating Instructions, Declaration of Conformity, Technical Data Sheet, Table of Dimensions, Wiring or Circuit Diagram, Operating Instructions for Thermostats used) is provided, the dates and operating instructions of which apply exclusively to this individual air heating battery provided. The data included in the Technical Data Sheet are to be considered as nominal operating values applying to the air heating battery specified by the customer and manufactured in accordance with the requirements requested for by the customer. They must be complied with to ensure an application of the air heating battery as directed.

It is also possible to manufacture air heating batteries in accordance with different operating conditions which are considered on the occasion of its development and design and included in the Technical Data Sheet. Any deviations from these recommended data provided must be compensated by suitable control and adjustment actions to be carried out on-site. In unfavourable cases partial considerations of or deviations from the values prescribed by the manufacturer (Technical Data Sheet refers) may cause damage to or destruction of the air heating battery.

Unless otherwise specified in the Documentation of the Air Heating Battery normal environmental and operating conditions, normal methods and modes of operation in accordance with Standard DIN VDE 0100 are a prerequisite for the use and operation of the Air Heating Battery.

g, Repair Activities

VOLTA are able to supply replacement heating rods within a few days if the manufacturer's identification number of the heating battery is advised by the customer. Then a qualified electrician will be able to perform the required repair himself. Repair or maintenance activities may be performed only if all electrical devices have been switched off, and the current supply system must be protected against re-switching in. Furthermore it must be paid attention to the fact that the heating rods are cooled off sufficiently prior to beginning with any repair and maintenance activities.

All repair activities may be performed by a corresponding expert only who installs and connects replacement heating rods the same way he has removed the damaged heating rods prior to repair activities involved. If larger heating batteries are subject to repair activities and to the extent that no experts are available, it is advisable to have the repair work performed by the manufacturer. A heating battery sent in for repair purposes will be returned in a few days as good as new and tested in accordance with the regulations and/or specifications.

h, Long-Term Control and Maintenance

As a matter of principle it is not required to maintain air heating batteries. It will be sufficient to examine the connecting cables periodically to ensure that the screws at the terminals are still tight and that both earthing systems (connection and housing) are still operating properly and that the insulation of the cables has not been cracked. Cleaning activities are required to be part of the maintenance activities only if the medium to be heated is extremely dirty or dusty (e.g. wood dust produced in a joiner's shop). It is recommended to clean the heating rods with the help of compressed air.

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3

Air filters that may have been installed in front of or behind the air heating battery must be cleaned at regular intervals.

If an occasional overheating of the heating rods has produced some scale on the outer surface, it can be assumed that said scale may have been produced on the inner surface as well, which scale might become loose due to vibrations and thus may cause a short circuit. Therefore if scaled heating rods are found it is advisable to return the air heating battery for repair purposes.

i, Use of Thermostats

Thermostats which are marketed and installed by VOLTA are perhaps mechanically integrated in the air heating batteries. Temperatures or flow speeds must be set and adjusted by the customer on-site, because he himself knows the necessary and complete operating dates and conditions only (flow, air quantity preservation and so forth).

For these reasons it is not advisable to have the thermostats preset by VOLTA.

When leaving our works the **thermostats** have been preset to the highest value possible, and it is **imperative to adjust them on-site** (in accordance with the Operating Instructions of the thermostat supplied).

j, EMVG Regulations and Advice

Based on the design and the physical features of air heating batteries and heating rods manufactured and marketed by VOLTA no interference emission or operating trouble may be expected in case of interference effects in accordance with EMVG requirements and regulations.

When wiring or connecting the air heating batteries or heating elements to the thermostats or control devices supplied by VOLTA all remedial actions required in accordance with EMVG are to be taken by the customer on-site in the event of possible interferences which might occur. All necessary remedial actions and modifications are to be taken and made in accordance with EMVG requirements and regulations.

When wiring or connecting the air heating battery to other electrical components, installations and products on-site it must be ensured that all EMVG requirements and regulations are complied with. Any remedial actions necessary are to be taken by the customer in accordance with the requirements existing on-site. All working activities and actions mentioned and referred to in this paragraph may be carried out by the corresponding experts only.

k, Manufacturer Machine Standard 2006/42/EG Declaration

The complete machine equipped with air heating batteries or heating element components may be operated only if the Protection Requirements and Standards of the Machine Standard 2006/42/EG required for the complete machine have been complied with.

2. Safety Regulations pertaining to Operating Instructions

a, Operating Directions

Air heating batteries are to be used for the heating of fresh, recirculated or processing air only (normal operating method according to Standard DIN VDE 0100).

The contact safety device must be examined electrically and be provided and ensured thermically on-site.

b, Electrical Air Heating Battery Installation Location

If no data provided by the customer are existing the electrical air heating batteries are manufactured for vertical or horizontal installation. In general, a horizontal installation with a lateral terminal box is preferential.

c, Installation and Removal Directions

Upon electrical connection of the air heating batteries it is a fundamental requirement to comply with the instructions of Standards 2006/95/EG and DIN VDE 0100, in particular with regard to the rating of all electrical devices connected to the air heating batteries, intentional putting into operation, safe switching off, and safe separation from sources of energy.

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4

Upon installation of the air heating battery the electrical connection system may be installed only if mechanical installation activities have been completed. This applies in reverse order when removing the air heating battery: any mechanical removing activity may be started only as soon as the electrical connection system has been cut completely. Furthermore it must be paid attention to the fact that the heating rods are cooled off sufficiently prior to beginning with any repair and maintenance activities. It is a fundamental requirement that experts may perform work on electrical connection systems only who must comply with the instructions as per Standards DIN VDE 0100 or DIN VDE 0110. Special care must be given to the connection of the protective conductor to the terminal provided in the switch box and to the additional earthing of the housing. At both ends there are flanges provided for mechanical installation purposes which are to be used according to their design. All mechanical operations must also be performed by experts.

d, Contact Protection Directions

The normal installation situation is as such that an air heating battery supplied by VOLTA will be installed between two channel elements and be rigidly connected to said channels mechanically (by screws). If not and if one side of the air heating battery remains open or unprotected, the customer himself has to take steps for contact protection purposes. It must be ensured that it will be impossible for any person to come into contact with the heating rods of an air heating battery. For example, this protection must be provided by assembling a grid to the open side of the air heating battery. In principle, the air heating battery housing hardly represents a grave danger or risk, because it is grounded by means of a protective conductor. However, if the housing warms up too much, depending on the installation situation and the on-site technical datas, it must be insulated (against heat) by the user/customer himself independently.

e, Repair or Maintenance Directions

Repair or maintenance activities may only be performed if all electrical devices have been switched off, and the current supply system must be protected against re-switching in. Furthermore it must be paid attention to the fact that the heating rods are cooled off sufficiently prior to beginning with any repair and maintenance activities.

3. Manufacturer

The manufacturer is at your disposal for any questions you may have and for any repair and maintenance activities to be performed (footnote refers). Always specify the purchase order or machine identification number specified at the end of the Operating Instructions. All Operating Instructions apply to the equipment only provided together with the purchase order or machine identification number specified.

Version 2011-01-01

Please specify the following purchase order or machine identification number when submitting any enquiries:

.....

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