Operating manual GB/en

AHU

X-CUBE X2 compact 2

with X-CUBE Control

TROX® TECHNIK
The art of handling air

Read the instructions prior to performing any task!

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About this manual

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

The operating manual is intended for use by instructed persons.

It is essential that instructed persons (*Chapter 1.9.1 'Qualification' on page 15*) 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 manual are mainly for information and may differ from the actual design of the air handling unit.

Other applicable documentation

In addition to this manual, the following documents apply:

- Transport and installation manual
- order-specific release drawing
- Data sheets for components from other suppliers, if any

TROX Technical Support

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

- Product name
- TROX order number and line number
- Delivery date
- Brief description of fault or issue

Online	*www.troxtechnik.com*
Phone	+49 2845 202-0

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 general delivery terms apply to warranty claims. Please refer to local warranty regulation found on the local TROX website.

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 – 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)

1 Safety

1.1 Correct use

The TROX air handling unit X-CUBE X2 compact 2 is a centralised ventilation unit that is used for the ventilation and air conditioning of various indoor spaces, such as

- Offices
- Meeting rooms
- Lounges
- Commercial and production companies
- Schools
- Hospitals
- Clean rooms

The following process steps can be carried out for air treatment:

- Transport
- Filtering
- Heating
- Cooling

The appliance may only be operated indoors; appliances with weather protection can be set up outdoors, e.g. on the roof of a building.

Access to the AHU must be prevented for unauthorised persons, e.g. by means of a spatial partition (operating room). Publicly accessible appliances must be secured by lockable inspection access doors.

The appliance may only be operated in accordance with the operating parameters specified in the order data sheet and on the rating plates.

Any other use is expressly excluded. Deviations require prior agreement or authorisation by TROX.

Incorrect use

WARNING!

Danger due to incorrect use!

Incorrect use of the air handling unit can lead to dangerous situations.

Never use the air handling unit:

– in rooms with explosive gases or gas mixtures
– in rooms with conductive dust
– in rooms with strong electromagnetic fields
– in rooms with aggressive room air components, e.g. sand
– outside of the design specifications, see TROX air handling unit data sheet
– for structural purposes or as the building roof
– as a smoke extract system in the event of a fire.

1.2 Safety signs

The following symbols and signs are usually found in the work area. They apply to the very location where they are found.

WARNING!

Danger due to illegible signage!

Over time, stickers and signs may fade or become otherwise illegible, meaning that hazards cannot be identified and necessary operating instructions cannot be followed. There is then a risk of injury.

– Ensure that all of the safety, warning and operating information is clearly legible.
– Replace illegible signs or stickers immediately.

Earthing

These stickers are located in the switch cabinet and at all equipotential bonding connection points, see *'Equipotential bonding' on page 7*, on the air handling unit.

Electrical voltage

Only skilled qualified electricians must work on AHU components and in internal spaces with this sign.

Unauthorised people must not enter areas, open cabinets or work on components where an electrical voltage is present and which are hence marked with this symbol.

Fan run down time

Warnung!
Vor dem Öffnen der Türen muss der Ventilator abgeschaltet sowie vom Stromnetz getrennt werden und zum Stillstand gekommen sein. (Wartezeit: Mindestens 2 Minuten)

Warning!
Switch off the fan, disconnect the mains supply and wait until the fan has come to a complete standstill **before you open the doors.** (Waiting time: At least 2 minutes)

Avertissement!
Éteindre le ventilateur, débrancher l'alimentation secteur et attendez l'arrêt total du ventilateur **avant d'ouvrir les portes.** (Temps d'attente : Au moins 2 minutes)

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Fig. 1: Notice on inspection access doors

You will find this notice on inspection access doors that allow access to centrifugal fans and rotary heat exchangers.

1.3 Safety equipment

Defective safeguards

WARNING!

Risk to life from defective safeguards!

The mains cable between the utility grid and the mains isolator carries a hazardous electrical voltage. Defective or disabled safeguards can cause serious or even fatal injuries.

– Do not disable or bypass any safeguards.

AHU casing

The AHU casing is made from steel panels with duplex powder coating on all sides. This construction ensures that no parts can be ejected from the unit in case of a fault. This construction also protects the interior of the AHU from environmental effects.

The inner skins of the casing are also available in stainless steel (optional).

Mains isolator of the AHU

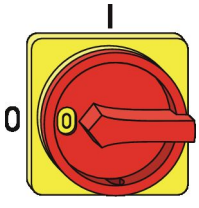


Fig. 2: Mains isolator

When you turn the mains isolator to '0', the supply voltage is immediately switched off.

You can then lock the isolator in the '0' position (with a padlock) to secure it against being switched on accidentally so that you can safely work on the AHU.

Local isolator

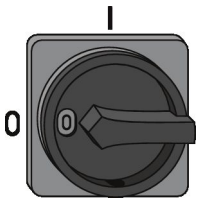


Fig. 3: Local isolator

As long as the AHU remains switched on (mains isolator in 'I' position), the connecting cable for the local isolator is live.

Each local isolator carries a sticker with the code of the equipment that it isolates.

You can lock each local isolator in the '0' position (with a padlock) to secure it against being switched on accidentally so that you can safely work on the respective component (e.g. fan).

Equipotential bonding

A skilled qualified electrician has to connect the AHU to the local earth bar; this is done as part of installation. Equipotential bonding prevents electrostatic ignition hazards.

Safety lock on inspection access doors to hazardous areas

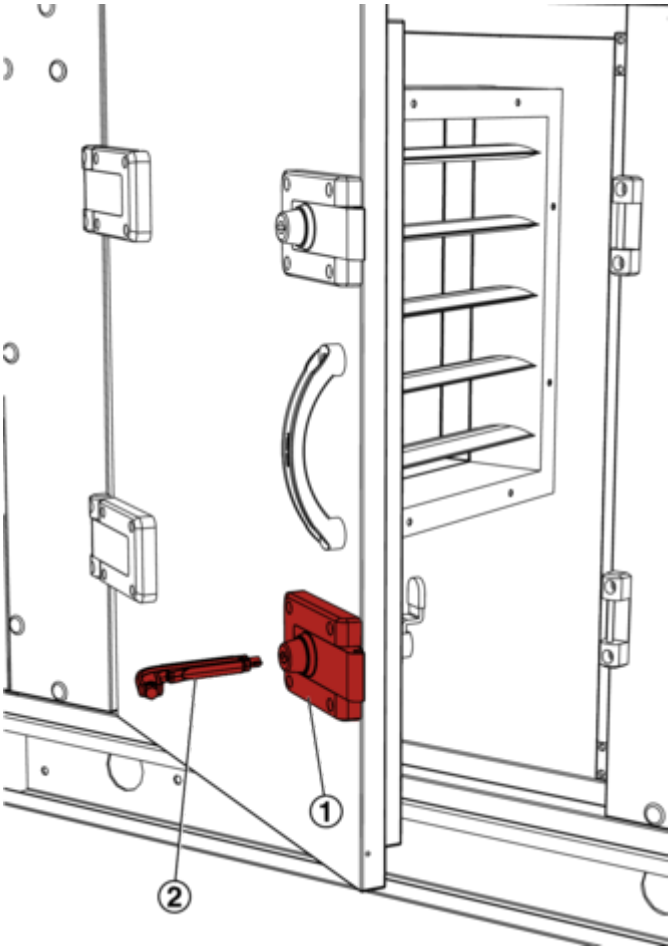


Fig. 4: Inspection access door lock

Inspection access doors to hazardous areas are secured with a lock (Fig. 4 /1) that can only be opened with a special key (Fig. 4 /2).

Motor protection switch

Motor protection switches are safety devices for switching, protecting and isolating motors or actuators on electric circuits. Motor protection switches protect motors against destruction due to overload, short circuits, locking during start-up, or failure of a live wire in three-phase systems. They also have a thermal tripping mechanism and an electromechanic tripping mechanism (short circuit protection). The motor protection switches are located in the AHU switch cabinet.

1.4 Securing the unit against being switched on accidentally

Securing the unit against being switched on accidentally

WARNING!

Risk to life from unauthorised people starting the unit or from people starting the unit accidentally!

If someone who is not authorised starts the unit, or if someone starts the unit accidentally, people could be seriously or even fatally injured.

Before you switch on the unit, make sure that

– Nobody is inside the AHU
– All inspection access doors have been closed
– No tools or materials have been left inside the AHU.

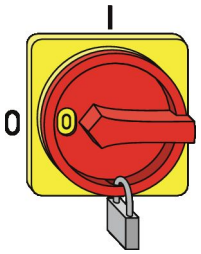


Fig. 5: Securing the mains isolator

1. Switch off the power supply to the AHU by turning the mains isolator to '0'.

   WARNING!

   Electric shock hazard!

   The power cable which connects the AHU to the mains holds electrical charges even after power is turned off.

2. Secure the mains isolator with a padlock (Fig. 5).
3. Keep the key in a safe place.
4. Cover the mains isolator with a notice informing people that work is in progress.

1.5 Behaviour in an emergency

In an emergency, observe the following points

1.5.1 Emergency switch-off

- Switch off the mains isolator and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* .
- Raise the alarm.
- If there is no risk to your own health, rescue other people from the hazardous area.

- Notify the emergency services.
- Provide first aid.
- Get yourself to safety. Take people in danger with you.

1.5.2 Behaviour in case of fire

DANGER!

Damage to health caused by toxic substances in the event of fire

Toxic substances can develop in the event of a fire.

– In case of fire, leave the area immediately.
– Use self-contained breathing apparatus to fight the fire.

The air handling unit is integrated into the fire protection concept of the building by the operator of the ventilation system. The system operator defines individual steps to be followed in the event of a fire.

1.6 Work areas and hazardous areas

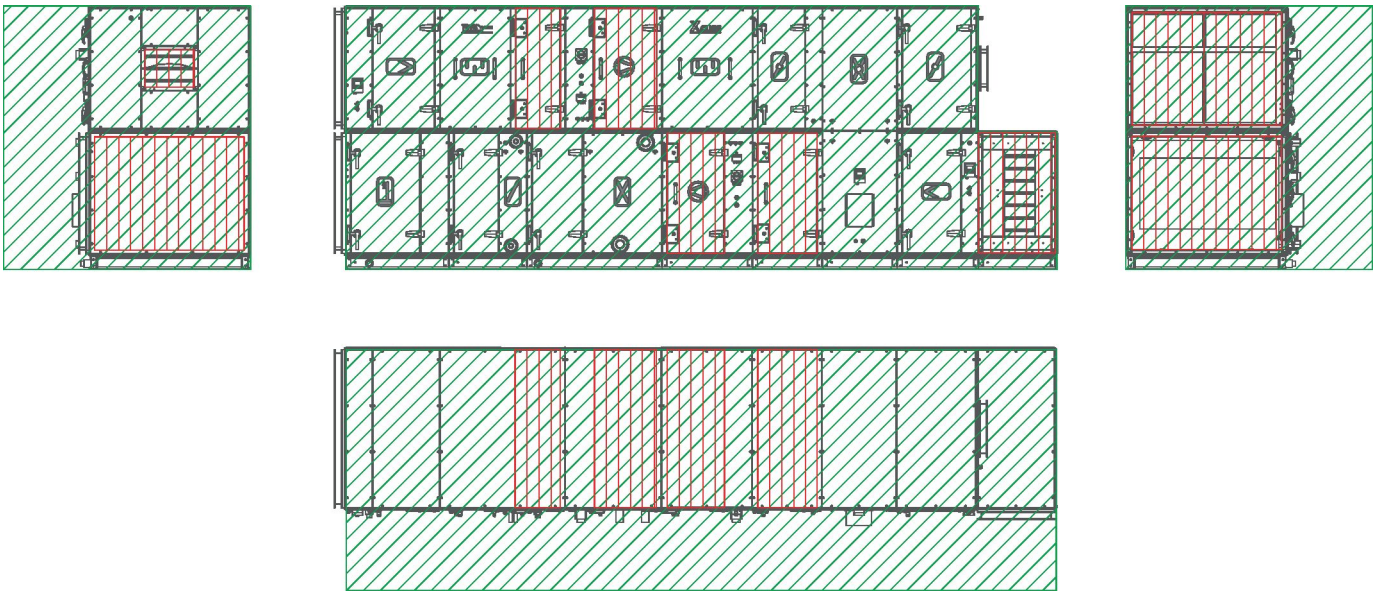


Fig. 6: Hazardous areas

Work areas
Hazardous area

Areas from which you can access

- fans
- electric air heaters
- integral switch cabinets

are hazardous areas. You can access these hazardous areas only after you open an inspection access door.

Before installation is complete, open air inlets and outlets are also considered hazardous areas.

1.7 Dangers when handling the AHU

The air handling unit is a state-of-the-art product and meets current safety requirements. Residual risks cannot be excluded, however, and you should proceed with caution. This section describes the residual risks that have been identified in a risk assessment.

Always follow the safety notes in this manual to reduce health hazards and prevent any hazardous situations.

1.7.1 General workplace hazards

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.

– Wear a safety harness.
– Only access roofs with suitable and intact fall protection equipment in place (ladders, railings, safety harness).
– Start working only if the components you have to work on are easily accessible.
– Stop materials or objects from falling.
– Wear safety shoes, protective clothing and a hard hat.

Leaks

CAUTION!

Risk of injury from slipping on a contaminated floor!

If a machine or component leaks, liquids may be getting onto the floor. People could slip and injure themselves.

- Remove any liquids on the floor quickly.
- Wear non-slip safety shoes.
- Note the safety data sheets provided by the liquid manufacturers.
- Attach warning notices and mandatory action signs wherever liquids may get onto the floor.

1.7.2 Electric shock hazards

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 following safety rules:
  - Use the mains isolator to switch off the unit.
  - Secure it against being switched on accidentally.
  - Disconnect the AHU from the mains power supply for the building.
  - 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 fuses. Be sure to maintain the correct current rating when you replace fuses.
- Ensure that live parts do not come into contact with moisture. Moisture can cause a short circuit.

Stored charges

DANGER!

Risk to life from charges stored in capacitors!

Many components contain capacitors, which may hold electrical charges even after power is turned off. Contact with these components can result in serious or fatal injuries.

- Before you start working on any component that contains capacitors, disconnect the component from the power supply. Then wait for 10 minutes to ensure that the capacitors have become fully discharged.

1.7.3 Moving machinery hazards

Rotating parts of a fan

WARNING!

Risk of injury from rotating parts!

Rotating parts in the fan can cause severe injuries.

- Do not reach into the moving fan or tamper with it.
- Do not open any covers or inspection access panels while the unit is in operation.
- Make sure that the rotor is inaccessible while in operation.
- The fan does not stop immediately! Check that no parts are moving before you open an inspection access door.
- 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, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. Wait until all parts have come to a standstill.

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.

Rotating parts of the rotary heat exchanger

WARNING!

Risk of injury from rotating parts!

Rotating parts in the rotary heat exchanger can cause serious injuries.

- Do not reach into the moving storage mass or tamper with it.
- Do not open any covers or inspection access panels while the unit is in operation.
- Make sure that the storage mass is inaccessible while in operation.
- 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 parts of the rotary heat exchanger and secure it against accidentally being switched on again, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . Wait until all parts have come to a standstill.

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.

1.7.4 Hazards from the hydraulic system

Jet of liquid from a defective hydraulic system

DANGER!

Risk to life from high pressure fluid injection!

If a hose or a pipe or an AHU component becomes defective, a jet of coolant, refrigerant or compressor oil under pressure may escape. The jet of liquid can cause serious injuries as well as frostbite and burns.

- Do not stand or hold objects in the path of a jet of liquid. Keep people away from the hazardous area.
- Immediately initiate an emergency stop. If necessary, initiate further measures to reduce the pressure and stop the jet of liquid.
- Remove escaping liquids and dispose of them correctly.
- Have any defective components repaired immediately.

Refrigeration system

WARNING!

Risk of injury from the refrigeration system!

Components, operating fluids and incorrect handling of the refrigeration system can cause serious injuries.

- Work on the refrigeration system must only be carried out by skilled qualified refrigeration technicians or the ↳ *TROX Technical Service* .
- Always comply with the safety data sheet provided by the refrigerant manufacturer.

1.7.5 Hazards due to high and low temperatures

Hot surfaces

WARNING!

Risk of injury from hot surfaces!

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

- Wear heat-resistant protective clothing and gloves whenever you work near a potentially hot surface.
- Before you start working, make sure that all surfaces have cooled down to ambient temperature.

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.

Release of steam

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.

Cold surfaces

WARNING!

Risk of injury from cold surfaces!

The surfaces of the integral refrigeration system and evaporator can cool down to -20 °C while in operation. Skin contact with cold surfaces causes frostbite and cold burns.

- Wear protective clothing and gloves that protect you from the cold when you work near a potentially cold surface.
- Before you start working, make sure that all surfaces have warmed up to ambient temperature.

1.7.6 Hazardous substances and operating fluids

Operating fluids with glycol

WARNING!

Health risk from operating fluids that contain glycol!

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

Refrigerant R-410A

WARNING!

Health risk from refrigerants!

If you inhale the refrigerant used in the refrigeration system you may feel severe shortness of breath, become unconscious, suffer cardiac arrhythmia and eventually suffocate. Skin contact with refrigerant causes cold burns.

- Avoid any contact with refrigerant.
- Work on the refrigeration system must only be carried out by skilled qualified refrigeration technicians or the ↳ *TROX Technical Service* .
- Do not eat, drink or smoke while handling refrigerants.
- Wash your hands when you interrupt or finish your work.
- If you have come into contact with refrigerant, follow the first aid instructions given on the manufacturer's safety data sheet for the refrigerant.
- If any refrigerant has escaped, provide sufficient ventilation of the space.
- Wear safety goggles and protective gloves against thermal risks when you handle refrigerants.

Compressor oil

WARNING!

Health risk from compressor oil!

If your skin comes into contact with compressor oil, or if you swallor or inhale it, you may suffer irritation to the skin, eyes, the gastro-intestinal tract and the upper respiratory tract.

- Avoid any contact with compressor oil.
- Work on the refrigeration system must only be carried out by skilled qualified refrigeration technicians.
- Do not eat, drink, or smoke while handling refrigerants.
- If you have come into contact with compressor oil, follow the first aid instructions given on the manufacturer's safety data sheet for the oil.

Lubricants

WARNING!

Health risk from lubricants!

Contact with lubricants can induce allergies and skin irritation.

- Wear protective gloves when handling lubricants.
- Be careful not to swallow lubricants or inhale the vapours.
- If any lubricant has got into your eyes, rinse your eyes thoroughly with plenty of water and seek medical attention if necessary.
- If your skin has come into contact with any lubricant, wash your hands thoroughly with plenty of water and soap.
- Comply with the safety data sheets provided by the lubricant manufacturer.

1.7.7 Fire hazards

Fire protection

WARNING!

Risk of injury from insufficient or inadequate fire-fighting!

If there is a fire and the fire extinguisher is not in working order or is unsuitable for the class of fire, this can result in serious or even fatal injuries and considerable damage to property.

- Make sure that all fire extinguishers are suitable for the expected class of fire.
- Check fire extinguishers every 2 years to ensure that they are in working order.
- Refill each fire extinguisher after it has been used.
- Use only extinguishing agents and replacement parts that comply with the information specified on the fire extinguisher.
- If you have to use a fire extinguisher, make sure you know how to use it safely (see instructions on the extinguisher).

Damaged fan parts

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.

1.7.8 Risk of entrapment (in units with whole body access)

Risk of entrapment in units with whole body access

WARNING!

Risk of entrapment where there is whole body access into air handling units!

Entrapment in an air handling unit can cause serious injury or even death.

- When you have to work on the air handling unit, secure the air handling unit against being switched on accidentally.
- Before you switch on the air handling unit again, make sure that nobody is inside.

1.8 Duty of care of the operator

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 be aware of the applicable occupational health and safety regulations and carry out a risk assessment to determine any additional hazards that may exist or result from the specific working conditions at the installation location of the air handling unit. The system owner has to create operating instructions for the air handling unit that reflect the results of this risk assessment.
- The system owner has to ensure, throughout the entire operating period of the air handling unit, that these operating instructions conform to applicable standards and guidelines; in case of any deviation, the system owner has to adapt the instructions.
- The system owner must secure the air handling unit to prevent access by unauthorised individuals.
- The system owner must clearly define the responsibilities for operation, maintenance, cleaning, troubleshooting and removal.
- 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 regularly provide training for the personnel and inform them of any dangers.
- The system owner must provide the employees with the required personal protective equipment.
- The system owner must observe the local fire regulations.

In addition, the system owner has to ensure that the AHU is in perfect technical condition at all times:

- The system owner must ensure that the maintenance intervals specified in this manual are observed. If the AHU is used beyond average, maintenance intervals should be shorter.
- The system owner must have all safeguards tested regularly to ensure that they are functional and complete.
- The system owner must document and permanently save the control matrix on which commissioning is based. The system owner must save both a digital version and a hardcopy of the initial version of the control matrix.
- The system owner must document and save any changes to the control matrix.

Hygiene requirements

The system owner has to comply with the local regulations and harmonised standards for hygiene requirements. This includes compliance with

- specific maintenance and inspection intervals for AHUs
- specifications for connected ducts and air terminal devices

1.9 Personnel requirements

1.9.1 Qualification

The work described in this manual has to be carried out by individuals with the qualification, training, knowledge and experience described below:

Facility manager
Facility managers have been instructed so that they are able to avoid any potential hazards related to the work under consideration. Facility managers must not carry out any jobs beyond regular operation unless explicitly stated in this manual and unless the system owner has specifically agreed to them. Instruction is provided by the HVAC contractor when the system is handed over.

Facility managers are responsible for cleaning the unit, for carrying out functional tests and regular checks, for maintenance and for smaller adjustments.

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.

Hygiene inspector
Hygiene inspectors are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to carry out hygiene inspections on air handling units. Hygiene inspectors have been trained in the field of air hygiene and indoor air quality, and they are familiar with the relevant standards and guidelines.

Instructed person
Instructed individuals have been instructed so that they are able to avoid any potential hazards related to the work under consideration. Instruction is provided by a qualified expert in the respective field.

A person instructed in the use of the AHU may carry out the following jobs:

- Visually inspect the system
- Replace filter elements
- Clean filter chambers
- Clean heat exchangers
- Clean fans

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 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 technician
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. They are also familiar with the avoidance of emissions, the recovery of fluorinated greenhouse gases and the safe handling of refrigeration equipment of the required type and size.

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.

Any work has to be carried out by individuals who can be expected to carry out their assigned duties reliably. Individuals whose reaction time is delayed due to alcohol, drugs or other medication must not carry out any work.

Passwords

Web server setup is password protected to prevent unauthorised individuals from entering or changing data (see software documentation for the AHU).

Instruction

System owners must regularly instruct their personnel. The instruction procedure has to be documented for further reference.

At least the following details have to be documented:

- Date of instruction
- Names of persons being instructed
- Type of instruction
- Name of instructor
- Signature of person being instructed

1.9.2 Unauthorised persons

WARNING!

Risk to life! Unauthorised access to the hazardous area and work area must be prevented!

Unauthorised people who do not fulfil the requirements specified here are usually not aware of the dangers in the work area. There is a risk to life and limb for unauthorised people.

– Keep unauthorised people away from hazardous areas and work areas.
– Instruct these people to leave the hazardous area or work area.
– Stop work while unauthorised people are present in the hazardous area or work area.

1.10 Personal protective equipment

Personal protective equipment is equipment that protects the user against health or safety risks at work.

Personal protective equipment must be worn for various types of work; the protective equipment required is listed in this manual together with the description of each type of work.

Description of personal protective equipment

Dust mask

Dust masks protect users from inhaling harmful dusts.

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 goggles

Safety goggles protect the eyes from flying particles and liquid splashes.

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.

1.11 Environmental protection

! NOTICE!

Risk of harm to the environment due to the incorrect handling of hazardous materials and substances.

Many substances are hazardous. If you handle them incorrectly or dispose of them incorrectly, they can considerably harm the environment.

- If you have to handle or dispose of substances that can harm the environment, follow the instructions below.
- If any hazardous substances have escaped to the environment, immediately take suitable measures to avoid further damage. If you are in doubt, inform the local authorities about the damage and enquire about suitable measures to be taken.
- If any hazardous substances have escaped to the environment, immediately take suitable measures to avoid further damage. If you are in doubt, inform the local authorities about the damage and enquire about suitable measures to be taken.

The following substances and materials which are hazardous to the environment are used in this AHU:

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.

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

- Propylene glycol
- Ethylene glycol

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.

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.

Lubricants

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

Batteries

Batteries contain toxic heavy metals. They are hazardous waste and must be taken to a hazardous waste collection point or disposed of by a specialist company.

1.12 Measures to take if a harmful substance has been released

Refrigerant R-410A

Personal safety:

- Bring people to safety.
- Provide sufficient ventilation in work areas, and extract harmful substances.
- Wear safety goggles and protective gloves against thermal risks.

Environmental protection:

- Make sure that hazardous substances cannot be released into the environment. Use collection devices.

Comply with the safety data sheet provided by the manufacturer.

Compressor oil

Personal safety:

- Wear safety goggles and protective gloves.

Environmental protection:

- Harmful substances must not enter sewerage systems or bodies of water. Use collection devices.
- Use sand, earth or a similar absorbent material to absorb any spills, and fill the contaminated material into a container so that it can be safely disposed of.
- Clean the contaminated area with water.
- If a hazardous substance has been released to a body of water or into the sewerage system, immediately inform the local authorities.

Comply with the safety data sheet provided by the manufacturer.

Coolant, glycol

Coolants that contain glycol are hazardous, so please note:

Personal safety:

- Bring people to safety.
- Wear protective equipment.
- Provide sufficient ventilation in work areas, and extract harmful substances.
- Do not inhale vapours or aerosols. Avoid contact with the eyes and skin.

Environmental protection:

- Harmful substances must not enter sewerage systems or bodies of water. Use collection devices.
- Use sand, earth or a similar absorbent material to absorb any spills, and fill the contaminated material into a container so that it can be safely disposed of.
- If a hazardous substance has been released to a body of water or into the sewerage system, immediately inform the local authorities.

Comply with the safety data sheet provided by the manufacturer.

Lubricants

Comply with the safety data sheet provided by the manufacturer.

2 Functional description

2.1 Function of the AHU

Functional description of the air handling unit

Air handling units are centralised ventilation and air conditioning units that are used for the mechanical ventilation of rooms.
Their primary task is to ensure optimum air quality in the building by supplying treated outside air as supply air and extracting the exhaust air from the building as exhaust air.

The air is treated by filtering, heating or cooling.

The air handling unit is divided into different functional units and can consist of several air handling components.

Depending on the equipment selected for the air handling unit, the following functions can be performed for air treatment:

Filtration	- Removal of dust or pollutant particles from the air.
Cooling	- Lowering the room temperature to achieve a comfortable room temperature.
Heating	- Increase the room temperature to create a cosy indoor climate.
Heat recovery system	- Efficient utilisation of waste heat from the room to preheat the conditioned air and save energy.
Dehumidifying	- Reduction of humidity to maintain healthy indoor air quality.

2.1.1 Variants

X2-Pxx with plate heat exchanger

Fig. 7: Exemplary device with plate heat exchanger X2-Pxx

1 Casing
2 Mains isolator
3 Touch panel
4 Cable glands
5 Connecting subframe
6 Water connections (heat exchanger)
7 Levelling feet
8 Base frame
9 Condensate drain, connection for drain trap
10 Door lock
11 Inspection access door (see table for an explanation of the symbols)
12 Door handle
13 Shut-off damper

X2-Rxx with rotary heat exchanger

Fig. 8: Exemplary device with rotary heat exchanger X2-Rxx

1	Casing	7	Levelling feet
2	Mains isolator	8	Inspection access door (see table for an explanation of the symbols)
3	Touch panel		
4	Cable glands	9	Door lock
5	Connecting subframe	10	Door handle
6	Base frame	11	Shut-off dampers

X2-RxxV with rotary heat exchanger and vertical air connection

Fig. 9: Exemplary device with rotary heat exchanger and vertical air connection X2-RxxV

1	Casing	6	Levelling feet
2	Touch panel	7	Base frame
3	Mains isolator	8	Door handle
4	Cable glands	9	Door lock
5	Inspection access door (see table for an explanation of the symbols)	10	Connecting subframe

Symbols used on the AHU

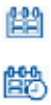
The installed components and the corresponding symbols are listed in the table below.

AHU casing units

Symbol	Designation
	Multileaf dampers
	Filters
	Centrifugal fan
	Cooling coil
	Heating coil
	Plate heat exchanger
	Rotary heat exchanger

2.2 Operating modes

Use the touch panel, the digital control panel or the web server to select one of the following operating modes:

Touch panel	Digital control panel	Web server	Description
		Stop	Standby mode
		Low speed	Manual mode with low fan speed
		High speed	Manual mode with high fan speed
		Weekly program Calendar	Automatic mode (weekly program or calendar)
	–	–	Service stop The AHU stops running, but voltage supply remains on. Use this mode to carry out service (maintenance). You can deactivate this mode only on the touch panel. The web server displays *'Stop'*, the digital control panel displays 

Note: You can use the touch panel, the digital control panel or the web server to select an operating mode. None of these entry modes has preference; the AHU runs with the operating mode that was selected last (except for service stop ).

Under normal conditions the AHU should run based on calendar or 'weekly program' (weekly schedule).

2.3 Description of the functional units

2.3.1 Equipment casing

The housing of the air handling unit consists of a frame construction with panels and inspection access doors and is mounted on a base frame.
The base frame is the foundation of the air handling unit and fulfils a load-bearing function. As an option, the AHU can be equipped with a vibration-damping frame (Vibration Baseframe - AVBF) for structure-borne noise decoupling. The terminal point for the equipotential bonding of the unit is located in the base frame. Levelling feet (optional) can be used to compensate for uneven floors.

At the components where condensation or water occurs, drain trays collect the water and drain it out of the unit. The water is drained into the sewer via a drain trap.

The air handling unit is connected to the air duct system via rectangular spigots (U-frame).
Optionally, these spigots can also be designed as insulating spigots with vibration-damping elements to ensure complete sound and vibration decoupling between the air handling unit and the air ducts.

Weatherproof air handling units intended for outdoor installation are fitted with a weather protection bonnet. There are also drainage holes in the base frame to ensure drainage.

Inspection access doors

The inspection doors are located on the operating side of the AHU and allow access to the interior of the AHU components.

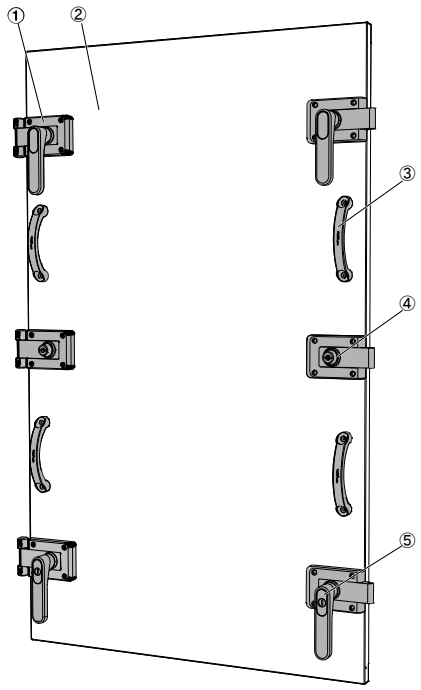


Fig. 10: X2c2 inspection access door

Connections and interfaces

Duct connections of the air handling unit

Duct connection	Abbreviation	Description
Extract air	ABL / ETA	Air flow that is conveyed out of the room by the air handling unit via the system.
Supply air	ZUL / SUP	Air flow that is conveyed into the system by the air handling unit after it has been treated.
Outdoor air	AUL / ODA	Untreated air that flows into the AHU from outside.
Exhaust air	FOL / EHA	Air flow that leads to the outside.

Connections for heat transfer fluids

Heat exchanger	Abbreviation	Description
Cooling coil, feed	VL	Externally generated cooling energy is fed into the air cooler via the flow.
Cooling coil, return	RL	The heat transfer fluid provided is fed back via the return flow.
Heating coil, feed	VL	Externally generated heat is fed into the heater via the flow pipe.
Heating coil, return	RL	The heat transfer fluid provided is fed back via the return flow.

With a swirching valve, heating or cooling is possible in changeover mode with just one heat exchanger.

2.3.2 Filter unit

Filters are used to separate contaminants from the outdoor air and extract air. The supply air filter protects the AHU and the ventilation system from dust particles in the outdoor air. The extract air filter protects the AHU from contaminated extract air.

The filter class that should be used depends on the application of the AHU. A high-efficiency filter not only separates contaminants from the air, it also prevents allergens, such as e. g. pollen or spores in the outdoor air, from getting into the indoor air. This helps to prevent or at least minimise allergic reactions in human beings.

It is hence essential to keep filter media in an AHU dry, clean and hygienically safe.

The level of contamination of filters is monitored by a differential pressure sensor in each Fan IO The pressure is measured both upstream and downstream of filters. The higher the differential pressure, the higher the level of filter contamination. If the specified maximum value is exceeded, you have to change the filter element.

You can access the filter through an inspection access panel.

'Filter' comprises:

- Filter chamber
- Filter frame
- Filter medium

2.3.3 Fan

Centrifugal fan

The centrifugal fan moves air through the AHU and the entire ventilation system.

The AHU casing unit with the centrifugal fan is a hazardous area; the inspection access door is marked accordingly and allows access for authorised individuals only. Before you access the centrifugal fan, use the mains isolator to switch off the AHU and secure it against being switched on accidentally.

2.3.4 Heat recovery system

Plate heat exchanger

The plate heat exchanger consists of stacked plates of corrugated metal which are arranged in such a way that the fluid to be heated and the fluid to be cooled flow through alternating spaces between each two plates.

Rotary heat exchanger

The storage mass consists of alternate layers of smooth and corrugated aluminium. As the wheel slowly rotates, extract air and supply air flow in opposite directions through the heat exchanger so that the thermal energy of the airflows is transferred.

2.3.5 Heat exchanger

Heating coil

If required, the heating coil heats the supply air to the specified setpoint value. The required heating energy comes from an external energy source and is transferred to the airflow by a heat exchanger. The heating coil is accessed through an inspection access door so that you can clean and maintain it easily.

Electric air heater

The electric air heater is used to heat the supply air. If required, it heats the supply air to the specified setpoint value. The required heating energy is transferred to the airflow by electric heating elements.

Condenser

The condenser reduces the refrigerant from its vapour phase to its liquid phase, thereby producing heat.

Depending on the installation location of the condenser, this leads to:

Exhaust air - Heat dissipation

Supply air - Heating of the supply air up to the set-point value

Steam coil

If required, the steam coil heats the supply air to the specified setpoint value. The required heating energy comes from an external energy source and is transferred to the airflow by an air to steam heat exchanger. The steam coil is accessed through an inspection access door so that you can clean and maintain it easily.

Cooling coil

If required, the cooling coil cools the supply air to the specified setpoint value. The required cooling energy comes from an external energy source and is transferred to the airflow by a heat exchanger. The cooling coil is accessed through an inspection access door so that you can clean and maintain it easily.

Evaporator

The evaporator is used to cool the airflow to achieve the setpoint value. The refrigerant evaporates in the process, thereby withdrawing heat from the ambient air, i.e. cooling the airflow.

Condensate drip tray

The condensate drip tray collects any condensate and removes it from the air handling unit via a connection. The condensate is channelled into the drain via a siphon.

2.3.6 Multileaf dampers

Shut-off dampers

Shut-off dampers are used to shut off the air flow in the AHU when it is not in operation. They are accessible via an inspection access door and can therefore be easily cleaned and maintained.

Damper blades

Control dampers are used to regulate the air flow within the air handling unit, e.g. as a bypass damper or as a mixed air damper. They are accessible via an inspection access door and can therefore be easily cleaned and maintained.

2.4 Control

X-CUBE control

X-CUBE control is the control system for the air handling unit.

It controls all other integral and external control and communication devices connected to the AHU. X-CUBE control provides communication interfaces for various peripheral devices and units.

The user interface of the X-CUBE control allows you to configure the entire system and to make adjustments.

The X-CUBE control user interface can be used in the following ways:

- On the touch panel
- Via the web server (on-site PC)

Chapter 3.4 'Configuration with the touch panel' on page 29 *Chapter 3.5 'Configuration with the web interface' on page 35* *Chapter 3.6 'Configuration with the digital control panel' on page 47*

Electrical console in the AHU

The electrical console is an integral part of the AHU. It supplies voltage to all electrical parts of the AHU. Depending on the device configuration, the electrical console also contains all inputs and outputs of the X-CUBE control technology and the motor protection switches (*Chapter 1.3 'Safety equipment' on page 7*) to protect the motors installed in the air handling unit.

2.4.1 Touch panel

Touch panel for the AHU

Fig. 11: Touch panel

The touch panel (Fig. 11) is an X-CUBE control user interface *Chapter 3.4.9 'Communication parameters' on page 33* .

Alternatively, you can use a web browser on your PC. To do so, you have to establish a connection from the AHU to your PC or network (see the X-CUBE compact transport and installation manual for details).

In addition, you can use a control panel (*'Digital control panel XCC-CD-RD' on page 26* , optional) to adjust some parameters for the AHU.

2.4.2 Room control panels

Digital control panel XCC-CD-RD

Fig. 12: Control panel

The optional room control unit has a touchscreen with a graphic interface for setting the control parameters of the air handling unit.

Functions:

- Setting ventilation control
  (according to the factory setting on the AHU)
- Setting the room temperature setpoint [°C]
- Setting a temporary volume flow rate increase (boost mode)
- Displaying current alarms

Analogue control panel XCC-CD-RA

Fig. 13: Control panel

The analogue control panel is used to change the room temperature.

The selector allows you to set a room temperature set-point or to change the supply air temperature within a certain range (±5 °C).

3 Operation and setting

3.1 Safety instructions for operation

Incorrect operation

WARNING!

Risk of injury from incorrect operation!

Incorrect operation can cause serious injuries and considerable damage to property.

- Read the operating manual.
- Follow the instructions in in this manual.
- Before you start working, ensure that:
  - all inspection access doors and covers have been closed.
  - all safeguards have been installed and function correctly.
  - nobody is inside the AHU.
- Do not open any covers or inspection access doors while the unit is in operation.
- Do not disable or bypass any safeguards while the unit is in operation.

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.

- Wear a safety harness.
- Only access roofs with suitable and intact fall protection equipment in place (ladders, railings, safety harness).
- Start working only if the components you have to work on are easily accessible.
- Stop materials or objects from falling.
- Wear safety shoes, protective clothing and a hard hat.

3.2 Starting the air handling unit

Before you start the AHU

Before you start the AHU, ensure that:

- There are no persons or objects, such as tools, in the AHU.
- All filter elements have been inserted and are intact.
- All connections for water, electricity etc. are intact and open.
- The AHU casing has been completely closed.

Switching the mains isolator on

Personnel:

- Instructed person

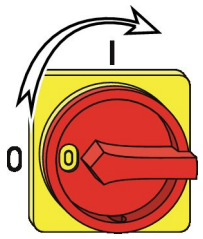


Fig. 14: How to turn the mains isolator

1. Turn the mains isolator for the AHU to the 'I' position.
   ⇨ The AHU starts up and is then ready for operation. The touch panel is switched on and displays the user interface.

If you are using a web browser

2. Switch on the PC (provided by others).
   ⇨ The PC starts up.
3. Open the web browser.
4. Enter the IP assigned during commissioning in the address line of the web browser:
   - `IP address/trox.html`

   Example: `192.168.0.200/trox.html`
   ⇨ This displays the user interface. Then log in to the user interface, *Chapter 3.5.1 'Log in to the web server' on page 35*
5. If the software interface is not displayed, first check the network settings, *Chapter 3.5.2.14 'Set communication parameters' on page 44*

3.3 Inspections during operation

The following inspections must be carried out weekly while the AHU is in operation:

- Check the differential pressure caused by filters.
- Check the system pressure of the heat transfer fluids according to the instructions of the system manufacturer (system by others).
- Check the AHU for malfunctions.

Check filter service life with differential pressure

Personnel:

- Instructed person

Protective equipment:

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

The condition of the air filter in the air handling unit can be checked while the system is running by reading the differential pressure. The pressure difference is determined by measuring the pressure in the air direction upstream and downstream of the filter. If the differential pressure exceeds the specified limit value, this is an indicator that the filter is dirty or clogged.

ENVIRONMENT!

Energy efficiency

From an economic point of view, it may make sense to change the filter before the recommended final pressure difference is reached.
Changing the filter early can help to maintain the air quality in the room and reduce energy consumption.

1. ▸ Read the maximum permissible pressure difference on the sticker on the filter inspection access door.
2. ▸ Read the differential pressure on the user interface.

   Comparison of the current differential pressure to the final differential pressure:

   ≤75 % - No action required.

   > 75 % - We recommend replacing the filter for energy reasons.

   ≥100% - Replace the filter immediately.

Tips for operation

Follow the maintenance schedule

Follow the maintenance schedule to ensure economic and energy-efficient operation of each AHU component. If a filter is contaminated, the fan and the entire AHU consume more power.

Keep the building usage in mind

Ensure that the operating mode of the AHU fits the requirements of the building. If the building usage changes, you may have to adapt the operating mode.

Demand-based control

Demand-based control ensures optimum operation and prevents excessive energy consumption.

3.4 Configuration with the touch panel

3.4.1 Navigation on the touch panel

Fig. 15: Touch panel

The touch panel reacts to the pressure from your fingers.

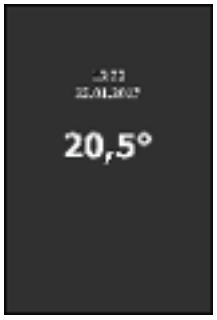


Fig. 16: Screen saver

The screen saver shows system time, date and current room temperature (actual temperature, e.g. from the control panel).

If you touch the screen saver, the home screen displays.

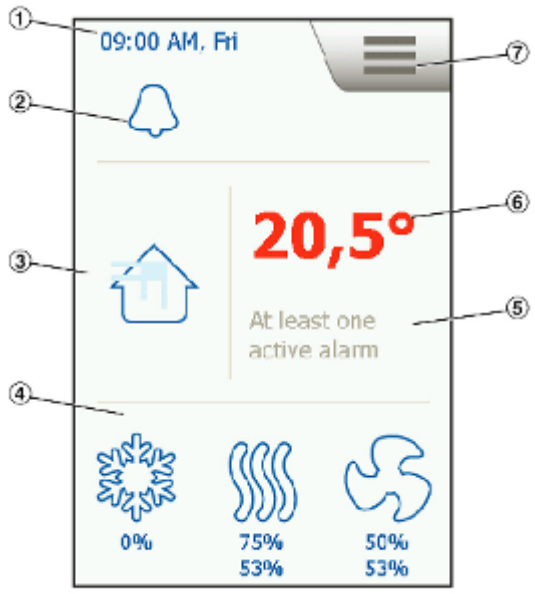


Fig. 17: Home screen

1 System time and day of the week
2 Current alarms, if any
3 Opens the system overview
4 Quick start – opens the settings for the respective component. To select components for display, go to *'Menu ➔ Home'*
5 System status (text)
6 Temperature setpoint
7 Menu

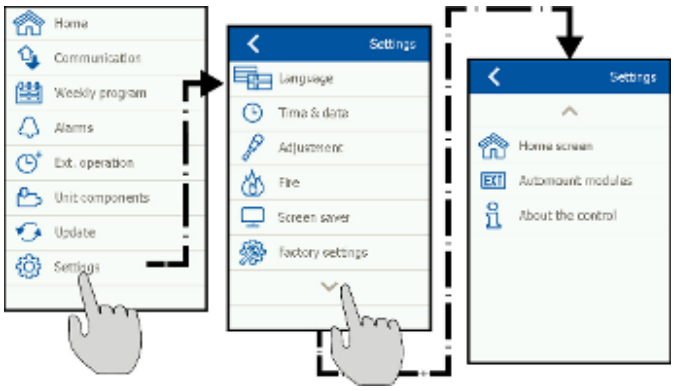


Fig. 18: Menu navigation

3.4.2 Login

Some settings require you to log in.

To log in, enter your password (number pad) and confirm your entry with ✓.

Default password: 0022

Login expires after some time and you will have to log in again.

3.4.3 Temperature setpoint

Personnel:

- Facility manager

Go to the home screen and select the temperature setpoint value.

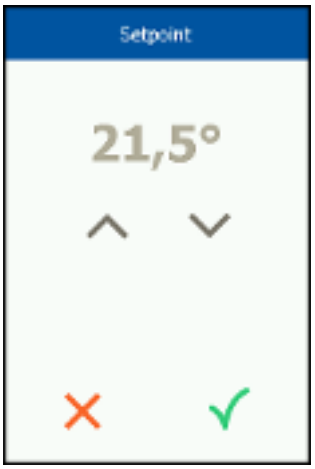


Fig. 19: Setting the temperature

- Use the arrow keys to set the required setpoint, then confirm your entry with ✓.
  - ⇨ The temperature setpoint has been set.

3.4.4 Operating mode

Personnel:

- Facility manager

1. ▸ On the touch panel select *'Menu ➔ Unit components'* .

2. ▸ Select the fan symbol ①.

3. ▸ Set the operating mode ①:

   - Auto mode *'Calendar'*
     AHU operation is based on the calendar; you can define the calendar mode on the web server.
   - Auto mode *'Weekly program'*
     AHU operation is based on a 'weekly program' (weekly schedule); you can define the weekly program with the touch panel.
   - Service stop
     The AHU stops running, but voltage supply remains on. Use this mode to carry out service (maintenance).
     You can deactivate this mode only on the touch panel.
   - Standby mode
   - Manual mode with low fan speed
   - Manual mode with high fan speed

Note: You can also use the digital control panel or the web server to select an operating mode. None of these entry modes has preference; the AHU runs with the operating mode that was selected last (except for service stop).

Under normal conditions the AHU should run based on calendar or 'weekly program' (weekly schedule).

3.4.5 'Weekly program' (weekly schedule)

Personnel:

- Facility manager

A 'weekly program' allows you to set the AHU operating times.

1. ▸ Select *'Menu ➔ Weekly program'* .

2. ▸ You can choose between three 'weekly programs':

   ① - Whole week: Identical schedule for all days.

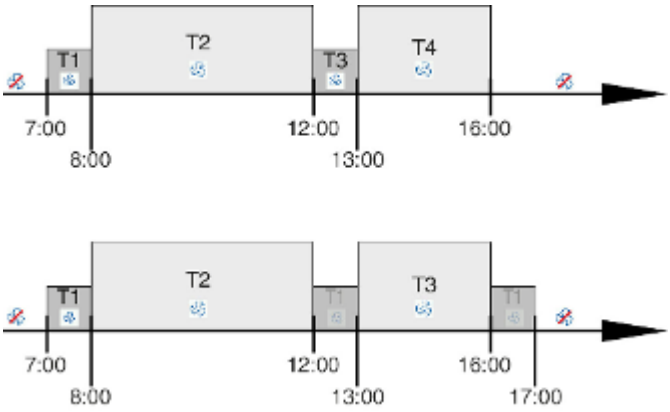
   ② - Daily program: Different schedule for every day.

   ③ - Weekday & weekend: Different schedules for working days and weekends.

   Select a weekly program, then use the switch ④ to activate it. Only one program (schedule) can be active at a time.

3. ▸ ① - Select a 'timer' (period, up to four per day).
② - Start time.
③ - End time.
④ - Set the fan speed.
Fan off
Low speed
High speed

Set additional 'timers' (periods) and days as required.



4. ▸ Set the 'timers' as shown in the examples.
Note that has the lowest priority and the highest priority.

This means that in example 2 the first period (Timer 1) (7:00-17:00) can be overridden with T2 and T3 .
Timer 1 can, however, not be overridden with .

Note: *'Extended operation'* overrides *'Weekly program'*.
Manual settings on the control panel override both the *'Weekly program'* and *'Extended operation'*.

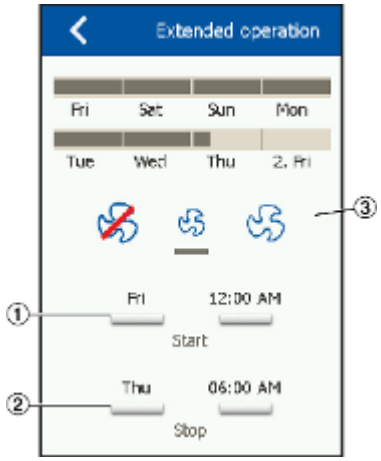
Fan speeds (project-specific) are set as part of commissioning: *'Menu ➔ Unit components ➔ '* .

3.4.6 Extended operation

Personnel:
- Facility manager

The *'Extended operation'* screen allows you to override the fan speed set in the current weekly program. Override automatically starts and stops at the times you set here. The maximum override period is 7 days.

1. ▸ Select *'Menu ➔ Extended operation'* .



2. ▸ ① - Set the start time for extended operation.
② - Set the end time for extended operation.
③ - Set the fan speed.
Extended operation off
Override of weekly program at low speed
Override of weekly program at high speed

Extended operation is activated immediately and overrides the weekly program as soon as the start time is reached. Extended operation ends automatically with the end time.

Note: Manual settings on the control panel override both the *'Weekly program'* and *'Extended operation'*.

Note that you cannot override 'Service stop' on the control panel.

3.4.7 Time and date

Personnel:

- Facility manager

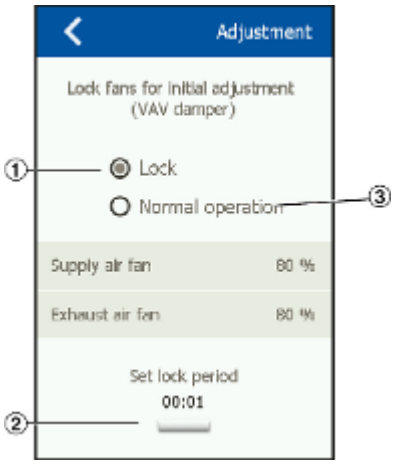
Select *'Menu ➔ Settings ➔ Time & date'* .

- Set the date and time; your settings are applied immediately.

3.4.8 Adjustment

You can lock the fan speed during commissioning if, for example, you have to adjust volume flow controllers. The AHU will then provide a constant volume flow.

1. Select *'Menu ➔ Settings ➔ Adjustment'* .



2. To lock the fan speed, select *'Lock'* ①, then set a period ②.

   ⇨ The fan continues to run at the current speed for the set period of time.

Deactivate the fan speed lock

3. To deactivate the fan speed lock, select *'Normal operation'* ③.

3.4.9 Communication parameters

Personnel:

- Facility manager

The X-CUBE compact controller has a factory set static IP address. This allows you to establish a cable network connection from the controller to your PC.

Default communication parameters:

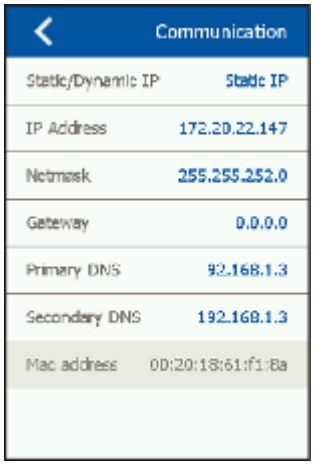
Parameters	Value
DHCP or static IP	Static IP
IP address	192.168.2.1
Network mask	255.255.255.0
Gateway	10.10.10.1
Primary DNS	10.10.10.18
Secondary DNS	10.10.10.19

If you have entered the correct communication settings and if you have connected a network cable, you can enter the IP address in the web browser and then access the web server of the AHU. If you need to adjust any communication parameters, you can do so on the touch panel.

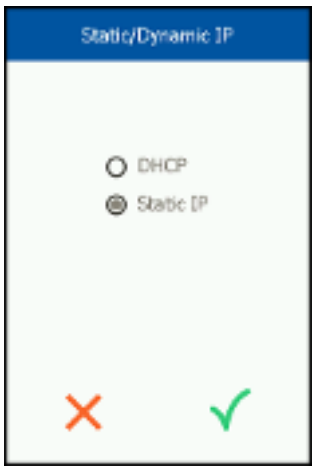
If you intend to integrate the AHU with a network, you can set the IP address to *'DHCP'*; the controller will then receive a dynamic IP address via the network.

Setting the static IP address

1. Select *'Menu ➔ Communication'* .



2. Select *'Static/Dynamic IP'*.



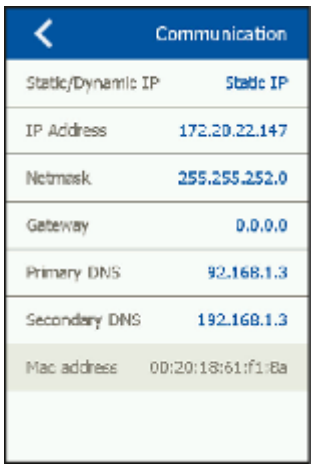
3. ▸ Select 'Static IP' and confirm with ✓.

4. ▸ Set the following parameters:
   - IP address
     Be sure to enter the correct IP address on the controller: it is the same as for the PC except for the last digit, which is different.
   - Netmask (use same value as on PC).
   - Gateway (use same value as on PC).
   - Primary DNS (use same value as on PC).
   - Secondary DNS (use same value as on PC).

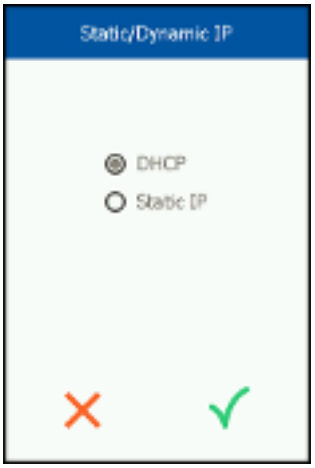
   ⇨ The communication parameters for connecting a PC have been set; to call the web server, enter the set IP address in the web browser.

Setting a dynamic IP address

1. ▸ Select *'Menu ➔ Communication'* .



2. ▸ Select *'Static/Dynamic IP'*.



3. ▸ Select DHCP and confirm with ✓.

   ⇨ The IP address of the X-CUBE controller is automatically assigned. The IP address from the router displays (given that the network connection is correct).

Displaying the AHU configuration

4. ▸ Open the browser on your PC and enter the displayed address into the address line, e.g. `http://10.5.110.227/`

   ⇨ The AHU configuration displays.

3.5 Configuration with the web interface

3.5.1 Log in to the web server

Personnel:

- Facility manager

The interface for communication between the AHU and the web server has been configured as part of initial commissioning. No further settings need to be made. (↪ Transport and installation manual X-CUBE compact, chapter Initial commissioning)

There are three login levels to access the web server. Each level has different access rights for operating, maintenance or configuration functions.

Level	User name	Password	Function
User	USER	0001	Setpoint specifications
Technician	INSTALL	0022	Setpoints and control settings
Maintenance	SERVICE	0333	Service parameters

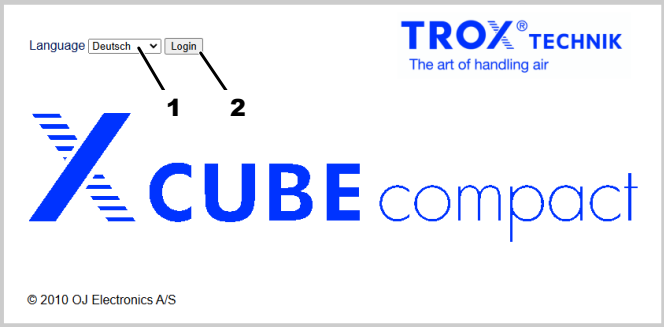


Fig. 20: Log in to the web server

1. Select a language (Fig. 20 /1).
2. Click on *'Login'* (Fig. 20 /2).
   ⇨ The web browser requests the login data (user name and password).
3. Enter and confirm your login data.
   ⇨ You have been logged in to the web server.

3.5.2 Setting parameters

3.5.2.1 Display of operating status

Personnel:

- Facility manager

The *'Status'* screen shows the current temperature values of the AHU and the status of each component.

- In the function menu, click on the register *'Maintenance* ➔ *Device* ➔ *Status'* .

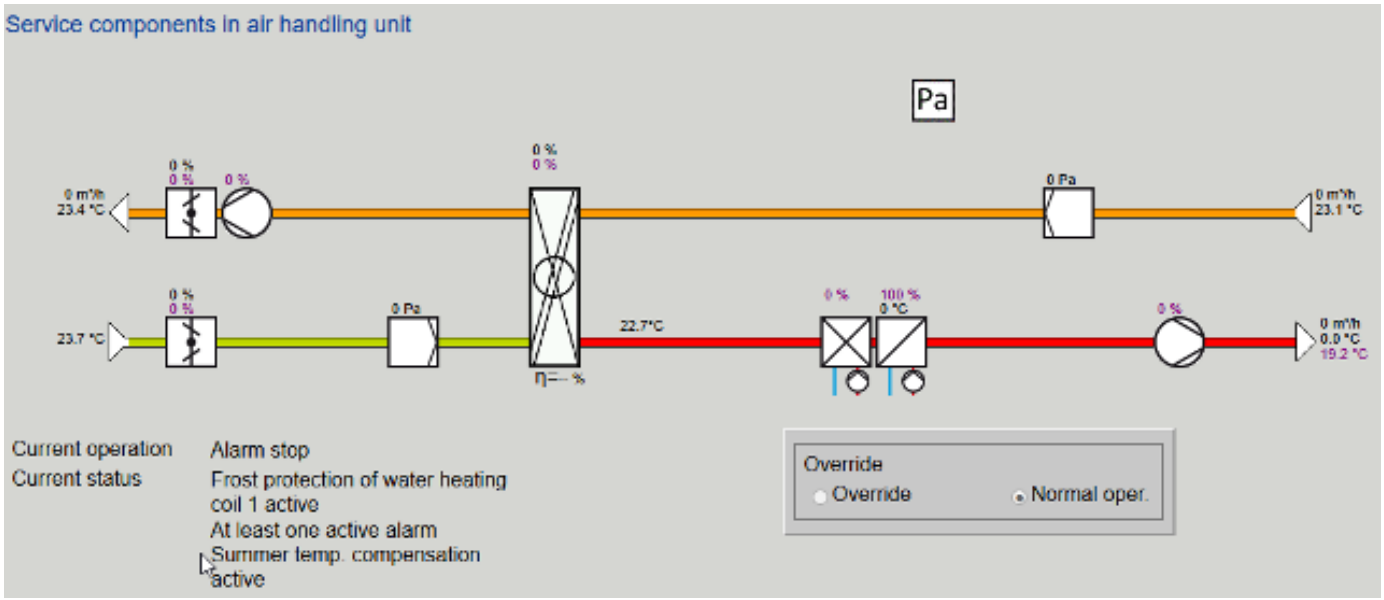
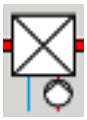
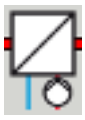


Fig. 21: System overview

⇨ The system overview shows the status of each component or temperature values. To see additional information for a component, click on the component.

Symbol	AHU component	Property
	Exhaust air	■ Display of exhaust air volume flow ■ Display of exhaust air temperature
	Exhaust air damper	■ Degree of opening [%] of the exhaust air damper
	Extract air fan	■ Extract air fan speed – actual value [%] ■ Extract air fan speed – setpoint value [%]
	Heat recovery unit	■ Percentage of heat recovery – actual value ■ Percentage of heat recovery – setpoint value ■ Heat recovery efficiency [%]
	Extract air filter	■ Extract air filter – air pressure [Pa]

Symbol	AHU component	Property
	Extract air	■ Display of extract air volume flow ■ Extract air temperature – actual value ■ Extract air temperature – setpoint value
	Outdoor air	■ Outdoor air temperature
	Outdoor air damper	■ Degree of opening [%] of the outdoor air damper
	Outdoor air filter	■ Outdoor air filter – air pressure [Pa]
	Cooling coil supply air	■ Cooling capacity – actual value [%]
	Heating coil supply air	■ Heating capacity – actual value [%] ■ Setpoint display of the set temperature
	Supply air fan	■ Supply air fan speed – actual value [%] ■ Supply air fan speed – setpoint value [%]
	Supply air	■ Display of supply air volume flow ■ Display of supply air temperature

3.5.2.2 Select operating mode

Personnel:

- Facility manager

The operating mode for the AHU can be set with *'Select fan speed'* (Fig. 22).

1. In the function menu, select *'User ➔ Operation ➔ Speed'* .

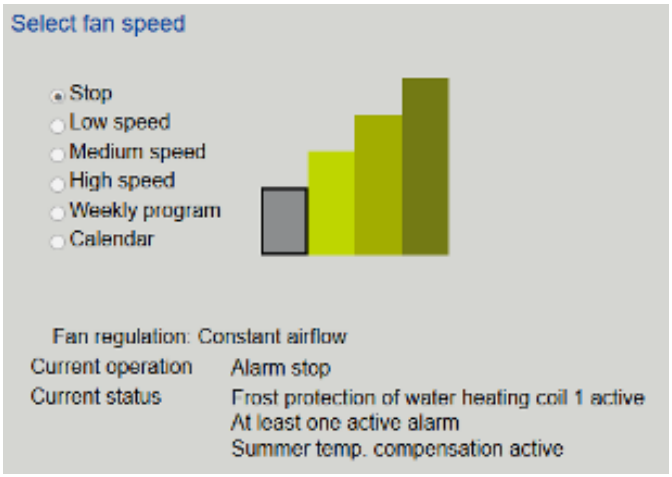


Fig. 22: Setting the fan speed

2. Select an operating mode, *Chapter 2.2 'Operating modes' on page 23* .

The current fan mode ('fan regulation'), operating mode ('current operation') and system status are displayed in the lower part of the screen.

Note: For safety reasons, you can deactivate a service stop only on the touch panel *3.4.4 'Operating mode' on page 31* .

3.5.2.3 Set calendar operating mode

A calendar allows you to set the AHU operating times.

You can only set AHU operating times if you have selected the 'Calendar' operating mode (3.5.2.2 'Select operating mode' on page 37).

1. In the function menu, select *'User ➔ Operation ➔ Basic programme'* .

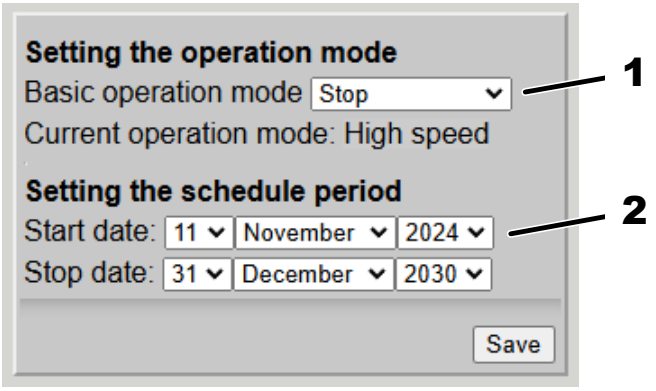


Fig. 23: Setting a 'basic programme'.

2. Select a basic operating mode (Fig. 23 /1).

   The basic operating mode you set here is used in the following cases:

   - Outside the start and stop date.
   - If no other action has been set in the daily schedule.
   - In the daily schedule before the first set action, e.g. 07:00 = 'low speed', then from 00:00 to 7:00 = basic operating mode.

3. Set the start date and stop date (Fig. 23 /2) for the calendar function.
4. Click *'Save'* to save settings.
5. In the function menu, select *'User ➔ Operation ➔ Daily schedule'* .

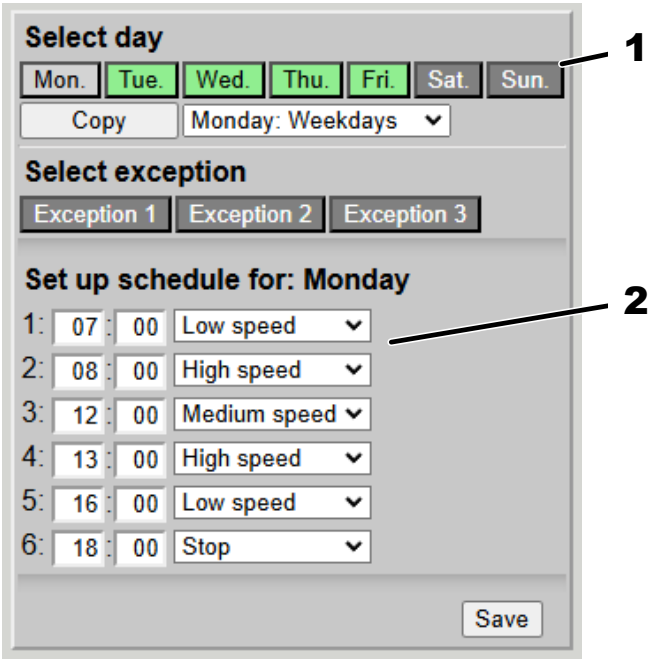


Fig. 24: Setting a daily schedule

6. First select a day of the week (Fig. 24 /1) and then set the times (1-6) and the fan speeds (Fig. 24 /2).

   Tip: If you have made settings for Monday, you can use *'Copy'* to apply them to other days.

   The *'Exception 1-3'* fields allow you to set operating times other than the daily schedule. To set exceptions, use the *'Exceptions'* and *'Calendar'* tags.

3.5.2.4 Set weekly programme

Personnel:

- Facility manager

A 'weekly programme' allows you to set the AHU operating times.

You can only set AHU operating times if you have selected the 'Weekly programme' operating mode (3.5.2.2 'Select operating mode' on page 37).

1. In the function menu, select *'User ➔ Operation ➔ Set programme'* .

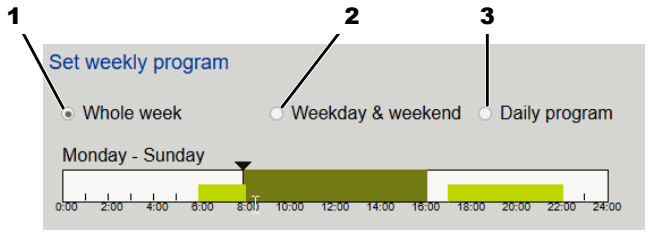


Fig. 25: Set weekly programme

2. You can choose between three 'weekly programmes':

   ① - Whole week: Identical schedule for all days.

   ② - Weekday & weekend: Different schedules for working days and weekends.

   ③ - Daily programme: Different schedule for every day.

   Set the desired weekly programme type, only one programme type can be set.

Setting the operating time (example)

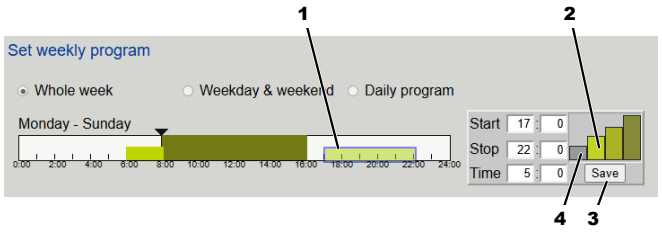


Fig. 26: Setting operating times

3. To create a new timer (time range), click on the white area (Fig. 26 /1), then select the fan speed (low, medium or high speed) (Fig. 26 /2). Enter the start and stop times using the keyboard, or move the bar using the mouse. Finish the entry with Save (Fig. 26 /3).

   You can set up to four 'timers' (periods).

   To change a timer, mark the period with the mouse and change it. After any changes, finish the entry with Save (Fig. 26 /3).

   To delete a timer, mark it with the mouse, then select *'Stop'* (grey bar – Fig. 26 /4), this deletes the timer.

   Note: *'Extended operation'* overrides *'Weekly programme'*.
   Manual settings on the control panel override both the *'Weekly programme'* and *'Extended operation'*.

   Project-specific fan speeds are set as part of commissioning.

3.5.2.5 Set extended operation

Personnel:

- Facility manager

The *'Extended operation'* (Fig. 27) screen allows you to override the fan speed set in the current weekly programme. Override automatically starts and stops at the times you set here. The maximum override period is 7 days.

1. In the function menu, select *'User ➔ Extended operation'* .

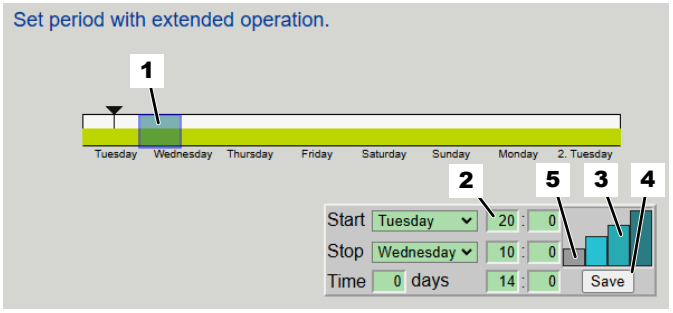


Fig. 27: Set extended operation

2. Click on the white area within the week view (Fig. 27 /1).
3. Set the start and stop times (Fig. 27 /2) for extended operation.
4. Select a low, medium or high fan speed (Fig. 27 /3) by selecting a bar.
5. Click on *'Save'* (Fig. 27 /4).

   ⇨ Extended operation is activated immediately and overrides the weekly program as soon as the start time is reached. Extended operation ends automatically with the end time.

   Note: Manual settings on the control panel override both the *'Weekly programme'* and *'Extended operation'*.

To end extended operation, click on the grey rectangle (Fig. 27 /5).

3.5.2.6 Setting temperature control

Personnel:

- Facility manager

The *'Set temperature regulation'* screen allows you to set parameters for temperature control.

1. In the function menu, select *'Technician ➔ Temperature'* .

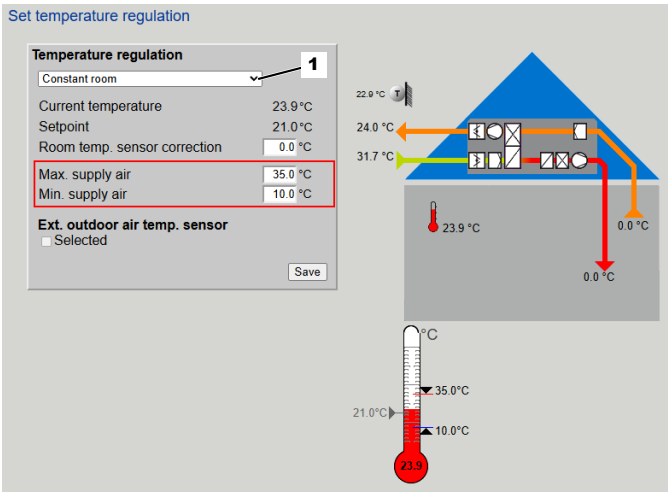


Fig. 28: Setting temperature control

2. Select a function from the drop-down list (Fig. 28 /1):

Constant supply air	-	A temperature sensor in the supply air duct is used to keep the supply air temperature constant.
Constant extract air	-	A temperature sensor in the extract air duct is used to keep the extract air temperature constant.
Constant room temperature	-	A temperature sensor in the room is used to keep the room air temperature constant.
Constant supply air/ extract air difference	-	The temperature is controlled so that a constant temperature difference is maintained between supply air temperature and extract air temperature. This control strategy is typically used for low-turbulence displacement ventilation; i.e. the supply air enters the room near the floor at a temperature lower than the room air temperature, while the extract air is removed near the ceiling.

3. Then set the temperature values:

Room temperature sensor correction	-	To compensate for measurement inaccuracies of the temperature sensor, you can set a correction factor of ±3.5 °C.
Max. supply air	-	Enter a maximum value for the supply air temperature.
Min. supply air	-	Enter a minimum value for the supply air; recommended: 17 °C

4. If there is an outdoor air temperature sensor ('external setpoint'), tick the *'Selected'* checkbox.
5. Click on *'Save'*.
   ⇨ The temperature control settings have been saved.

3.5.2.7 Temperature setpoint specification

1. In the function menu, select *'User ➔ Temperature'* .

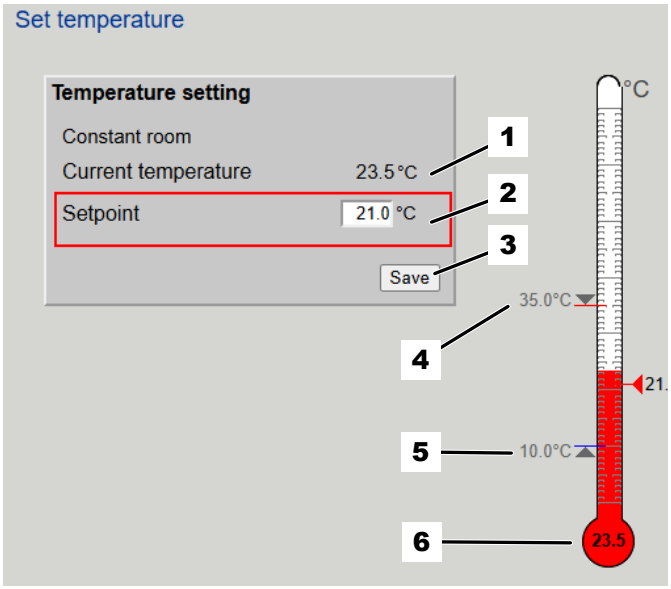


Fig. 29: Temperature setting

1 Actual temperature
2 Temperature setpoint
3 Button to save the entry
4 Maximum supply air temperature (not with 'Constant supply air' mode)
5 Minimum supply air temperature (not with 'Constant supply air' mode)
6 Actual temperature

2. Enter a temperature setpoint (Fig. 29 /2).
3. Click on *'Save'* (Fig. 29 /3).
   ⇨ The AHU controls the temperature according to the setpoint for the set temperature control type.

3.5.2.8 Set summer and winter compensation

Personnel:

- Facility manager

The *'Set summer/winter compensation'* screen (Fig. 30) allows you to set temperature compensation values for summer and winter operation.

If this function is active, the temperature setpoint will be corrected in summer or winter based on the outdoor air temperature:

Summer operation - In the temperature range from *'Summer start'* to *'Summer maximum'*, the temperature setpoint is dynamically decreased by the *'Summer temp. diff.'* value.

Winter operation - In the temperature range from *'Winter start'* to *'Winter maximum'*, the temperature setpoint is dynamically increased by the *'Winter temp. diff.'* value.

Summer/winter compensation is only possible with control mode 'Constant supply air', 'Constant extract air' or 'Constant room temperature'.

1. In the function menu, select *'Technician ➔ Summer/winter ➔ compensation'* .

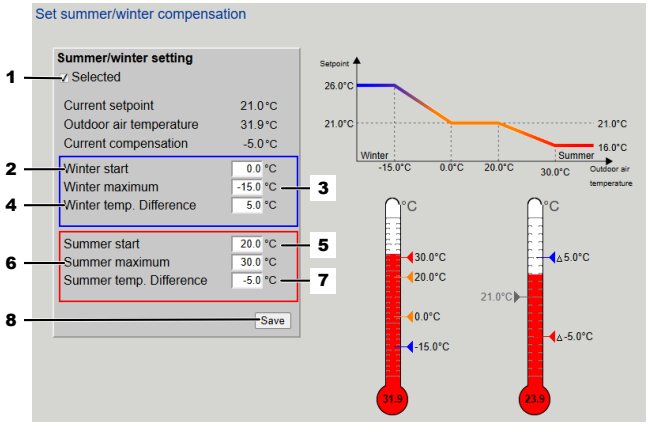


Fig. 30: Summer/winter compensation

2. Tick the checkbox (Fig. 30 /1) to activate summer/winter compensation.
3. Enter the outdoor air temperature for starting winter compensation (Fig. 30 /2).
4. Enter the outdoor air temperature for maximum winter compensation (Fig. 30 /3).
5. Set the maximum winter compensation of the setpoint (Fig. 30 /4).
6. Enter the outdoor air temperature for starting summer compensation (Fig. 30 /5).
7. Enter the outdoor air temperature for maximum summer compensation (Fig. 30 /6).
8. Set the maximum summer compensation of the setpoint (Fig. 30 /7).
9. Save the summer/winter compensation settings with the button (Fig. 30 /8).

   ⇨ Summer/winter compensation has been set.

3.5.2.9 Set automatic changeover summer/winter

Personnel:

- Facility manager

The automatic summer/winter changeover enables automatic switching between summer and winter operation based on the parameters set for the various control modes.

1. In the function menu, select *'Technician ➔ Summer/Winter ➔ Sum/Win changeover'* .

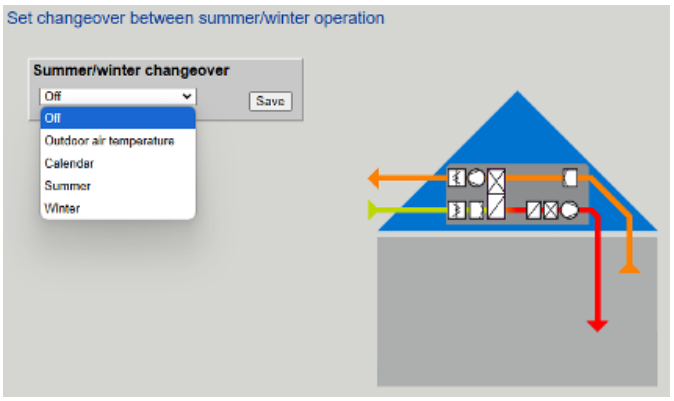


Fig. 31: Summer/winter changeover

2. Select the desired control type from the drop-down list (Fig. 31 /1).

OFF - There will be no change between summer and winter operation.

Outdoor temperature - The system changes to summer operation when the outdoor air temperature exceeds the set *'Changeover temp. summer'*.

The system changes to winter operation when the outdoor air temperature drops below the set *'Changeover temp. winter'*.

Calendar - The system changes between summer mode and winter operation based on the set calendar dates.

Summer - The system runs permanently in summer operation.

Winter - The system runs permanently in winter operation.

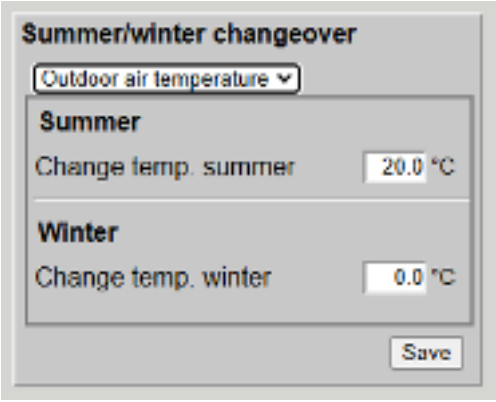


Fig. 32: Outdoor temperature

3. If you choose *'Outdoor temperature'* as the type of control, you also have to set the summer and winter changeover temperature (Fig. 32).

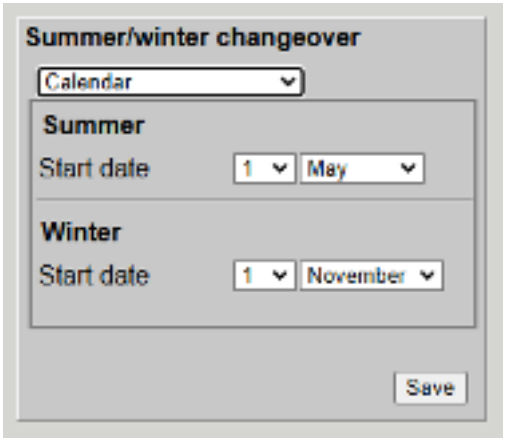


Fig. 33: Calendar

4. If you choose *'Calendar'* as the type of control, you also have to set the summer start date and the winter start date (Fig. 33).
5. Click on *'Save'*.
   ⇨ Automatic summer/winter changeover has been set.

3.5.2.10 Setting summer night purge

Personnel:

- Facility manager

In the *'Set summer night purge'* screen (Fig. 34), summer night purge can be activated and the time period for activating summer night purge can be set. With summer night purge, the rooms are cooled with outdoor air, outside the set operating times. Night purge is activated as soon as all of the required settings have been made.

> ***Energy savings***
>
> *Night purge provides a high energy savings potential as rooms can be cooled down at night, without the requirement for cooling energy.*

1. In the function menu, select *'Technician ➔ Temperature ➔ Summer night'* .

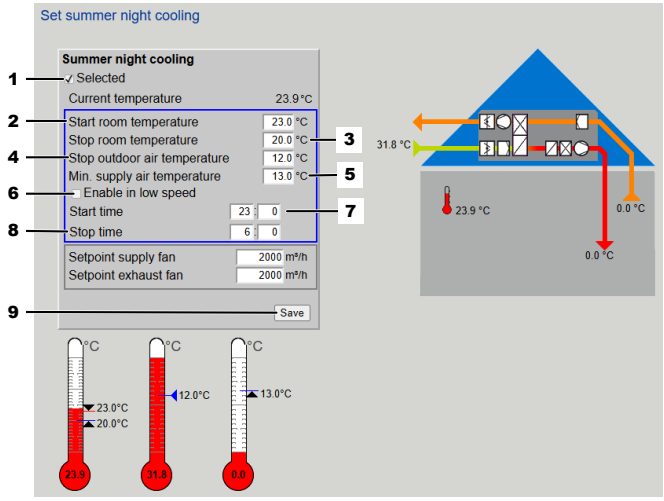


Fig. 34: Night purge

2. Tick the checkbox (Fig. 34 /1) to activate night purge.
   ⇨ The settings for summer night purge are displayed.
3. Enter the room air start temperature for night purge ('Start room temp.', Fig. 34 /2).
   ⇨ As soon as the room temperature is above the start temperature within the start and end times, night purge is activated.

> *If there is a temperature sensor installed in the room, the room temperature is monitored continuously. If there is no temperature sensor installed in the room, the room temperature is determined based on the extract air temperature. Night purge is then activated at the set start time.*

4. Enter the room air end temperature for night purge ('Stop room temp.', Fig. 34 /3).
   ⇨ If the room air temperature is lower than this temperature ('stop room temp.'), night purge is inactive.
5. Enter the outdoor air end temperature for night purge (Fig. 34 /4).
   ⇨ If the outdoor air temperature is below the outdoor air end temperature, night purge is inactive.

6. Enter the outdoor air end temperature for night purge (Fig. 34 /5).
   ⇨ If the supply air temperature is below the set minimum supply temperature, night purge is inactive.
7. Tick the checkbox (Fig. 34 /6) to activate night purge even if the system is only running at low speed.
   ⇨ If the tick is not set and the system is running at low speed, e.g. due to the operating time setting, night purge is not activated.

> *If the low speed is specified by an external control, e.g. a management and control equipment (MCE), this setting will not take effect. Night purge then remains inactive despite the tick being set.*

8. Enter the night purge start time (Fig. 34 /7).
   ⇨ Night purge is active from the set switch-on time.
9. Enter the night purge end time ('Stop time', Fig. 34 /8).
   ⇨ Night purge is inactive from the set switch-off time.
10. Save the settings you have made using the button (Fig. 34 /9).
    ⇨ The settings for night purge are saved.

3.5.2.11 Select a language

Personnel:
- Facility manager

The *'Set language'* screen allows you to select the language for the web interface.

1. In the function menu, select *'Technician ➔ Language'* .

Fig. 35: Language settings

2. In the *'Language selection'* screen, click on the field with the desired screen language.
   ⇨ The screen language has been set.

3.5.2.12 Set time and date

Personnel:
- Facility manager

The *'Set clock'* screen (Fig. 36) allows you to set the time and date.

1. In the function menu, select *'User ➔ Time and date'* .

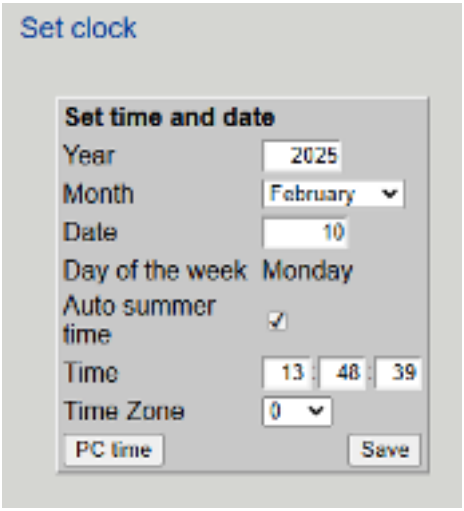


Fig. 36: Setting of time and date

2. To use the date and time from your PC, click on *'PC time'*. You can also enter the time and date manually and save your entries with *'Save'*.

3.5.2.13 Display of measured values

Personnel:
- Facility manager

The measured values for the last 7 days or the last 24 hours can be displayed on the *'Logging data'* screen (Fig. 37). The following measured values can be displayed:

- Supply air [m³/h or Pa], depending on fan speed control
- Extract air [m³/h or Pa], depending on fan speed control
- Temperature [°C]
- Airflow [m³/h]

- Active alarms (number)
- Heating/heat recovery/cooling [%]

1. In the function menu, select *'Service ➔ Alarm log ➔ Data log'* .

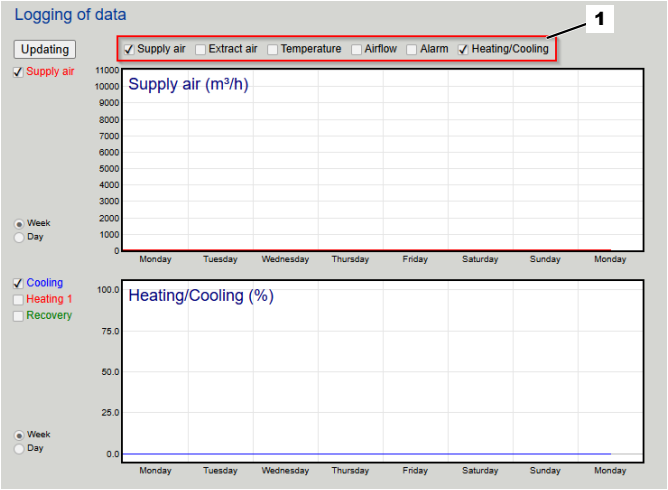


Fig. 37: Display of measured values

2. Click on the selection field to display the desired measured value (Fig. 37 /1).

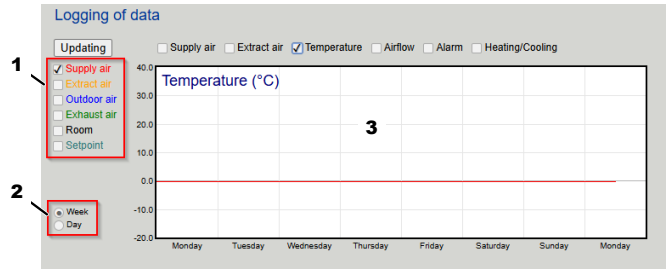


Fig. 38: Selecting measured values

3. Click on the selection field for the daily or weekly display (Fig. 38 /2).
4. Click on the selection field to display the desired measured values (Fig. 38 /1).
5. Click on the diagram (Fig. 38 /3) to enlarge the display.

3.5.2.14 Set communication parameters

Personnel:

- Facility manager

The X-CUBE compact controller has a factory-set static IP address. This enables a direct cable network connection between the controller and PC.

Default communication parameters:

Parameters	Value
Static IP/DHCP	Static IP
IP address	192.168.2.1
Network mask	255.255.255.0
Gateway	10.10.10.1
Primary DNS	10.10.10.18
Secondary DNS	10.10.10.19

If you have entered the correct communication settings and if you have connected a network cable, you can enter the IP address in the web browser and then access the web server of the AHU. If you need to adjust any communication parameters, use the touch panel or the web server.

Setting the static IP address

1. In the function menu, select *'Technician ➔ Communication ➔ Internet'* .

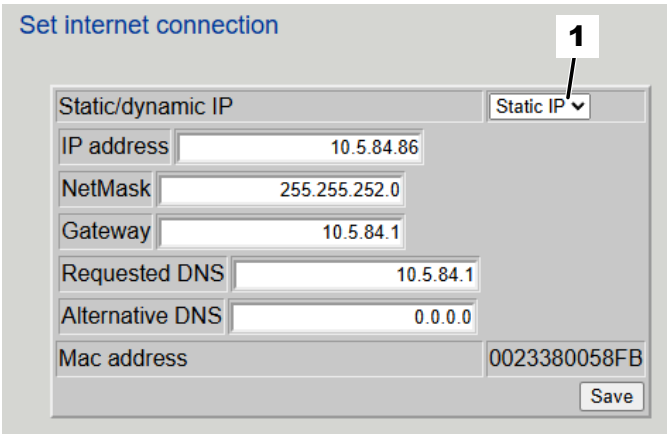


Fig. 39: Setting the static IP address

2. Select *'Static IP'* from the drop-down list (Fig. 39 /1), then set the following parameters:
   - IP address
     Be sure to enter the correct IP address on the controller: it is the same as for the PC except for the last digit, which is different.
   - Netmask (use same value as on PC).
   - Gateway (use same value as on PC).
   - Primary DNS (use same value as on PC).
   - Secondary DNS (use same value as on PC).
3. Click on *'Save'*.

   ⇨ The communication parameters for connecting a PC have been set; to call up the web server, enter the set IP address in the web browser.

If the AHU is integrated into a network, you can set the IP address to *'DHCP'*; the controller will then receive a dynamic IP address via the network.

Setting a dynamic IP address

1. In the function menu, select *'Technician ➔ Communication ➔ Internet'* .

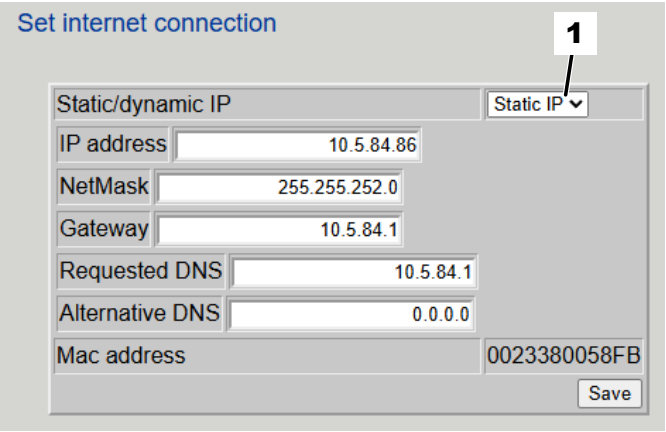


Fig. 40: Setting a dynamic IP address

2. Select *'DHCP'* from the drop-down list (Fig. 40 /1).
3. Click on *'Save'*.

   ⇨ The IP address of the X-CUBE controller is automatically obtained from the network. The IP address assigned by the router is then displayed (given that the network connection is correct).

Calling up the visualisation

4. Open the browser on your PC and enter the displayed address into the address line, e.g. `http://10.2.100.252/`

   ⇨ The AHU visualisation is displayed.

Setting external Modbus RTU

1. In the function menu, select *'Technician ➔ Communication ➔ Modbus'* .

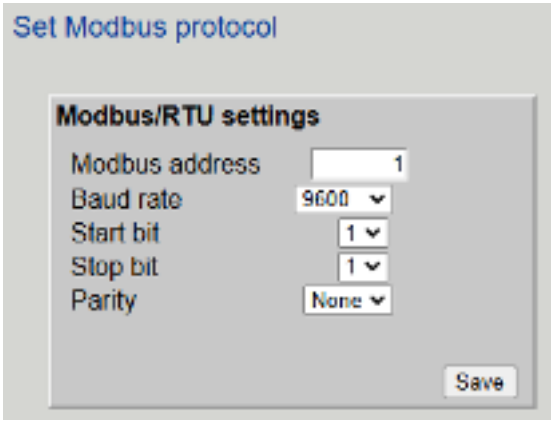


Fig. 41: Setting external Modbus RTU

2. ■ Enter the *'Modbus address'*.
   ■ Select a *'Baud rate'*.
   ■ Select *'Start bits'*.
   ■ Select number of *'Stop bits'*.
   ■ Select *'Parity'*.
3. Click *'Save'* to confirm your settings.

3.5.2.15 Locking the fan speed

Personnel:

- Facility manager

You can lock the fan speed during commissioning, e. g., to adjust volume flow controllers. The AHU will then provide a constant volume flow into the ventilation system.

1. In the function menu, select *'Technician ➔ Adjustment'* .

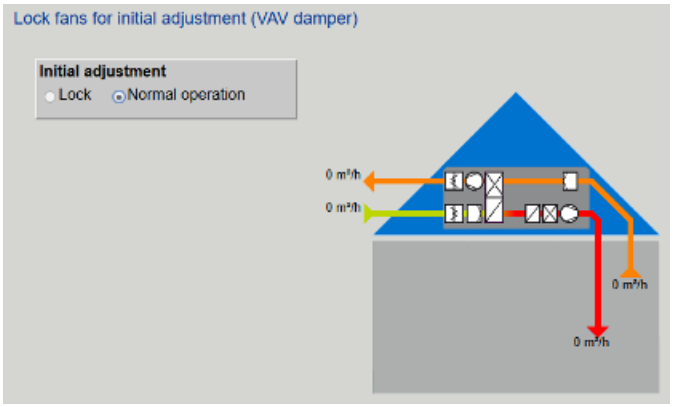


Fig. 42: Fan speed

2. Select *'Lock'* or *'Normal operation'*.

   ⇨ Selecting *'Lock'* displays the screen (Fig. 43).

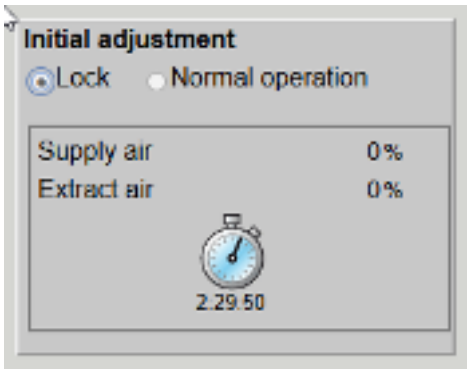


Fig. 43: Setting a lock period

3. Set the blocking time by clicking on the clock.

   ⇨ The volume flow rate will remain constant for the set period of time. After the set blocking time, the AHU returns to normal operation.

3.5.2.16 Activate override control for outputs

Personnel:

- Facility manager

Use the *'Override'* function (Fig. 44) to carry out service or maintenance jobs, to check whether the outputs work correctly. The *'Override'* function cannot be used if there are any alarms present in the AHU system.

The example below shows how to override the extract air fan speed.

1. In the function menu, select *'Service ➔ Device ➔ Status'* .

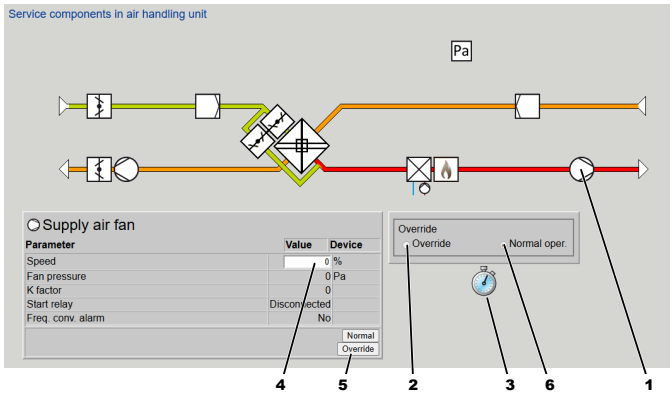


Fig. 44: Set override function

2. Click on the component of the AHU (Fig. 44 /1) that is to be overridden (supply air fan).
3. Click on *'Override'* (Fig. 44 /2).
4. Click on the clock (Fig. 44 /3) to set a time.
5. Enter the override percentage for the extract air fan speed (Fig. 44 /4).
6. Click on *'Override'* (Fig. 44 /5).

   ⇨ Override is active, and the percentage value you have entered is now the current setpoint value.

   After the set time, the AHU returns automatically to normal operation.

   To deactivate override and return to normal operation, select *'Normal operation'* (Fig. 44 /5).

3.5.2.17 Operating mode for fire alarm

Personnel:

- Facility manager

Use this function to override the set AHU operating mode in the event of a fire. The supply air and extract air temperature sensors are monitored; if a set value is exceeded, the system generates a fire alarm, and the AHU is overridden according to the settings made here.

If the actual temperature exceeds the set extract air and/or supply air temperature:

- a fire alarm ('A' alarm) is generated
- the fan speed is changed
- the fire dampers are actuated
- heating and cooling systems may be switched off

1. In the function menu, select *'Service ➔ Device ➔ Fire alarm'* .

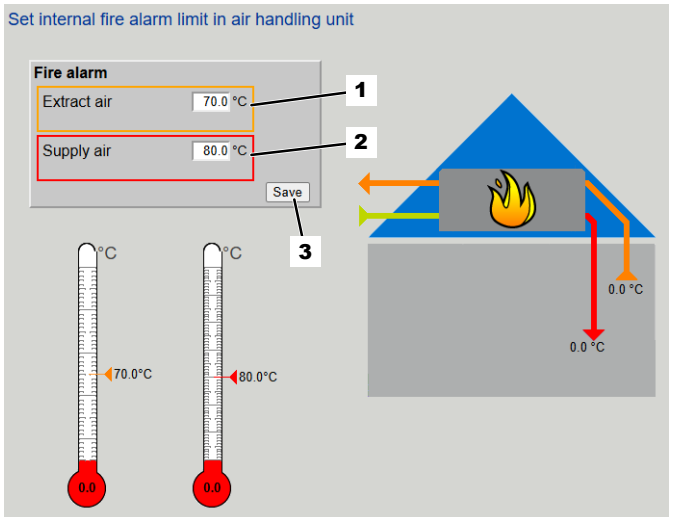


Fig. 45: Setting temperature limits for a fire alarm

2. Enter the extract air temperature limit (Fig. 45 /1).
3. Enter the temperature limit for the supply air fan (Fig. 45 /2).
4. Click on *'Save'* (Fig. 45 /3).
5. In the function menu, select *'Technician ➔ Fire ➔ Ventilation'* .

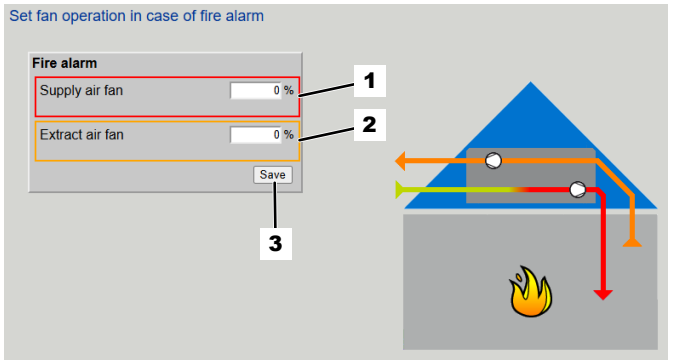


Fig. 46: Setting the fans for the event of a fire alarm

6. Set the power for the supply air fan (Fig. 46 /1).

   If you enter 0%, the fans will be switched off in the event of a fire.
7. Set the power for the extract air fan (Fig. 46 /2).
8. Click on *'Save'* (Fig. 46 /3).
9. If fire dampers are controlled via the AHU, go to the function menu and select *'Technician ➔ Fire ➔ Fire dampers'* . Set the reaction of each fire damper in the event of a fire here.

3.6 Configuration with the digital control panel

Control panel functions

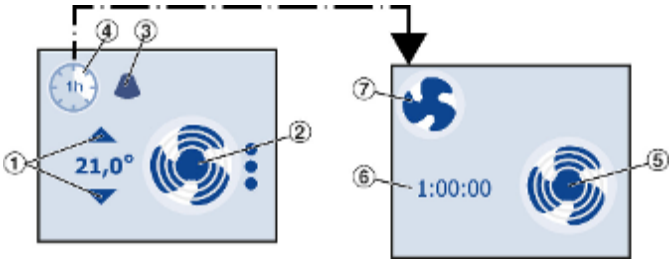


Fig. 47: Display

Function	Symbol	Description
Temperature		Use the arrows ① to set the room temperature setpoint. You can set any value [°C] that is within the range defined on the AHU. If no arrows are being displayed, the AHU has not been set for temperature control.
Ventilation	Select the fan symbol ② to set one of the following modes:	
		Manual ventilation at the lowest speed (fan stage).
		Manual ventilation at the highest speed (fan stage).
		Automatic ventilation; the fan speed depends on the weekly program.
		Ventilation off.
Fault	Fault ③	
	 (blue)	Fault that does not affect the function of the AHU.
	 (red)	The AHU has been stopped due to a fault. Service required.
Boost		Select this symbol ④ to set the maximum fan speed (max. ventilation, boost).
		Select this symbol ⑤ to set the 'boost timer' ⑥. The system goes into boost mode if there has been no user input for approx. 10 seconds.
		To end boost mode, select this symbol ⑦.

3.7 Switching the AHU off

Personnel:

- Instructed person

NOTICE!

Risk of data loss from turning off the mains isolator!

If you just turn off the mains isolator to stop the AHU, data may be lost.

– Only in an emergency should you use the mains isolator to stop the AHU.
– Always shut down X-CUBE Control first.

1. ▸ Shut down the AHU on the controls interface (touchscreen) as described in the software documentation.

   ⇨ The AHU shuts down. The touch panel switches off.

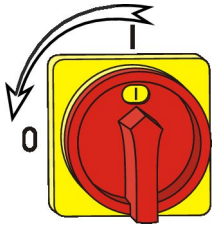


Fig. 48: Switching off the mains isolator

2. ▸ Use the mains isolator to switch off the AHU.

WARNING!

Electric shock hazard!

The power cable which connects the AHU to the mains holds electrical charges even after power is turned off.

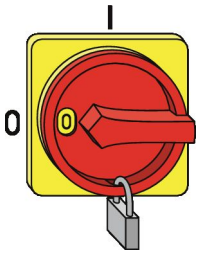


Fig. 49: Securing the mains isolator

3. ▸ Secure the main switch with a padlock. Keep the key in a safe place.
4. ▸ Cover the mains isolator with a notice informing people that work is in progress.

   ⇨ AHU is secured, work can be carried out on the appliance.

Observe further information for longer periods of decommissioning, ↳ *Chapter 6 'Decommissioning' on page 81*

4 Maintenance

4.1 Safety instructions regarding maintenance

Incorrect maintenance

WARNING!

Risk of injury from incorrect maintenance!

Incorrect maintenance can cause serious injuries and considerable damage to property.

- Before you start maintenance, switch off the air handling unit and secure it against being restarted accidentally.
- Have only authorised persons carry out maintenance.
- Before you start, make sure that there is sufficient clearance for the work you have to complete.
- Keep the work area tidy and clean. Parts and tools that are loosely stacked or left lying around are a source of accident.
- When you reinstall previously removed parts, follow the correct procedure, use all fixing elements and tighten all screws with the correct torque.
- Before you recommission the unit, make sure that:
  - All maintenance jobs have been completed according to this manual.
  - Nobody is inside the AHU.
  - All inspection access doors and covers have been closed.
  - All safeguards have been installed and function correctly.

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.

- Wear a safety harness.
- Only access roofs with suitable and intact fall protection equipment in place (ladders, railings, safety harness).
- Start working only if the components you have to work on are easily accessible.
- Stop materials or objects from falling.
- Wear safety shoes, protective clothing and a hard hat.

Rotating parts of a fan

WARNING!

Risk of injury from rotating parts!

Rotating parts in the fan can cause severe injuries.

- Do not reach into the moving fan or tamper with it.
- Do not open any covers or inspection access panels while the unit is in operation.
- Make sure that the rotor is inaccessible while in operation.
- The fan does not stop immediately! Check that no parts are moving before you open an inspection access door.
- 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, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . Wait until all parts have come to a standstill.

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.

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.

4.2 Maintenance plan

The following sections describe the maintenance jobs required to ensure efficient and fault-free operation of the unit.

If during regular checks you detect increased wear, change the maintenance intervals accordingly and carry out more frequent checks for wear and tear.

All maintenance work can also be carried out by TROX Technical Service. If you have any questions about maintenance and maintenance intervals, contact the TROX Technical Service, ‘TROX Technical Support’ on page 3.

AHU hygiene inspection

Interval	Maintenance work	Personnel
Every two years (for devices with humidifier)	Check AHU for hygienic conditions.	Hygiene inspector
Every three years (for devices without humidifier)	Check AHU for hygienic conditions.	Hygiene inspector

Ducting and air terminal devices

Interval	Maintenance work	Personnel
Every 6 months	Check supply air and extract air terminal devices for contamination, damage and corrosion. If necessary, clean and repair them according to the manufacturer's instructions.	Instructed person
	Check external weather louvres for contamination, damage and corrosion. If necessary, clean and repair them according to the manufacturer's instructions.	Instructed person
	Check ducts for damage. If necessary, repair them according to the manufacturer's instructions.	Instructed person
	Check flexible connectors for leakage, correct function and damage. If necessary, repair them according to the manufacturer's instructions.	Instructed person
Every 12 months	Clean supply air and extract air terminal devices.	Instructed person
	Check outdoor air and exhaust air terminal devices for contamination, damage and corrosion. If necessary, clean and repair them according to the manufacturer's instructions.	Instructed person
	Check the inside of ducts in at least 2 spots for contamination, damage, corrosion and condensation. If necessary, check further spots and determine whether cleaning is required.	Instructed person
	Check flexible connectors for leakage, correct function and damage.	Instructed person

AHU casing

Interval	Maintenance work	Personnel
Every 6 months	Visually check AHU casing units for contamination, damage and corrosion. Clean if necessary.	Instructed person
Every 12 months	Check joints between AHU casing units for leakage.	Instructed person
	Check casing for condensation buildup.	Instructed person
	Check panel seals.	Instructed person
	Check panel seals and fasteners for firm fit and function.	Instructed person
	Check equipotential bonding	Instructed person

Filter unit

Interval	Maintenance work	Personnel
Monthly	Visually check the filter element for contamination. Replace filter element if the maximum differential pressure is exceeded, *4.3.4 'Checking and changing the filter' on page 60*.	Instructed person
	Check filter element for odours and moisture penetration. Replace filter element, if necessary, *4.3.4 'Checking and changing the filter' on page 60*.	Instructed person
	Check filter frames and clamping rails for contamination, secure seating, damage and corrosion. Clean if necessary.	Instructed person
Every 6 months	Measure and check the differential pressure of all filters.	Instructed person
Annually	Replace filter elements of the first stage, *4.3.4 'Checking and changing the filter' on page 60*.	Instructed person
	Check filter frames and clamping rails for secure seating, damage and corrosion.	Instructed person
	Check filter monitoring function.	Instructed person
Every two years	Replace filter elements of the second stage, *4.3.4 'Checking and changing the filter' on page 60*.	Instructed person

Cooling coil

Interval	Maintenance work	Personnel
Every 3 months	Check dehumidifying cooling coil, condensate drip tray and droplet eliminator for contamination, damage, corrosion and leakage. Clean and repair if necessary.	Instructed person
	Check function of condensate drain and drain trap. Clean and repair if necessary.	Instructed person
Every 6 months	Check heat exchanger for contamination, damage, corrosion and leakage.	HVAC technician
Every 12 months	Check function of flow and return pipes.	HVAC technician

Heating coil

Interval	Maintenance work	Personnel
Every 6 months	Check heat exchanger for contamination, damage, corrosion and leakage.	HVAC technician
Every 12 months	Check function of feed and return pipes.	HVAC technician

Steam coil

Interval	Maintenance work	Personnel
Every week	Check steam installation for leakages and damage.	Instructed person
Every 6 months	Check heat exchangers for contamination, damage, corrosion and leakage.	HVAC technician
Annually	Check function of feed and return pipes.	HVAC technician

Rotary heat exchanger

Interval	Maintenance work	Personnel
Every 3 months	Visually check the rotary heat exchanger for foreign matter, contamination, hygienic condition, damage and corrosion. Clean if necessary.	Instructed person
	Visually check seals for wear, contamination, foreign matter and contact. The seals must be close to the storage mass, but not in contact with it. Clean if necessary.	Instructed person
	Check drive belt for wear and tension.	Instructed person
	Visually check the rotor for imbalance and runout.	Instructed person
	Check bearings for overheating, vibration and running noise.	Instructed person
	Check function of condensate drip tray, condensate drain and drain trap. Clean if necessary.	Instructed person
	Check rotor operation monitoring function.	HVAC technician

Multileaf dampers

Do not use oil or grease on multileaf dampers with gears.

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage and corrosion.	Instructed person
	Check whether damper blades move smoothly.	Instructed person
	Check function of damper bearings and linkage.	Instructed person
Every 12 months	Check actuator function.	HVAC technician

Electric air heater

Interval	Maintenance work	Personnel
Every 6 months	Visually check the electric duct air heater for contamination and damage.	Instructed person
	Check function of the electric air heater.	Qualified electrician

Electric motors

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage and corrosion.	Instructed person
	Check motors for bearing noise.	Instructed person
Every 12 months	Check electrical connections.	Qualified electrician
	Measure current consumption and compare it with nominal current.	Qualified electrician
	Check all safeguards for correct function.	Qualified electrician

Centrifugal fan with direct or EC motor

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage and corrosion. Clean if necessary.	Instructed person
	Visually check anti-vibration elements for damage and correct function.	Instructed person
	Check seals for fit and damage.	Instructed person
	Check impeller for imbalance.	Instructed person
	Check motor for bearing noise. Repair if necessary.	Instructed person
	Carry out a functional test of the fans (with the inspection access doors closed). Ensure smooth, low-vibration running; untypical running noises, e.g., mechanical vibrations, must be eliminated. In order to avoid damage, we recommend that vibration measurements be carried out regularly in accordance with ISO 14694. Observe the specified limit values and, if they are exceeded, take corrective measures, such as rebalancing ↳ documentation from the fan manufacturer.	Qualified electrician
	Check equipotential bonding. Repair if necessary.	Qualified electrician

Pumps

Interval	Maintenance work	Personnel
Every 6 months	Check for contamination, damage and corrosion. Clean if necessary.	Instructed person
	Check flanges and stuffing boxes for leakages.	Instructed person
	Check pump function.	HVAC technician

Control valves

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage and corrosion. Clean if necessary.	Instructed person
	Check connections and free movement.	Instructed person
Every 12 months	Check function of control valves.	HVAC technician

Sound attenuator

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage and corrosion. Clean if necessary.	Instructed person

Plate heat exchanger

Interval	Maintenance work	Personnel
Every 3 months	Check condensate drain, condensate drip tray and drain trap for correct function and contamination. Clean if necessary.	Instructed person
Every 6 months	Visually check plate heat exchanger for contamination, damage and corrosion. Clean if necessary.	Instructed person
	Check heat exchanger for leakages.	Instructed person

Refrigeration system and evaporator

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage, corrosion and leakage. Clean if necessary.	Instructed person
	Visually check for ice buildup.	Instructed person
	Check droplet eliminator, condensate drip tray, condensate drain and drain trap for correct function and contamination. Clean and repair if necessary.	Instructed person
Annually	Check function of expansion valve.	Skilled qualified refrigeration technician

Refrigeration system – condenser

Interval	Maintenance work	Personnel
Every 6 months	Visually check for contamination, damage, corrosion and leakage. Clean if necessary.	Instructed person
	Check condenser function.	Instructed person

Electrical components and devices

Interval	Maintenance work	Personnel
Every 6 months	Visually check sensors for contamination, damage and corrosion. Clean if necessary.	Instructed person
Every 12 months	Check sensor connections.	Skilled qualified electrician
	Check sensor function.	Skilled qualified electrician
	Check actuators for contamination, damage and corrosion.	Instructed person
	Check actuator input signals, and check operating and adjustment ranges.	Skilled qualified electrician
	Check anti-frost thermostat.	Instructed person
	Check frequency inverter.	Skilled qualified electrician
	Check fan vibration monitoring system.	Skilled qualified electrician
	Check local isolators.	Skilled qualified electrician
	Check CO sensor.	Skilled qualified electrician

Switch cabinet

Interval	Maintenance work	Personnel
Every 6 months	Visually check switch cabinet ventilation and lighting.	Instructed person
Every 12 months	Check cable glands and terminals for secure seating.	Qualified electrician
	Check for contamination, damage and corrosion.	Instructed person
	Check that all protective covers are in place.	Instructed person
	Check functional elements.	Qualified electrician
	Check switching and control procedures.	Qualified electrician
	Check manual, automatic and remote control functions.	Instructed person

Controls

Interval	Maintenance work	Personnel
Every 12 months	Check that controllers have been correctly installed and check the ambient conditions.	Qualified electrician
	Check integral power supply (backup batteries).	Qualified electrician
	Check functional elements, and operating and display devices.	Instructed person
	Check input signals.	Qualified electrician
	Check circuits and control signals.	Qualified electrician
	Check parameters.	Instructed person

Interval	Maintenance work

4.3 Maintenance

4.3.1 Decommissioning for maintenance

WARNING!

Electric shock hazard!

The power cable which connects the AHU to the mains holds electrical charges even after power is turned off.

Please note that switching off the AHU may also have an effect on other devices or systems in your environment. Therefore, before switching off the air handling unit, check whether other devices or systems could be affected by the failure of the air handling unit.

To switch off the air handling unit, you must first switch off the main switch. This is normally located in the switch cabinet of the air handling unit.
Observe the following steps when switching off the AHU:

1. ▸ Switch off all operating modes and functions of the air handling unit before switching off the main switch.

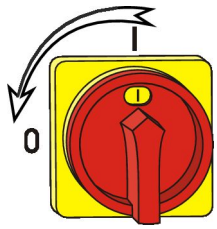


Fig. 50: Switching off the mains isolator

2. ▸ Use the mains isolator to switch off the AHU.

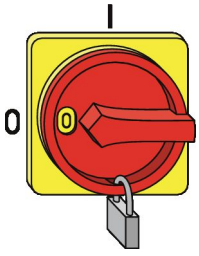


Fig. 51: Securing the mains isolator

3. ▸ Switch off the power supply to the AHU by turning the mains isolator to '0'.

4. ▸ ■ Secure the mains isolator with a padlock (Fig. 51).
   ■ Keep the key in a safe place.
   ■ Cover the mains isolator with a notice informing people that work is in progress.

4.3.2 Opening inspection access doors

Opening inspection access doors

Personnel:
- Instructed person

Protective equipment:
- Safety harness
- Industrial safety helmet
- Protective gloves

⚠ CAUTION!
Risk of injury due to falling doors!
Once all the locks on an inspection access door have been opened, the door can be removed. Here, the door can fall if it is not held in place.

When opening all locks, make sure the door is held in place!

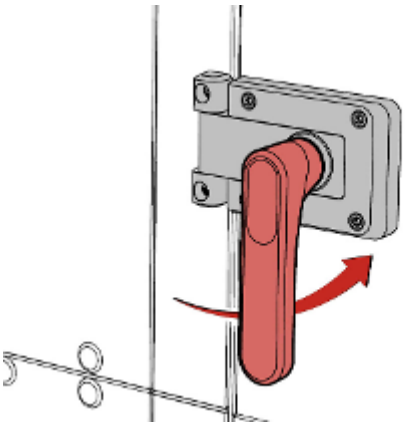


Fig. 52: Inspection access door with lock

▸ Turn the door handle anti-clockwise by 90° (Fig. 52).

⇨ This unlocks the door; it can now be opened.

Opening inspection access doors to hazardous areas

Personnel:
- Instructed person

Protective equipment:
- Safety harness
- Industrial safety helmet
- Protective gloves

Tool:
- TROX special key

⚠ CAUTION!
Risk of injury due to falling doors!
Once all the locks on an inspection access door have been opened, the door can be removed. Here, the door can fall if it is not held in place.

When opening all locks, make sure the door is held in place!

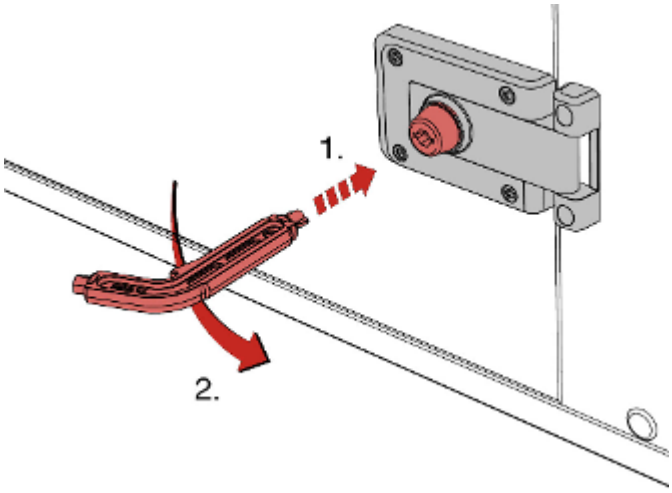


Fig. 53: Inspection access door with safety lock

▸ Insert the TROX special key into the lock and turn it anti-clockwise as far as it will go (Fig. 53).

⇨ This unlocks the door; it can now be opened.

Opening inspection access doors on the discharge side

Personnel:
- Instructed person

Protective equipment:
- Safety harness
- Industrial safety helmet
- Protective gloves

Tool:
- TROX special key

⚠ 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.

CAUTION!

Risk of injury due to falling doors!

Once all the locks on an inspection access door have been opened, the door can be removed. Here, the door can fall if it is not held in place.

When opening all locks, make sure the door is held in place!

Variants of inspection access doors on the discharge side

- Lock with operating lever (with/without lock)
- Lock for TROX special key

Opening is shown by means of an example using the TROX special key.

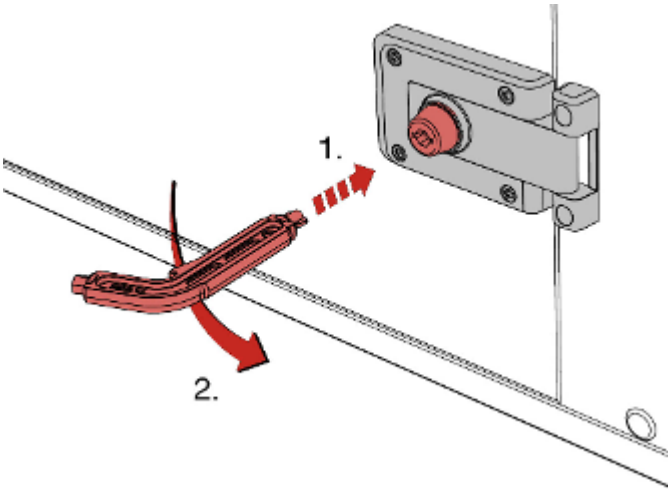


Fig. 54: Opening the lock

1. Insert the TROX special key into the lock.
2. Turn the key or the operating lever 90° anti-clockwise (Fig. 54).

   ⇨ Door lock has been unlocked.

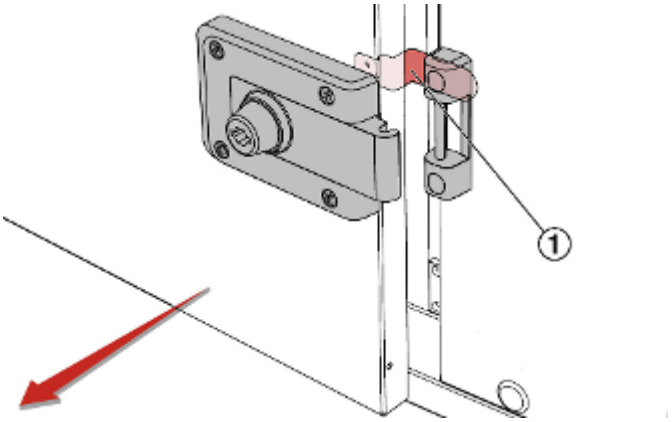


Fig. 55: Safety catch

3. Carefully open the inspection access door until it is caught by the safety catch (Fig. 55 /1).

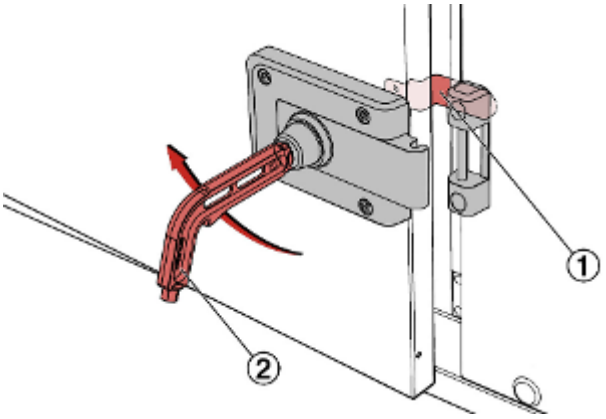


Fig. 56: Releasing the safety catch

4. Turn the TROX special key or operating lever (Fig. 56 /2) 90° clockwise.

   ⇨ This releases the safety catch (Fig. 56 /1); the inspection access door can now be completely opened.

4.3.3 Cleaning the AHU

Cleaning the AHU

The AHU (external and internal surfaces) and the installed components are cleaned manually with the aid of cleaning equipment (dry/moist method). In the process, dust deposits are first extracted or blown off in a dry process. If necessary, the surfaces and components are subsequently cleaned with a damp cloth.

Cleaning equipment and aids:

- Vacuum cleaner, compressed air, steam cleaner
- Damp, lint-free cloths
- Non-corrosive and silicone-free cleaning agents

Information on resistance to cleaning agents and disinfectants can be requested from TROX.

During cleaning, please note:

- When you remove dirt or dust, ensure that it does not get into adjacent parts of the system. Remove dirt and dirty water carefully and dispose of them correctly.
- Special regulations or guidelines may apply to the cleaning of AHUs in the pharmaceutical and food industries and in hospitals; be sure to comply with them.

Cleaning the heating coil

WARNING!

Risk of injury from hot surfaces!

The surfaces of the heating coil can heat up to 100 °C during operation. Skin contact with hot surfaces causes severe skin burns.

– Wear heat-resistant protective clothing and gloves whenever you work near a potentially hot surface.
– Before you start working, make sure that all surfaces have cooled down to the ambient temperature.

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 heating coil may cause cuts or grazes.

– Be careful when you are working on the heating coil.
– Wear protective gloves, safety shoes and a hard hat.

Clean the heating coil while installed; remove it only if it is otherwise not accessible.

Ensure the following:

- Use only water, compressed air or a vacuum cleaner.
- Do not use a high pressure cleaner or high pressure steam cleaner.
- Be careful so as not to damage the blades.
- Use only cleaning agents with a pH value between 7 and 9.
- Prevent dirt and dust from getting into adjacent parts of the system.
- Carefully remove dirt and dirty water.
- Dispose correctly of dirt and dirty water.

Cleaning the cooling coil

WARNING!

Risk of injury from cold surfaces!

The surfaces of the cooling coil can cool down to -20 °C during operation. Skin contact with cold surfaces causes frostbite and cold burns.

– Wear protective clothing and gloves that protect you from the cold when you work near a potentially cold surface.
– Before you start working, make sure that all surfaces have warmed up to the ambient temperature.

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 cooling coil may cause cuts or grazes.

– Be careful when you are working on the cooling coil.
– Wear protective gloves, safety shoes and a hard hat.

Clean the cooling coil while installed; remove it only if it is otherwise not accessible.

Ensure the following:

- Use only water, compressed air or a vacuum cleaner.
- Do not use a high pressure cleaner or high pressure steam cleaner.
- Be careful so as not to damage the fins.
- Use only cleaning agents with a pH value between 7 and 9.
- Prevent dirt and dust from getting into adjacent parts of the system.
- Carefully remove dirt and dirty water.
- Dispose correctly of dirt and dirty water.

Cleaning the rotary heat exchanger

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 rotary heat exchanger may cause cuts or grazes.

– Be careful when you are working on the rotary heat exchanger.
– Wear protective gloves, safety shoes and a hard hat.

Clean the rotary heat exchanger if it has been idle for 14 days or more; clean it while installed; remove it only if it is otherwise not accessible.

Ensure the following:

- Use only water, compressed air or a vacuum cleaner.
- Do not use a high pressure cleaner or high pressure steam cleaner.
- Be careful so as not to damage the blades.
- Use only cleaning agents with a pH value between 7 and 9.
- Prevent dirt and dust from getting into adjacent parts of the system.
- Carefully remove dirt and dirty water.
- Dispose correctly of dirt and dirty water.

Cleaning the plate heat exchanger

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 plate heat exchanger may cause cuts or grazes.

– Be careful when you are working on the plate heat exchanger.
– Wear protective gloves, safety shoes and a hard hat.

Clean the plate heat exchanger while installed; remove it only if it is otherwise not accessible.

Ensure the following:

- Use only water, compressed air or a vacuum cleaner.
- Do not use a high pressure cleaner or high pressure steam cleaner.
- Direct air jets or water jets only at an angle of 90° onto surfaces.
- Be careful so as not to damage the blades.
- Use only cleaning agents with a pH value between 7 and 9.
- Prevent dirt and dust from getting into adjacent parts of the system.
- Carefully remove dirt and dirty water.
- Dispose correctly of dirt and dirty water.

4.3.4 Checking and changing the filter

4.3.4.1 Check / replace filter with clamp fastening

General information on inspecting the filters

Maintenance applies mainly to the filter element. Check the filter regularly and replace it, if necessary.

The service life of a filter depends mainly on how contaminated the air is. Check the filter in intervals that are short enough so that you can anticipate any defects or problems before they actually occur.

Replace the filter immediately if any of the following is true:

- When the specified final pressure difference is reached, *Chapter 3.3 'Inspections during operation' on page 28*
- There are hygiene problems (micro-organisms, fungal spores, odours, etc.)
- The filter is defective
- The maximum filter usage time has been reached (1 years, to VDI 3803, part 4).

Optical filter inspection and replacement

Personnel:

- Instructed person

Protective equipment:

- Industrial safety helmet
- Safety goggles
- Dust mask
- Protective clothing
- Safety shoes
- Protective gloves

Tool:

- Refuse sacks
- Lighting
- Replacement filter
- Damp cleaning cloth
- Industrial vacuum cleaner
- TROX special key

CAUTION!

Risk of injury due to a missing filter element!

If no filter element has been fitted in the AHU, dust and germs can get into the ventilation system and will be spread by the AHU. People may fall seriously ill as a consequence.

– Do not put the AHU into operation if no filter element has been fitted.
– Make sure that enough spare filter elements are readily available.

1. Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*.
2. Open the filter unit inspection access doors on the dust side, *Chapter 4.3.2 'Opening inspection access doors' on page 57*.

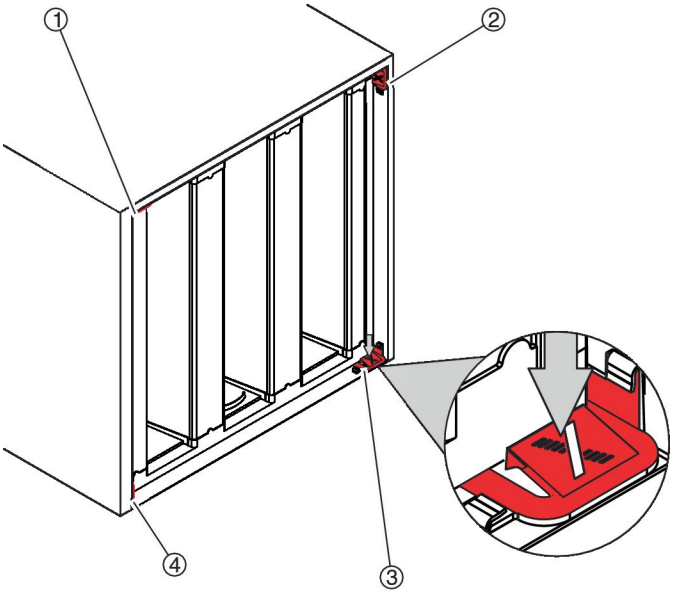


Fig. 57: Loosening the quick release fasteners

3. Press down the quick release fasteners (Fig. 57 /1 to 4).

   ⇨ The attachment of the filter is solved.

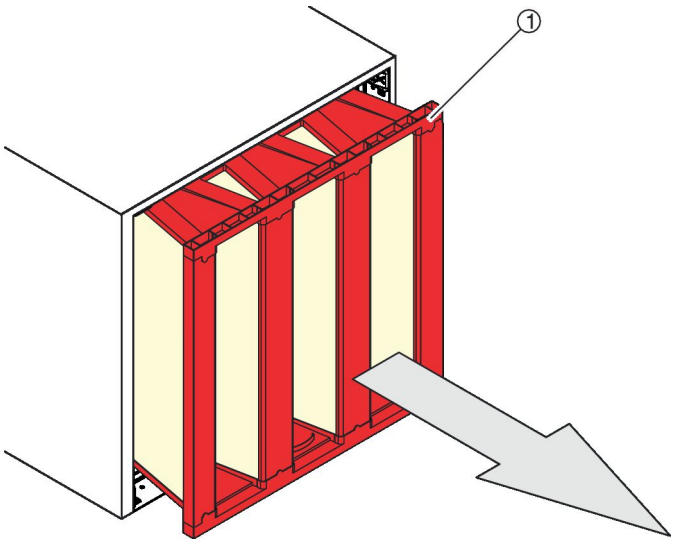


Fig. 58: Pulling out the filter

4. Pull the filter (Fig. 58 /1) out to the front.
5. Check the removed filter for defects, optical or hygienic defects, replace the filter if necessary. Place the replaced filter in a waste bag and seal the bag.

   Air filters can be disposed of with household waste.
6. Vacuum off any dirt from the filter chamber, filter frame, clamp fastenings etc. and then clean with a damp cloth.

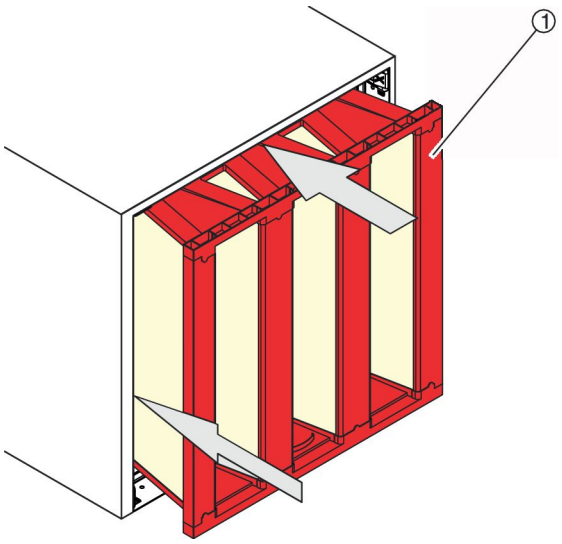


Fig. 59: Replacing the filter

7. Insert the filter.

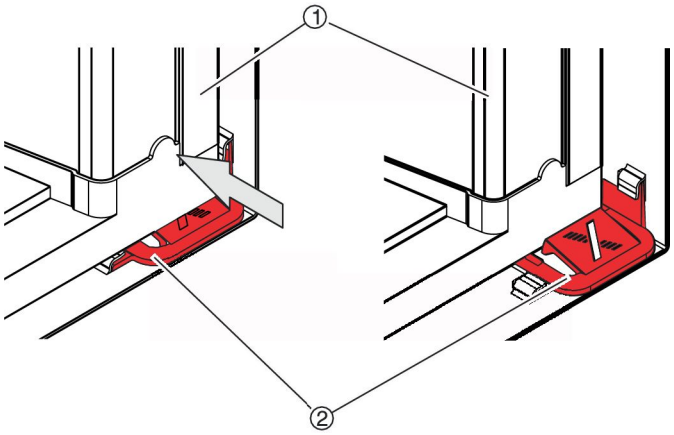


Fig. 60: Locking the filter element in place

8. Push the new filter element (Fig. 60 /1) in and over the quick release fasteners (Fig. 60 /2) until it locks into place.
9. Close the inspection access doors.
10. Prepare restart, *'Before you start the AHU' on page 28* .
11. Remove the padlock from the mains isolator.
12. Restart the air handling unit, *'Switching the mains isolator on' on page 28* .
13. Go to the X-CUBE control user interface and enter the new filter in accordance with the software documentation.

4.3.4.2 Filter with clamping rail

General information on inspecting the filters

Maintenance applies mainly to the filter element. Check the filter regularly and replace it, if necessary.

The service life of a filter depends mainly on how contaminated the air is. Check the filter in intervals that are short enough so that you can anticipate any defects or problems before they actually occur.

Replace the filter immediately if any of the following is true:

- When the specified final pressure difference is reached, *Chapter 3.3 'Inspections during operation' on page 28*
- There are hygiene problems (micro-organisms, fungal spores, odours, etc.)
- The filter is defective
- The maximum filter usage time has been reached (1 years, to VDI 3803, part 4).

Optical filter inspection and replacement

Personnel:

- Instructed person

Protective equipment:

- Industrial safety helmet
- Safety goggles
- Dust mask
- Protective clothing
- Safety shoes
- Protective gloves

Tool:

- Refuse sacks
- Lighting
- Replacement filter
- Damp cleaning cloth
- Industrial vacuum cleaner
- TROX special key

CAUTION!

Risk of injury due to a missing filter element!

If no filter element has been fitted in the AHU, dust and germs can get into the ventilation system and will be spread by the AHU. People may fall seriously ill as a consequence.

– Do not put the AHU into operation if no filter element has been fitted.
– Make sure that enough spare filter elements are readily available.

1. Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*.
2. Open the filter inspection access doors, *Chapter 4.3.2 'Opening inspection access doors' on page 57*.

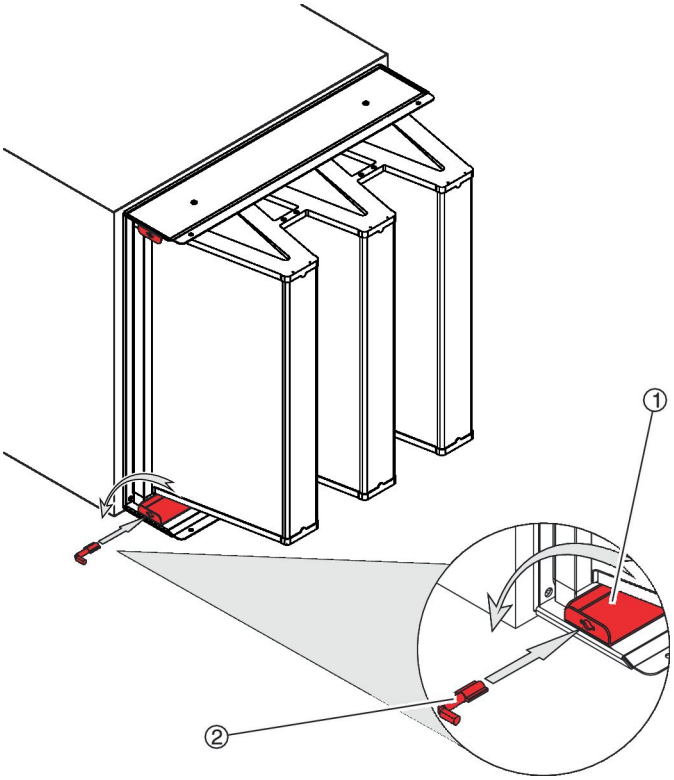


Fig. 61: Inserting the special key

3. Insert the special key (Fig. 61 /2) into the recess of each clamping rail (Fig. 61 /1) and turn it anti-clockwise by 90°.

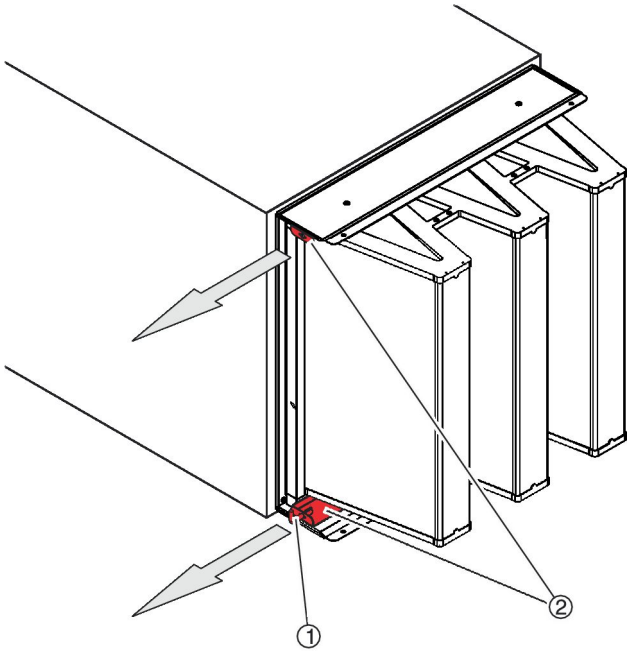


Fig. 62: Releasing the clamping rails

4. Use the special key (Fig. 62 /1) to pull out the clamping rails (Fig. 62 /2) as far as they will go.

   ⇨ Filter is loosened.

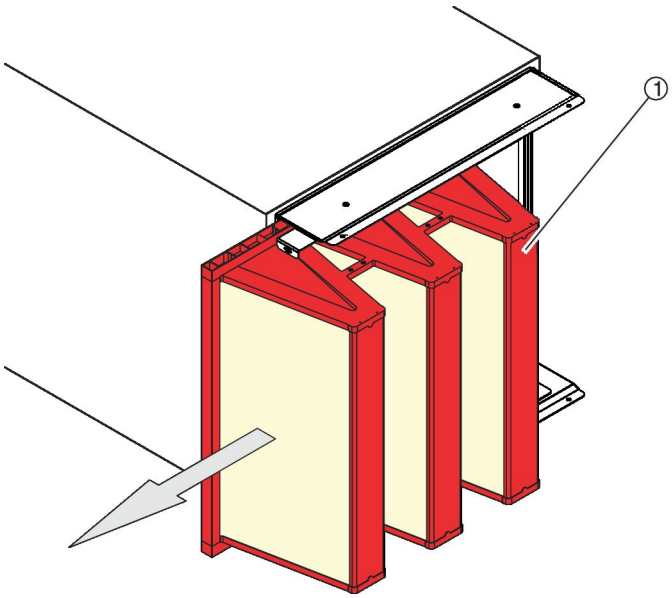


Fig. 63: Pulling out the filter

5. Pull the filter (Fig. 63 /1) out to the side.
6. Check the removed filter for defects, optical or hygienic defects, replace the filter if necessary. Place the replaced filter in a waste bag and seal the bag.

   Air filters can be disposed of with household waste.
7. Vacuum off any dirt from the filter chamber, filter frame, clamping rails, etc. and then clean with a damp cloth.

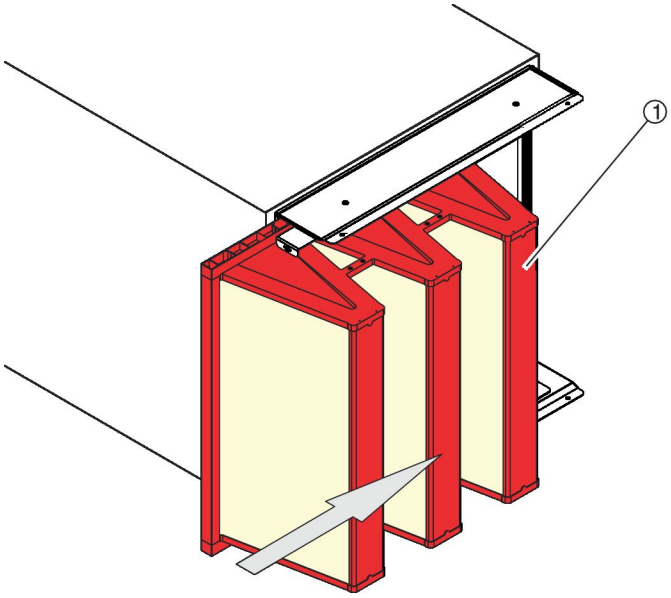


Fig. 64: Replacing the filter

8. Insert the filter (Fig. 64 /1) and slide it into the intended position.

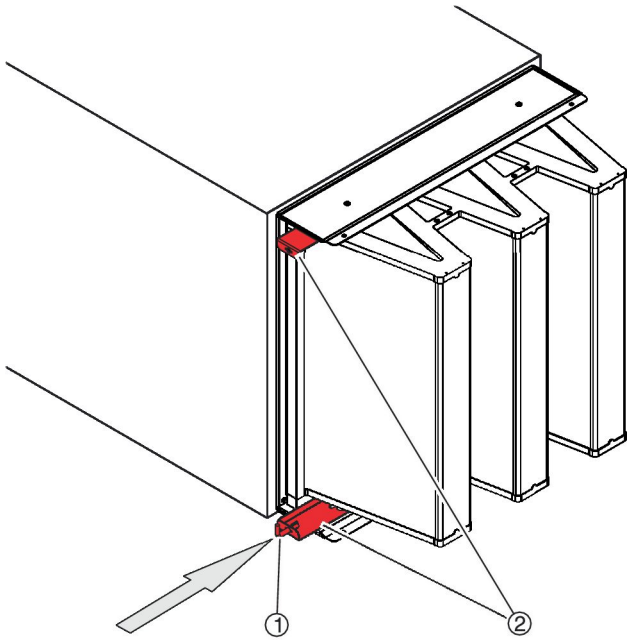


Fig. 65: Pushing the clamping rails in

9. Use the special key (Fig. 65 /1) to push the clamping rails (Fig. 65 /2) in as far as they will go.

   ⇨ Filter is attached.
10. Close the inspection access doors.
11. Carry out a zero point correction for the pressure monitor, .
12. Prepare restart, *'Before you start the AHU' on page 28* .
13. Remove the padlock from the mains isolator.
14. Restart the air handling unit, *'Switching the mains isolator on' on page 28* .

15. Go to the X-CUBE control user interface and enter the new filter in accordance with the software documentation.
16. If software by others is used, enter the new filter in that software or MCE.

4.4 Completion of the maintenance work

Personnel:

- Instructed person

1. Prepare restart, *'Before you start the AHU' on page 28*
2. Remove the padlock from the mains isolator.
3. Restart the air handling unit, *'Switching the mains isolator on' on page 28* .
4. If fault messages occur on the control system, it may be necessary to acknowledge them.

5 Faults

5.1 Safety notes regarding trouble-shooting

Incorrect troubleshooting

WARNING!

Risk of injury due to incorrect troubleshooting!

Incorrect troubleshooting can cause serious injuries and considerable damage to property.

- Before you start maintenance, switch off the air handling unit and secure it against being restarted accidentally.
- Refer to the list of possible faults to see who should or should not clear a fault.
- Before you start, make sure that there is sufficient clearance for the work you have to complete.
- Keep the work area tidy and clean. Parts and tools that are loosely stacked or left lying around are a source of accident.
- Before you recommission the unit, ensure the following:
  - All faults have been rectified according to this manual.
  - Nobody is inside the AHU.
  - All inspection access doors and covers have been closed.
  - All safeguards have been installed and function correctly.

Rotating parts of a fan

WARNING!

Risk of injury from rotating parts!

Rotating parts in the fan can cause severe injuries.

- Do not reach into the moving fan or tamper with it.
- Do not open any covers or inspection access panels while the unit is in operation.
- Make sure that the rotor is inaccessible while in operation.
- The fan does not stop immediately! Check that no parts are moving before you open an inspection access door.
- 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, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. Wait until all parts have come to a standstill.

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.

5.2 X-CUBE control alarms

Alarms are displayed on the X-CUBE control user interface. Faults are displayed as text messages on the user interface.

You can view alarms on the touch panel or on the web interface. Alarms are displayed as text messages, which you can acknowledge (reset the alarm).

5.2.1 Alarm displays on the touch panel

Personnel:

- Facility manager

Fig. 66: Alarm display

(blue)	Reduced operation of the AHU due to a fault. Service required.
(red)	The AHU has been stopped due to a fault. Service required.

Alarms are generally acknowledged (reset) automatically as soon as the fault for an alarm has been rectified. Some alarms require manual acknowledgement, e. g. fire alarms.

Resetting alarms

1. Select *'Menu* ➔ *Alarms'* or the alarm symbol (Fig. 66 /1, displays only for current alarms).

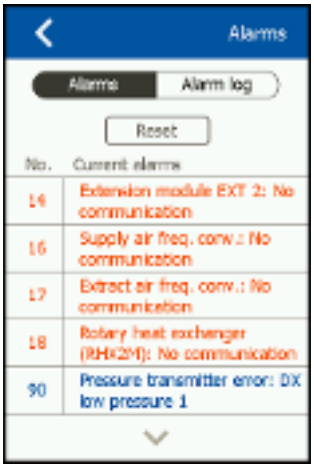


Fig. 67: List of alarms

2. To reset a current alarm, select *'Reset'*. If a fault has not been rectified, it will reappear.

   The *'Alarms'* screen shows the current alarms. To see earlier alarms, select *'Alarm log'*.

5.2.2 Alarm displays on the web interface

Personnel:

- Facility manager

Current alarms are displayed with an alarm number and a text. 'A' alarms are displayed in red, 'B' alarms are displayed in blue.

1. On the main menu, select *'Service ➔ Alarms'*.

   ⇨ The *'Alarms'* screen (Fig. 68) displays.

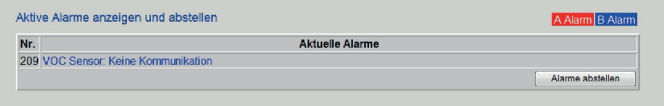


Fig. 68: Alarms

2. Click *'Reset alarms'* (Fig. 68) to reset alarms.

   ⇨ The alarms are then deleted from the list. Current alarms will, however, reappear on the new alarm list.

3. On the main menu, select *'Service ➔ Alarm log'*.

   ⇨ The *'Alarm log'* screen (Fig. 69) displays.

Fig. 69: List of alarms

4. The list of alarms (Fig. 69) shows the last 16 alarms, including date and time and alarm number.

5. On the main menu, select *'Service ➔ Alarm forecast'*.

   ⇨ The *'Possible alarms'* list (Fig. 70) displays.

Fig. 70: Possible alarms

These are alarms which occurred, but have not yet been activated by the system.

For an overview of 'A' alarms and 'B' alarms, limit values and delays, see the list of alarms in the appendix ().

5.3 List of faults

You may also commission the TROX Technical Service to carry out maintenance (↳ 'TROX Technical Support' on page 3).

Fault description	Cause	Remedy	Personnel
Filter change	The filter element is contaminated.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Replace the filter element, ↳ *4.3.4 'Checking and changing the filter' on page 60*	Instructed person
	The operating time has been exceeded.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Replace the filter element, ↳ *4.3.4 'Checking and changing the filter' on page 60* .	Instructed person
	Service life has been exceeded.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Replace the filter element, ↳ *4.3.4 'Checking and changing the filter' on page 60* .	Instructed person
Frost protection is active.	The anti-frost thermostat detected a low temperature, and frost protection has been activated to ensure that no AHU components become damaged. The AHU has been switched off automatically.	In this order: ■ Secure the AHU against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Check the thermostat settings. The temperature set on the thermostat must not be lower than 5 °C. ■ Check whether cooling coil, heating coil or run around coil system contain heat transfer fluid. ■ If necessary, replenish the heat transfer fluid according to the instructions from the system or component manufacturer.	Instructed person
Preventive frost protection is active.	Preventive frost protection mode has been activated to protect the heating coils.	In this order: ■ Secure the AHU against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* .	Instructed person

Fault description	Cause	Remedy	Personnel
Preventive frost protection is active.	Preventive frost protection mode has been activated to protect the heating coils.	■ Check the thermostat settings. The temperature set on the thermostat must not be lower than 5 °C. ■ Check whether cooling coil, heating coil or run around coil system contain heat transfer fluid. ■ If necessary, replenish the heat transfer fluid according to the instructions from the system or component manufacturer.	Instructed person
Fire damper has been triggered – unit has been switched off.	There is a fire. The AHU has been switched off automatically.	Initiate fire-fighting.	Instructed person
	The fusible link is defective. The AHU has been switched off automatically.	Contact the TROX Technical Service, *'TROX Technical Support' on page 3*.	Instructed person
Fire damper has been triggered – unit has not been switched off.	There is a fire.	Initiate fire-fighting.	Instructed person
	The fusible link is defective.	Contact the TROX Technical Service, *'TROX Technical Support' on page 3*.	Instructed person
Locked by central fire alarm system	There is a fire. The fire alarm system (by others) has generated an alarm. The AHU has been switched off automatically.	Initiate fire-fighting.	Instructed person
	False alarm. The fire alarm system (by others) has generated an alarm. The AHU has been switched off automatically.	The fire alarm system should be inspected; contact the manufacturer of the fire alarm system.	Instructed person
Fault – 24 V control voltage.	The 24-volt DC power supply unit in the switch cabinet has a fault. The AHU has been switched off automatically.	Commission a skilled qualified electrician to rectify the fault.	Instructed person
	A short circuit 24 V DC range has occurred. The AHU has been switched off automatically.	Commission a skilled qualified electrician to rectify the fault.	Instructed person
Error fuse control cabinet	Circuit breaker in the switch cabinet was triggered by a short circuit.	■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Pump motor protection switch.	Motor current too high due to blocked motor. Fan motor protection switch has triggered and air handling unit has switched off.	■ Secure the AHU against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	Motor current too high due to short circuit. Fan motor protection switch has triggered and air handling unit has switched off.	■ Secure the AHU against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person

Fault description	Cause	Remedy	Personnel
Pump motor protection switch.	Motor current too high due to defective bearings. Fan motor protection switch has triggered and air handling unit has switched off.	■ Secure the AHU against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Extract air fan motor protection switch.	Motor current too high due to blocked motor. Fan motor protection switch has triggered and air handling unit has switched off.	■ Secure the AHU against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	Motor current too high due to short circuit. Fan motor protection switch has triggered and air handling unit has switched off.	■ Secure the AHU against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	Motor current too high due to defective bearings. Fan motor protection switch has triggered and air handling unit has switched off.	■ Secure the AHU against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Pump motor protection switch.	Motor current too high due to blocked motor. Pump motor protection switch on the heating coil has triggered.	Commission a skilled qualified electrician to rectify the fault.	Instructed person
	Motor current too high due to short circuit. Pump motor protection switch on the heating coil has triggered.	Commission a skilled qualified electrician to rectify the fault.	Instructed person
	Motor current too high due to defective bearings. Pump motor protection switch on the heating coil has triggered.	Commission a skilled qualified electrician to rectify the fault.	Instructed person
External lock	The AHU has been switched off due to an external lock.	Release of the external lock is required.	Instructed person
Alarm rotation guard rotary heat exchanger	The rotor operation monitoring function has detected a problem.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Visually check the V-belt for damage; contact a skilled qualified electrician for repair, if necessary.	Instructed person
Defective Modbus cable or missing terminating resistor	Bus end resistor is missing.	Commission a skilled qualified electrician to rectify the fault.	Instructed person
	The bus cable in the AHU has become detached or cut.	Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with pump.	The communication cable to the component has become detached or cut.	In this order:	Instructed person

Fault description	Cause	Remedy	Personnel
Fault with pump.	The communication cable to the component has become detached or cut.	■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with valve.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus multi-leaf damper.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus fan.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* .	Instructed person

Fault description	Cause	Remedy	Personnel
Fault with Modbus fan.	The communication cable to the component has become detached or cut.	■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus differential pressure sensor.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus plate heat exchanger differential pressure sensor.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus plate heat exchanger pass-through damper.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order:	Instructed person

Fault description	Cause	Remedy	Personnel
Fault with Modbus plate heat exchanger pass-through damper.	No voltage is supplied to the component.	▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus plate heat exchanger bypass damper.	The communication cable to the component has become detached or cut.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus rotary heat exchanger speed.	The communication cable to the component has become detached or cut.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus rotary heat exchanger alarm.	The communication cable to the component has become detached or cut.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* .	Instructed person

Fault description	Cause	Remedy	Personnel
Fault with Modbus rotary heat exchanger alarm.	No voltage is supplied to the component.	▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus humidity sensor.	The communication cable to the component has become detached or cut.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus temperature sensor.	The communication cable to the component has become detached or cut.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus electric air heater.	The communication cable to the component has become detached or cut.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person

Fault description	Cause	Remedy	Personnel
Fault with Modbus room air temperature sensor.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus room humidity sensor.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus RAC system valve.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus RAC system pump.	The communication cable to the component has become detached or cut.	In this order:	Instructed person

Fault description	Cause	Remedy	Personnel
Fault with Modbus RAC system pump.	The communication cable to the component has become detached or cut.	■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus outside temperature sensor.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus VOC sensor.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* . ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus CO2 sensor.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, ↳ *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8* .	Instructed person

Fault description	Cause	Remedy	Personnel
Fault with Modbus CO2 sensor.	The communication cable to the component has become detached or cut.	■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with Modbus RAC system.	The communication cable to the component has become detached or cut.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
	No voltage is supplied to the component.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Parameter loading error	The function of the PLC is impaired.	Commission a skilled qualified electrician to rectify the fault.	Instructed person
Factory settings loading error	The function of the PLC is impaired.	Commission a skilled qualified electrician to rectify the fault.	Instructed person
Internal fault with supply air fan; acknowledgement on AHU may be necessary.	The integral frequency inverter for the fan is not functioning correctly. The AHU has been switched off.	■ Secure the AHU against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Internal fault with extract air fan; acknowledgement on AHU may be necessary.	The integral frequency inverter for the fan is not functioning correctly. The AHU has been switched off.	■ Secure the AHU against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ■ Secure the air handling unit against being switched on accidentally. ■ Commission a skilled qualified electrician to rectify the fault.	Instructed person
The thermal cut-out for the electric heater has been triggered.	The airflow above the air heater is too low. The air heater is overheating.	In this order: ■ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*.	Instructed person

Fault description	Cause	Remedy	Personnel
The thermal cut-out for the electric heater has been triggered.	The airflow above the air heater is too low. The air heater is overheating.	▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Electric duct air heater – consolidated alarms.	The thermal cut-out on the air heater has been triggered.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
The airflow monitor for the electric duct air heater has been triggered.	No airflow. Ducts have been shut off.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with direct evaporator.	The function of the external refrigeration system is impaired.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with RAC system pump.	The function of the RAC system pump is impaired due to a blockage, bearing defect or short circuit.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Humidifier – fault	The function of the humidifier is impaired.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person
Fault with external heat pump.	The function of the external heat pump is impaired.	In this order: ▪ Switch off the air handling unit and secure it against being switched on accidentally, *Chapter 1.4 'Securing the unit against being switched on accidentally' on page 8*. ▪ Commission a skilled qualified electrician to rectify the fault.	Instructed person

5.4 Completion of troubleshooting

Personnel:

- Instructed person

1. Prepare restart, ‘*Before you start the AHU*’ *on page 28*
2. Remove the padlock from the mains isolator.
3. Restart the air handling unit, ‘*Switching the mains isolator on*’ *on page 28* .
4. If fault messages occur on the control system, it may be necessary to acknowledge them.

6 Decommissioning

WARNING!

Danger due to incorrect decommissioning!

Incorrect decommissioning may lead to dangerous situations.

– Appoint a HVAC technician for decommissioning.
– Appoint a qualified electrical and refrigeration specialist for decommissioning.

Decommissioning if there is a risk of frost

A decommissioned AHU has to be protected from frost. If only water (without any additives) has been used as a heat transfer fluid, you have to drain the following components:

- Heating coil
- Cooling coil
- Humidifier
- Condensate drip trays
- Drain traps
- Run around coil system

Decommissioning the rotary heat exchanger

If the unit is down for up to 3 months (e.g. in summer), start the fan every 2 weeks so it retains its self-cleaning function.

Downtime of 3 months or longer

If downtime lasts 3 months or longer

- Remove the drive belts of the rotary heat exchangers in order to protect the belts from damage.
- Physically disconnect the entire AHU from the mains.
- Ensure that any residual energy is dissipated.
- Remove and dispose of any operating fluids, auxiliary materials and leftover processing materials in an environmentally sound manner.

Downtime of 1 year or longer

If downtime lasts 1 year or longer

- Replace the bearings.
- If an automatic lubricator for the bearings is in place, remove the used lubricant and replace it with new lubricant; follow the instructions of the fan manufacturer.
- Remove the droplet eliminator and demister for cleaning.

Removing motors

Use only suitable and approved equipment to lift and move motors. If, for example, an integral cross bar and trolley are used to remove a fan motor, ensure that the unit remains stable, e.g. by fixing it to the building structure.

7 Glossary

Exhaust air – EHA

Exhaust air is the air flow that flows outdoors from the inside.

Extract air – ETA

Extract air is the air flow leaving the treated room.

Indoor air – IDA

Indoor air is the air in the treated room or area.

Outdoor air – ODA

Outdoor air (ODA) is the untreated air that flows into the AHU from outside or into an opening.

Recirculated air – RCA

Recirculated air is extract air that is returned to the air handling unit and recycled as supply air.

Secondary air – SEC

Secondary air is the air flow that is taken from a room and returned to the same room after treatment.

Supply air – SUP

Airflow entering the room or air entering the unit after being treated in the AHU.

Transfer air – TRA

Room air that flows from the treated room into another treated area is referred to as transfer air.

TROX® TECHNIK

The art of handling air

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