



Air Handling Unit

X-CUBE



TROX[®] TECHNIK

The art of handling air

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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 1.3.1 'Qualification' on page 8*) 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 these instructions, the following documents apply:

- Transport and installation manual
- Order-specific approval drawing
- Safety data sheets, ↪ Appendix

TROX Technical Service

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

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

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Limitation of liability

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

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

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

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

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

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

Safety notes

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

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

DANGER!

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

WARNING!

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

CAUTION!

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

NOTICE!

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

ENVIRONMENT!

Environmental pollution hazard.






Tips and recommendations



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





Specific safety notes




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

Warning signs	Type of danger
	Warning - danger of crushing.
	Warning – hand injuries.
	Warning – high-voltage.
	Warning – danger of falling.
	Warning – 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	6			
	1.1 Correct use	6			
	1.2 System owner's responsibility	7			
	1.3 Personnel requirements	8			
	1.3.1 Qualification	8			
	1.3.2 Unauthorised persons	8			
	1.4 Personal protective equipment	9			
	1.5 Safety signs	10			
	1.6 Safeguards	11			
	1.7 Securing the unit against being switched on accidentally	13			
	1.8 Work areas and hazardous areas	14			
	1.9 Residual risks	15			
	1.9.1 General workplace hazards	15			
	1.9.2 Electric shock hazards	15			
	1.9.3 Moving machinery hazards	16			
	1.9.4 Hazards from the hydraulic system	17			
	1.9.5 Hazards from high and low tempera- tures	17			
	1.9.6 Hazardous substances and operating fluids	18			
	1.9.7 Fire hazards	19			
	1.9.8 Risk of entrapment in units with whole body access	19			
	1.10 Environmental protection	20			
	1.11 Measures to take if a harmful substance has been released	20			
2	Functional description	22			
	2.1 Symbols used on the air handling unit	22			
	2.2 Function of the air handling unit	22			
	2.3 Operating modes	22			
	2.4 Function of each component	23			
	2.5 Operating and display elements	24			
	2.5.1 Mains isolator	24			
	2.5.2 Inspection access doors with a lock	24			
	2.5.3 Filter monitoring	25			
	2.6 Connections and interfaces	25			
3	Control	27			
	3.1 Safety notes regarding operation	27			
	3.2 Emergency switch-off	27			
	3.3 Switch-off in the event of a fire	27			
	3.4 Preparing a (re)start	27			
	3.5 Starting the air handling unit	27			
	3.6 Checks during operation	27			
	3.7 Tips for operation	28			
	3.8 After shutdown	28			
	3.9 Reading the differential pressure on the filter 	29			
4	Maintenance	30			
	4.1 Safety notes regarding maintenance	30			
	4.2 Switching off the AHU and securing it against being switched on accidentally ...	31			
	4.3 Maintenance plan	31			
	4.4 Maintenance	39			
	4.4.1 Opening inspection access doors	39			
	4.4.2  Checking filters for contamination	40			
	4.4.3 Cleaning the AHU	41			
	4.4.4  Replacing a filter element	44			
	4.5 After maintenance	46			
5	Faults	47			
	5.1 Safety notes regarding troubleshooting ...	47			
	5.2 Faults displayed on the AHU	48			
	5.3 List of faults	48			
	5.4 Troubleshooting	48			
	5.5 After troubleshooting	48			
6	Replacement parts	49			
	6.1 Safety notes regarding replacement parts	49			
	6.2 Ordering replacement parts	49			
7	Accessories	50			
8	Removal and disposal	51			
	8.1 Safety notes regarding disassembly and disposal	51			
	8.2 Disassembly	52			
	8.3 Disposal	52			
9	Technical data	54			
	9.1 Operating conditions	54			
	9.2 Technical data sheet	54			
	9.3 Rating plate	54			
	9.4 CE declaration of conformity	54			
10	Glossary	55			
11	Index	56			
	Appendix	58			
	A Safety data sheets	59			

1 Safety

1.1 Correct use

The TROX X-CUBE air handling unit is designed exclusively for the treatment of air, i.e. transporting, filtering, heating, cooling, humidifying and dehumidifying air.

Correct use also involves complying with all the information provided in this manual.

Any use that goes beyond the correct use or different use of the unit is regarded as incorrect use.

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 System owner's responsibility

System owner

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

System owner's obligations

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

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

In particular:

- The system owner must 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.

System owner's additional obligations for AHUs with a refrigeration system

For AHUs with a refrigeration system/evaporator:

- The system owner must document any checks in the supplied refrigeration system log.
- The system owner must regularly (every year) instruct personnel in:
 - Safety regulations for refrigeration systems
 - Risks from using refrigeration systems
 - Emergency measures in case of an accident or fault related to refrigeration systems

This instruction has to be documented.

- The system owner must ensure that work on the refrigeration system is only carried out by skilled qualified refrigeration technicians.
- The system owner must ensure regular maintenance and service according to local regulations.
- The system owner must comply with technical and safety-related national standards and guidelines.



As standard, the TROX Technical Service will document in the refrigeration system log any required maintenance jobs they carry out.

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

1.3 Personnel requirements

1.3.1 Qualification

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

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 persons have been adequately advised or supervised to enable them 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:

- Visual inspections
- Replace filter elements
- Clean filter chambers
- Clean heat exchangers
- Clean fans

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

Webserver 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

1.3.2 Unauthorised persons

WARNING!

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

Unauthorised persons 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 persons away from hazardous areas and work areas.
- Instruct these persons to leave the hazardous area or work area.
- Stop work while unauthorised persons are present in the hazardous area or work area.

1.4 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

Hearing protection



Hearing protection protects against hearing damage resulting from noise exposure.

Industrial safety helmet



Industrial safety helmets protect the head from falling objects, swinging loads, and impacts with stationary objects.

Protective clothing



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

Protective gloves



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

Safety harness



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

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

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

Safety shoes



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

Safety goggles



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

1.5 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 11](#), on the air handling unit.

Electrical voltage



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

Unauthorised persons 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



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.

1.6 Safeguards

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).

Local isolator

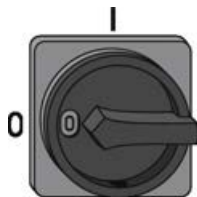


Fig. 2: Local isolator



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

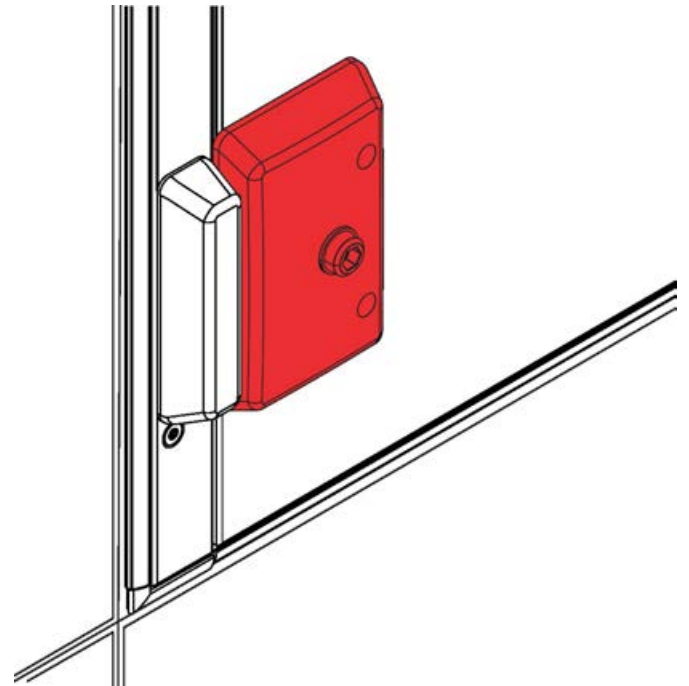


Fig. 3: Safety lock

Inspection access doors to hazardous areas can only be opened with a special key.

Safety catch on discharge side inspection access doors

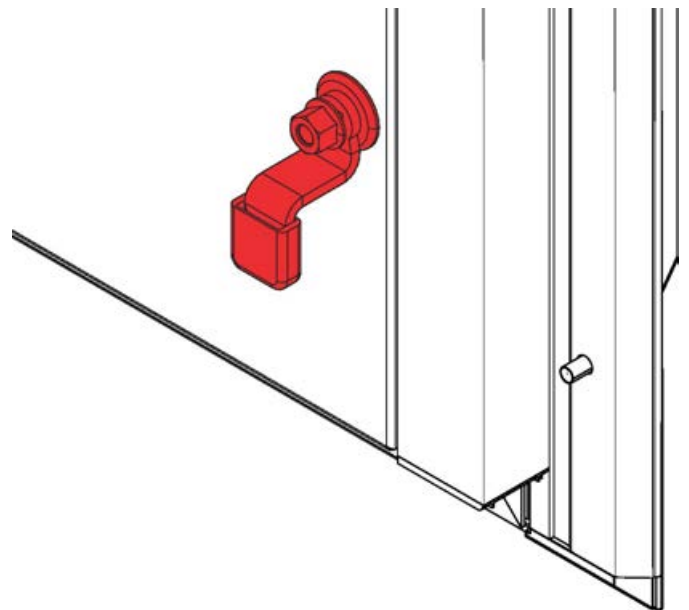


Fig. 4: Safety catch

Each inspection access door on the discharge side is fitted with a safety catch (Fig. 4). The safety catch prevents the inspection access door from suddenly swinging open and injuring people.

Inside door handle



Fig. 5: Inside door handle on an inspection access door

If an AHU casing unit is higher than 1836 mm, the inspection access doors are factory fitted with an inside door handle. The inside door handle prevents people from becoming trapped inside the unit.

Inside door handle with safety catch

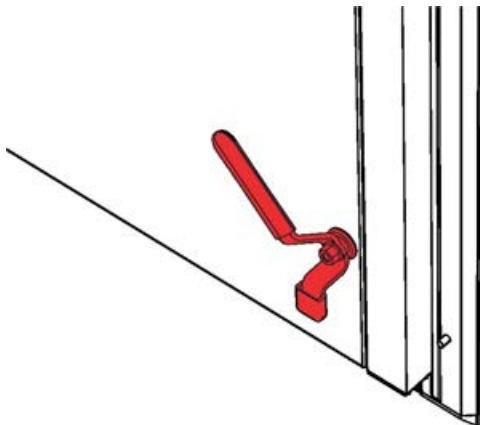


Fig. 6: Inside door handle with safety catch

If an AHU casing unit is higher than 1836 mm, the inspection access doors on the discharge side are factory fitted with an inside door handle with safety catch. This safeguard prevents:

- inspection access doors on the discharge side from swinging open and injuring people
- people from becoming trapped inside the unit

Hold open device

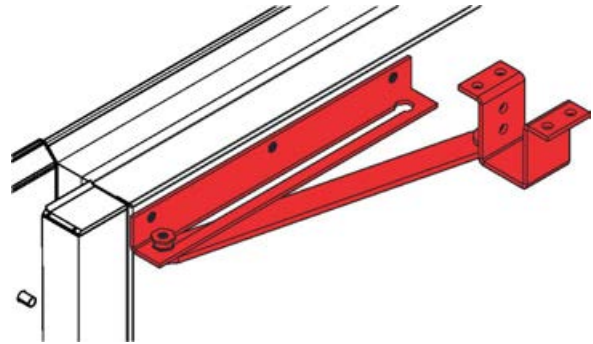


Fig. 7: Hold open device for outdoor air handling units

On devices designed for outdoor installations, each inspection access door is equipped with a hold open device (Fig. 7). The hold open device prevents the inspection access door from being slammed shut by wind.

Note: If there is no hold open device on an inspection access door due to lack of space, it must be secured against slamming shut by suitable means.



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.

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.

1.7 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. 8: Securing the mains isolator

1. ▶

! WARNING!

Electric shock hazard!

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

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

2. ▶ Secure the mains isolator with a padlock (Fig. 8).
3. ▶ Keep the key in a safe place.
4. ▶ Cover the mains isolator with a notice informing people that work is in progress.

1.8 Work areas and hazardous areas

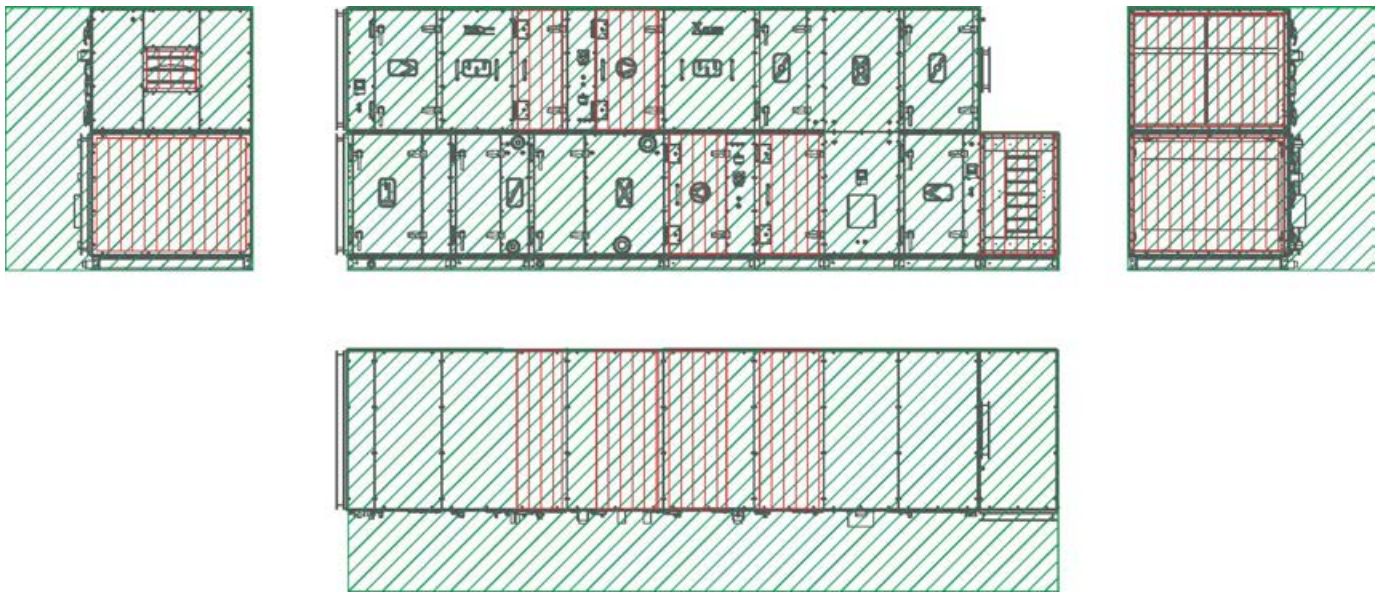




Fig. 9: Hazardous areas

-  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.

1.9 Residual risks

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 observe the safety notes provided in the following chapters of this manual to reduce health hazards and prevent any hazardous situations.

1.9.1 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.

1.9.2 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.

1.9.3 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 1.7 'Securing the unit against being switched on accidentally' on page 13*. 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 1.7 'Securing the unit against being switched on accidentally' on page 13*. 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.

1.9.4 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.
 *Appendix A.2 'Freezing agent' on page 69*

1.9.5 Hazards from 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.

1.9.6 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.  *Appendix A.2 'Freezing agent' on page 69*
- 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 swallow 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.  *Appendix A.1 'Compressor oil' on page 59*

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.

1.9.7 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.

1.9.8 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.

Measures to take if a harmful substance has been...

1.10 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 one 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.

1.11 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, ↗ *Appendix A.2 'Freezing agent' on page 69*.

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, ↗ *Appendix A.1 'Compressor oil' on page 59*.

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.

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.

2 Functional description

Your air handling unit (AHU) is a bespoke product and has been configured according to your project. A list of all functions is given on the technical data sheets. An illustration and the technical data should already have been provided to you for information and acceptance. We recommend that you keep those documents with this manual.

2.1 Symbols used on the air handling unit

Symbols on the AHU casing indicate which optional components have been installed.

Explanation

Symbol	Description
	Filters
	Fan: <ul style="list-style-type: none"> Centrifugal fan FanArray
	Sound attenuators
	Multileaf damper
	Cooling: <ul style="list-style-type: none"> Cooling coil Evaporator
	Heating: <ul style="list-style-type: none"> Heating coil Electric air heater Condenser Steam heated register
	Rotary heat exchanger
	Plate heat exchanger
	Run around coil system
	Run around coil system with hydraulic unit
	Humidifier: <ul style="list-style-type: none"> Steam humidifier High-pressure spray humidifier Evaporative humidifier

Symbol	Description
-	Noise insulating connector
-	Air recirculation chamber
	Switch cabinet: <ul style="list-style-type: none"> Integral switch cabinet Floor-standing switch cabinet Wall-mounted switch cabinet
	Mains isolator
FOL (EHA)	Exhaust air
ZUL (SUP)	Supply air
AUL (ODA)	Outdoor air
ABL (ETA)	extract air

2.2 Function of the air handling unit

General function

The AHU consists of several casing units with components.

Depending on the equipment of the device, the following functions can be designed for air treatment:

- Filtering
- Circulation
- Heating
- Cooling
- Heat recovery
- Humidification
- Dehumidification
- Mixing

2.3 Operating modes

2.4 Function of each component

Filter

The filter cleans the air and removes any contaminants to ensure purity. Filter elements may be of various filter classes, depending on the application. The filter is accessed through an inspection access door so that you can change filter elements easily.

The filter consists of:

- Filter chamber
- Filter frame
- Filter element

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.

FanArray

The FanArray moves air through the AHU and the entire ventilation system. All the fans work together to produce the required volume flow rate.

Sound attenuator

The sound attenuator consists of sound attenuator splitters; they reduce noise resulting from fan operation and air treatment. The splitters are accessed through an inspection access door; you can remove them for cleaning.

Multileaf dampers

The multileaf dampers are used to restrict or completely block the airflow. The multileaf dampers are accessed through an inspection access door so that you can clean and maintain them 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.

Condenser

In the condenser, the vaporous refrigerant coming from the evaporator liquefies, which emits heat.

Depending on the installation location of the condenser, the following function results:

Exhaust air - Heat dissipation

Supply air - Heating of supply air to setpoint value

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.

Steam heated register

If required, the steam heated register 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 steam heat exchanger. The steam heat register 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.

Evaporator

The evaporator cools the supply air to the setpoint value when required. The refrigerant evaporates during the heat transfer and withdraws energy (heat) from the environment, which then cools the supplied air.

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.

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.

☞ Run around coil system with hydraulic unit

At least one heat exchanger in the supply air flow and one in the extract air flow are connected via a TROX pump (hydraulic unit) and pipes. This arrangement forms the run around coil system with hydraulic unit. The extract air heat is transferred to the heat transfer fluid in the heat exchanger. The pump moves the heat transfer fluid to the supply air heat exchanger. The heat is then transferred from the heat transfer fluid to the supply air. Connections should be in counterflow so that the heat transfer fluid and the air flow in opposite directions. This ensures that the two airflows are completely separate from each other.

☒ Run around coil system

At least one heat exchanger in the supply air flow and one in the extract air flow are connected by a pump (by others) and pipes. This arrangement constitutes a run around coil system. The extract air heat is transferred to the heat transfer fluid in the heat exchanger. The pump moves the heat transfer fluid to the supply air heat exchanger. The heat is then transferred from the heat transfer fluid to the supply air. Connections should be in counterflow so that the heat transfer fluid and the air flow in opposite directions. This ensures that the two airflows are completely separate from each other.

① Steam humidifier

The humidifier unit consists of two separate components: the steam generator and the steam distribution system. As the water in the steam generator evaporates, the steam is transferred to the airflow via the steam distribution system. This is how the air is humidified.

① High-pressure spray humidifier

The high-pressure spray humidifier is used to humidify the supply air without heat exchange. A grid of spray nozzles atomise fresh water, thereby creating a fine mist in the humidification chamber.

① Evaporative humidifier

The evaporative humidifier is used for evaporative cooling of the extract air (adiabatic cooling); no heat exchange takes place. If the outdoor air temperature is fairly high, the extract air is cooled; the warm outdoor air can hence be cooled without the need for an external refrigeration system. As a result, less refrigeration energy is required. There is a choice of two constructions, either for flow-through operation or for recirculation of water in the water container.

Air recirculation chamber

The air recirculation chamber is a central chamber in the AHU in which air recirculation is controlled by multi-leaf dampers. Recirculation operation may be anything between 0 and 100%, depending on requirements.

Noise insulating connector

The noise insulating connector is fitted between the AHU and the ducting. The noise insulating connector includes an anti-vibration element that prevents the transmission of noise and vibrations from the AHU to the ducting.

2.5 Operating and display elements

2.5.1 Mains isolator

Mains isolator

Local isolator

☞ 'Local isolator' on page 11

2.5.2 Inspection access doors with a lock

Inspection access doors

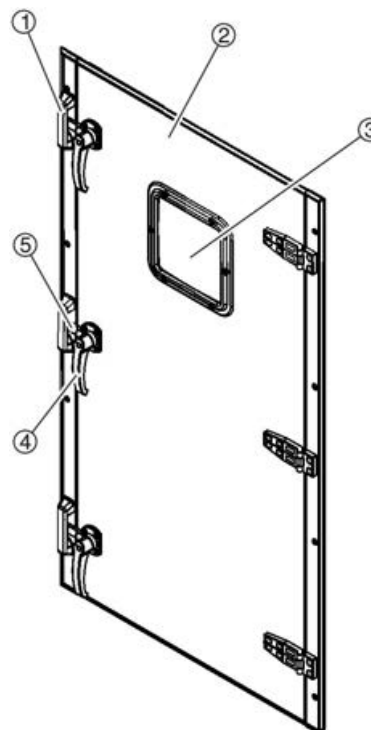







Fig. 10: Inspection access door

- 1 Lock
- 2 Inspection access door
- 3 Inspection window
- 4 Lever
- 5 Latch

Inspection access doors (Fig. 10 /2) are located at the front of the AHU; they allow you to access various AHU components. Some doors are fitted with an inspection window (Fig. 10 /3).


The inspection access doors are closed with a latch (Fig. 10 /5) and lock (Fig. 10 /1); depending on the AHU component, the door can be opened with a handle (Fig. 10 /4) or requires a special key (not shown).

Each inspection access door is fitted with several safeguards:

-  Hold open device
-  Safety catch
-  Inside door handle
-  Inside door handle with safety catch
-  Safety lock

2.5.3 Filter monitoring

For filter monitoring, the air pressures in front of and behind the filter elements are measured with a differential pressure gauge and the differential pressure is visualised. In differential pressure gauges with differential pressure switches (optional), the pre-set pressure value of the filter is monitored. If this is exceeded, a signal is sent to the control unit. In devices with X-CUBE control, a message is output in the visualisation.

The differential pressure gauges are installed on the operating side of the air handling unit, on each filter . The AHU may have been fitted with analogue or digital differential pressure measuring devices.

 **ENVIRONMENT!**

Saving energy

The higher the differential pressure, the higher the resistance of the filter and hence the power consumption of the air handling unit. If the maximum final differential pressure has been reached, you have to replace the filter.



The maximum final differential pressure (ΔP_{max}) for a filter is given on a sticker on the inspection access door to the filter chamber.



Fig. 11: Digital differential pressure measuring device

The differential pressure gauge determines the current pressure difference, shows it on the display and transmits it to the control system.

For further information, see the manufacturer's documentation.



Fig. 12: Analogue differential pressure gauge

The current differential pressure is displayed on the inspection window.

If the pointer deviates from the zero point (pressureless condition), a zero point correction can be made via zero point adjustment (screw). The mechanical and optional electrical zero points are set at the same time by turning the zero point screw (on the front of the device).

2.6 Connections and interfaces

Duct connections of the air handling unit

Duct connection	Meaning
Extract air (ETA/ABL)	Duct through which the extract air from rooms enters the AHU.
Supply air (SUP/ZUL)	Duct through which the supply air flows from the AHU into rooms.

Connections and interfaces

Duct connection	Meaning
Outdoor air (ODA/AUL)	Duct through which outdoor air enters the AHU.
Exhaust air (EHA/FOL)	Duct through which air is led outside.

Connections for heat transfer fluids

Used to lead the heat transfer fluid (by others) into the heating coil or cooling coil and out again.

Condensate drains

Used to discharge condensate.

Humidifier connections

Used to transport the humidifying fluid to the distribution system.

Evaporator and condenser connections

Used to lead the heat transfer fluid (by others) into the evaporator or condenser and out again.

Cable glands

The casing panels of components that need supply voltage or a control cable (such as fans, actuators, anti-frost thermostats) are fitted with cable glands.

3 Control

3.1 Safety notes regarding 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 Emergency switch-off

- Switch off the mains isolator and secure it against being switched on accidentally,  Chapter 1.7 'Securing the unit against being switched on accidentally' on page 13 .
- 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.

3.3 Switch-off in the event of a fire

The owner of the ventilation and air conditioning system has to include the air handling unit in the fire protection strategy for the building. The system owner has to define the steps to be followed in the event of a fire.

3.4 Preparing a (re)start

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.

Before you start the AHU

Before you start the AHU, ensure that:

- Nobody is inside the AHU and no objects have been left inside 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.

3.5 Starting the air handling unit



Switching the mains isolator on

Personnel:

- Instructed person

3.6 Checks during operation

The following checks must be carried out each week while the air handling unit is in operation:

- Check the differential pressure on the filter,  Chapter 3.9 'Reading the differential pressure on the filter ' on page 29 .
- Check the system pressure of the heat transfer fluids according to the instructions of the system manufacturer (system by others).
- Check the air handling unit for faults.

3.7 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.

3.8 After shutdown

Decommissioning

WARNING!

Risk of injury from incorrect decommissioning!

Incorrect decommissioning may lead to dangerous situations.

- Appoint an HVAC technician for decommissioning.
- Appoint a skilled qualified electrician and refrigeration technician 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.

3.9 Reading the differential pressure on the filter

Personnel:

- Instructed person

Protective equipment:

- Industrial safety helmet



ENVIRONMENT!

Saving energy

The higher the differential pressure, the higher the resistance of the filter and hence the power consumption of the air handling unit. If the maximum final differential pressure has been reached, you have to replace the filter.



Fig. 13: Analogue and digital differential pressure measuring devices

- ▶ Read the differential pressure from the inspection window (Fig. 13 /1) or the display (Fig. 13 /2).
- ⇒ If the maximum final differential pressure has been reached, you have to replace the filter element,  Chapter 4.4.4  'Replacing a filter element' on page 44 .



The maximum final differential pressure (ΔP_{max}) for a filter is given on a sticker on the inspection access door to the filter chamber.

4 Maintenance

The air handling unit requires regular maintenance. Regular care and maintenance ensure operational readiness, functional reliability and long service life of the air handling unit.



Maintenance can also be performed by the TROX Technical Service (optional) (↪ 'TROX Technical Service' on page 3).

4.1 Safety notes 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 1.7 'Securing the unit against being switched on accidentally' on page 13*. 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 Switching off the AHU and securing it against being switched on accidentally

Before you start maintenance, switch off the AHU and secure it against being switched on accidentally:


-  Chapter 1.7 'Securing the unit against being switched on accidentally' on page 13

4.3 Maintenance plan

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

If during regular checks you detect increased wear, change the maintenance intervals accordingly and carry out more frequent checks for wear and tear. If you have any questions about maintenance and maintenance intervals, contact the TROX Technical Service,  'TROX Technical Service' on page 3.



You may also commission the TROX Technical Service to carry out maintenance ( 'TROX Technical Service' 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 interfaces of AHU casing units for leakage.	Instructed person
	Check casing for condensation build-up.	Instructed person
	Check panel seals.	Instructed person
	Check panel seals and fasteners for firm fit and function.	Instructed person
	Check the equipotential bonding.	Instructed person

➤ Filter

Interval	Maintenance work	Personnel
Every month	Visually check filter element for contamination, ↪ Chapter 3.9 'Reading the differential pressure on the filter' on page 29 . Replace filter element if the maximum differential pressure is exceeded, ↪ Chapter 4.4.4 'Replacing a filter element' on page 44 .	Instructed person
	Check filter element for odours and moisture penetration. Replace filter element, if necessary, ↪ Chapter 4.4.4 'Replacing a filter element' on page 44 .	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
Every 12 months	Replace filter elements of the first stage, ↪ Chapter 4.4.4 'Replacing a filter element' on page 44 .	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, ↪ Chapter 4.4.4 'Replacing a filter element' on page 44 .	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 feed 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 heated register

Interval	Maintenance work	Personnel
Every week	Check steam installation for leakages and damage.	Instructed person
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

Maintenance plan

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 air heater for contamination and damage.	Instructed person
	Check function of the electric air heater.	Skilled qualified electrician

High-pressure spray humidifier

Interval	Maintenance work	Personnel
Every 6 months	Visually check high-pressure spray humidifier for contamination, damage and corrosion.	Instructed person

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

Interval	Maintenance work	Personnel
Every 12 months	Check electrical connections.	Skilled qualified electrician
	Measure current consumption and compare it with nominal current.	Skilled qualified electrician
	Check all safeguards for correct function.	Skilled 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.	Skilled qualified electrician
	Check equipotential bonding. Repair if necessary.	Skilled qualified electrician

⊖ FanArray

Interval	Maintenance work	Personnel
Every 6 months	Check for contamination, damage and corrosion. Clean and repair if necessary.	Instructed person
	Check seals for fit and damage. Repair or replace them if necessary.	Instructed person
	Check equipotential bonding. Repair if necessary.	Skilled qualified electrician
	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.	Skilled 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

Air recirculation chamber

Interval	Maintenance work	Personnel
Every 6 months	Visually check air recirculation chamber for contamination, damage and corrosion. Clean if necessary.	Instructed person
	Check whether damper blades move smoothly.	Instructed person
	Check function of damper bearings and linkage.	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 – compressor

Interval	Maintenance work	Personnel
Every 6 months	Visually check the compressor fixing and anti-vibration elements.	Instructed person
Every 12 months	Check the compressor fixing and anti-vibration elements.	Instructed person
	Check Rotalock valves.	Skilled qualified refrigeration technician
	Check flange connections, quick-release fasteners and seals.	Skilled qualified refrigeration technician
	Check oil sump heater.	Skilled qualified refrigeration technician
	Check collector pipes and connections.	Skilled qualified refrigeration technician
	Check function of high pressure and low pressure sensors.	Skilled qualified refrigeration technician
	Measure power consumption to check PTC thermistor.	Skilled qualified refrigeration technician
	Check refrigerant and oil levels.	Skilled qualified refrigeration technician
	Check output control.	Skilled qualified refrigeration technician
	Check scroll compressor.	Skilled qualified refrigeration technician
	Check refrigeration system safety valve.	Skilled qualified refrigeration technician
Check refrigeration system for leakage.	Skilled qualified refrigeration technician	

 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
Every 12 months	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.	Skilled qualified electrician
	Check for contamination, damage and corrosion.	Instructed person
	Check that all protective covers are in place.	Instructed person
	Check functional elements.	Skilled qualified electrician
	Check switching and control procedures.	Skilled qualified electrician
	Check manual, automatic and remote control functions.	Instructed person

Evaporative humidifier

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

Steam humidifier

Interval	Maintenance work	Personnel
Every week	Check water and steam installation for leakages and damage.	Instructed person
	Check drain pipe for contamination.	Instructed person
	Check electrical system for loose cables and damaged components.	Instructed person
	Check steam humidifier for damage.	Instructed person

Interval	Maintenance work	Personnel
Every 6 months	Drain steam cylinder and clean scale collector tank.	HVAC technician
Every 12 months	Remove and clean steam cylinder.	HVAC technician
	Clean unit interior.	HVAC technician
	Visually check components (heating cable connector on steam cylinder, level unit, etc.) inside the unit for damage.	HVAC technician

4.4 Maintenance

4.4.1 Opening inspection access doors

Opening standard inspection access doors

Personnel:

- Instructed person

Protective equipment:

- Safety harness
- Industrial safety helmet
- Protective gloves

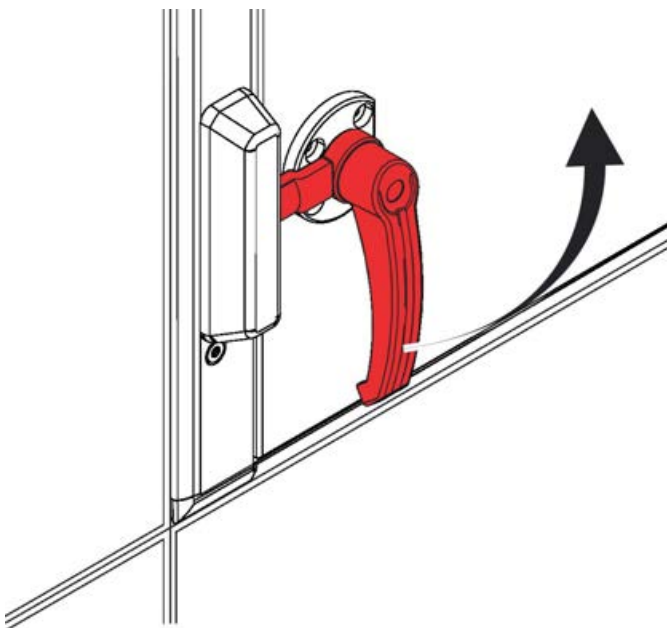


Fig. 14: Opening a door lock

- ▶ Turn the door handle anti-clockwise by 90° (Fig. 14).
- ⇒ This unlocks the door; it can now be opened.

Tool:

- TROX special key

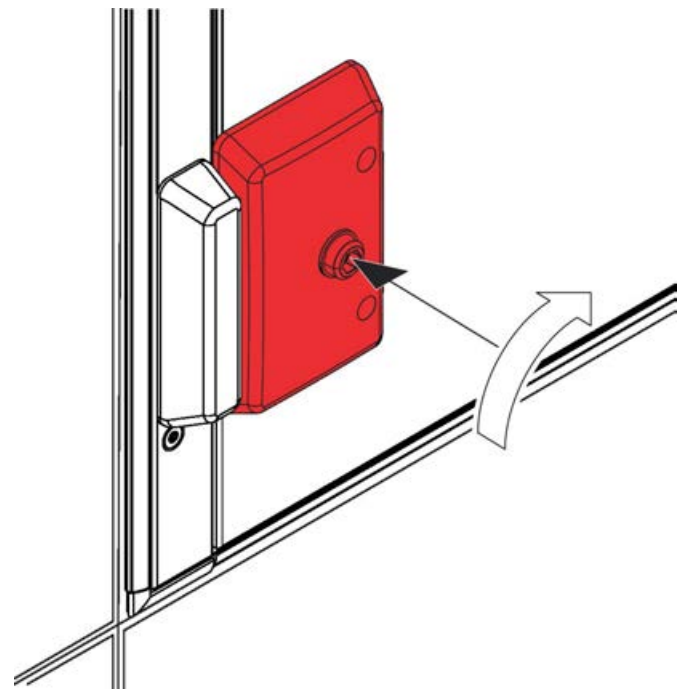


Fig. 15: Opening a lock with the special key (hazardous areas)

- ▶ Insert the TROX special key into the lock and turn it anti-clockwise as far as it will go (Fig. 15).
- ⇒ 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

Opening inspection access doors on the discharge side

Personnel:

- Instructed person

Protective equipment:

- Safety harness
- Industrial safety helmet
- Protective gloves

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.

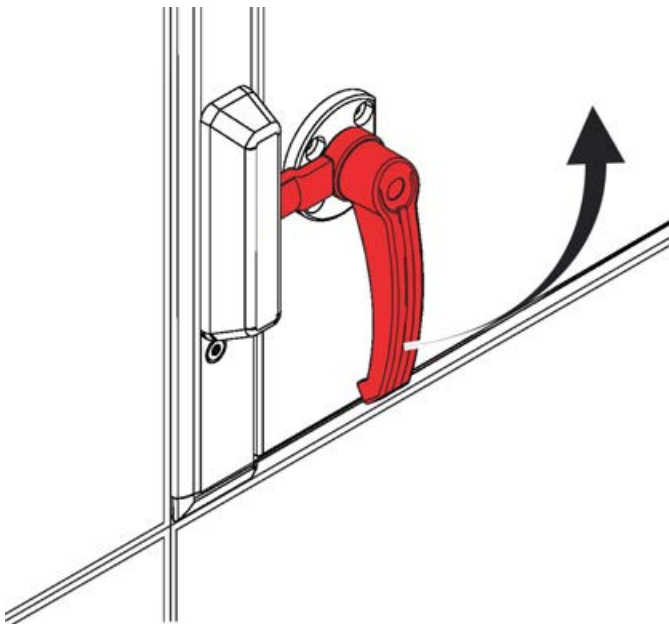


Fig. 16: Opening a door lock

1. ▶ Turn the door handle anti-clockwise by 90° (Fig. 16).
⇒ The door has been unlocked.

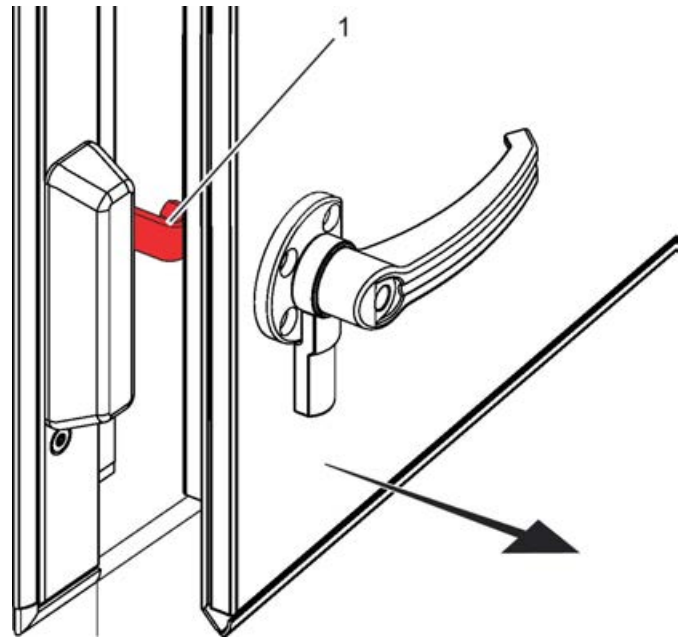


Fig. 17: Safety catch

2. ▶ Carefully open the inspection access door until it is caught by the safety catch (Fig. 17 /1).

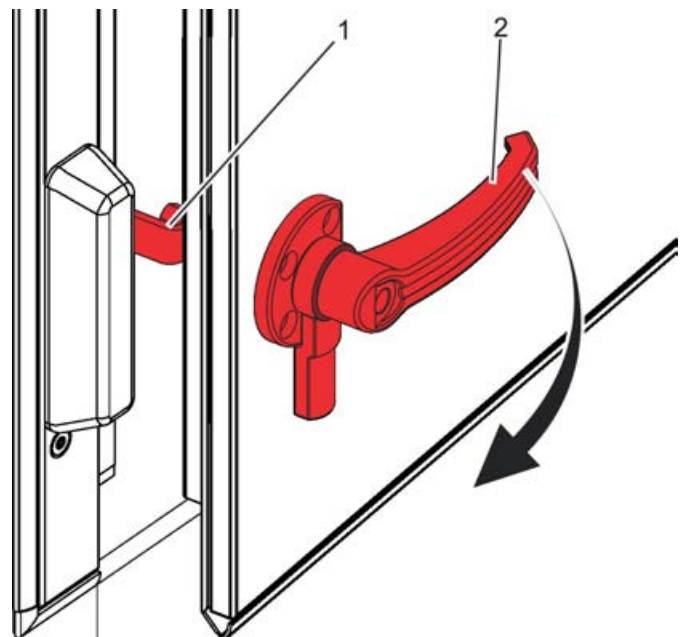




Fig. 18: Releasing the safety catch

3. ▶ Turn the door handle (Fig. 18 /2) clockwise by 90° .
⇒ This releases the safety catch (Fig. 18 /1); the inspection access door can now be completely opened.

4.4.2 Checking filters for contamination

To check the filter for contamination, check the differential pressure  Chapter 3.9 'Reading the differential pressure on the filter  on page 29 .

If the maximum differential pressure is exceeded, replace the filter, see [Chapter 4.4.4](#) 'Replacing a filter element' on page 44.



The maximum differential pressure is given on a sticker on the revision access door to the filter chamber.

4.4.3 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.

4.4.4 Replacing a filter element

Missing filter element

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.

Replacing a filter element with quick release fasteners

Personnel:

- Instructed person

Protective equipment:

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

1. ▶ Switch off the air handling unit and secure it against being switched on accidentally, Chapter 1.7 'Securing the unit against being switched on accidentally' on page 13 .
2. ▶ Open the inspection access doors on the upstream side of the filter, 'Opening inspection access doors on the discharge side' on page 40 .

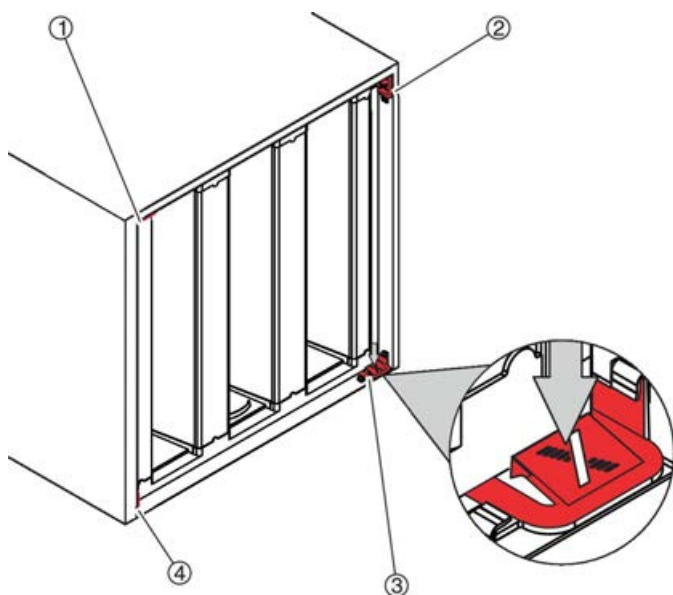


Fig. 19: Loosening the quick release fasteners

3. ▶ Press down the quick release fasteners (Fig. 19 /1 to 4).
⇒ The filter element can now be removed.

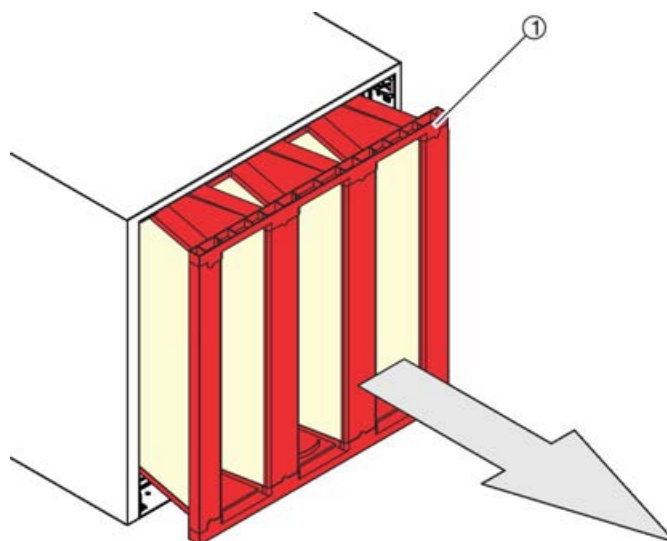


Fig. 20: Removing the filter element

4. ▶ Pull out the filter element (Fig. 20 /1).

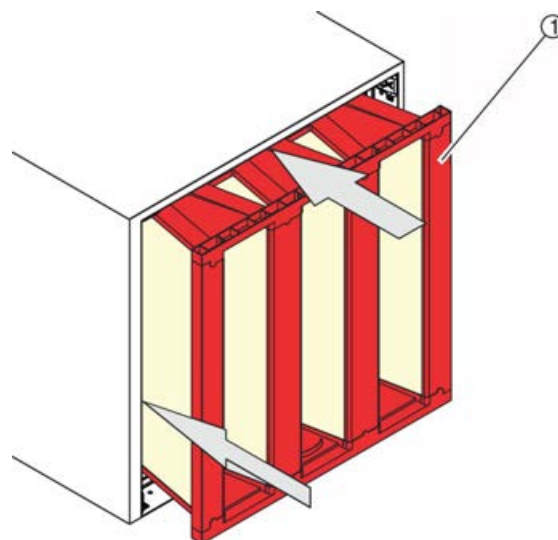


Fig. 21: Replacing the filter element

5. ▶ Insert a new filter element.

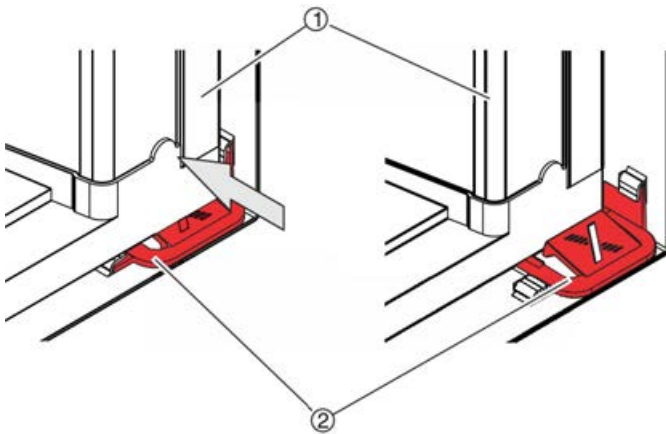


Fig. 22: Filter element locks in place

6. ▶ Push the new filter element (Fig. 22 /1) in and over the quick release fasteners (Fig. 22 /2) until it locks into place.
7. ▶ Close the inspection access doors.
8. ▶ Prepare restart, ☞ 'Before you start the AHU' on page 27 .
9. ▶ Remove the padlock from the mains isolator.
- 10.▶ Restart the air handling unit, ☞ 'Switching the mains isolator on' on page 27 .

Replacing a filter element on a mounting rail

Personnel:

- Instructed person

Protective equipment:

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

Tool:

- TROX special key

1. ▶ Switch off the air handling unit and secure it against being switched on accidentally, ☞ Chapter 1.7 'Securing the unit against being switched on accidentally' on page 13 .
2. ▶ Open the filter inspection access doors, .

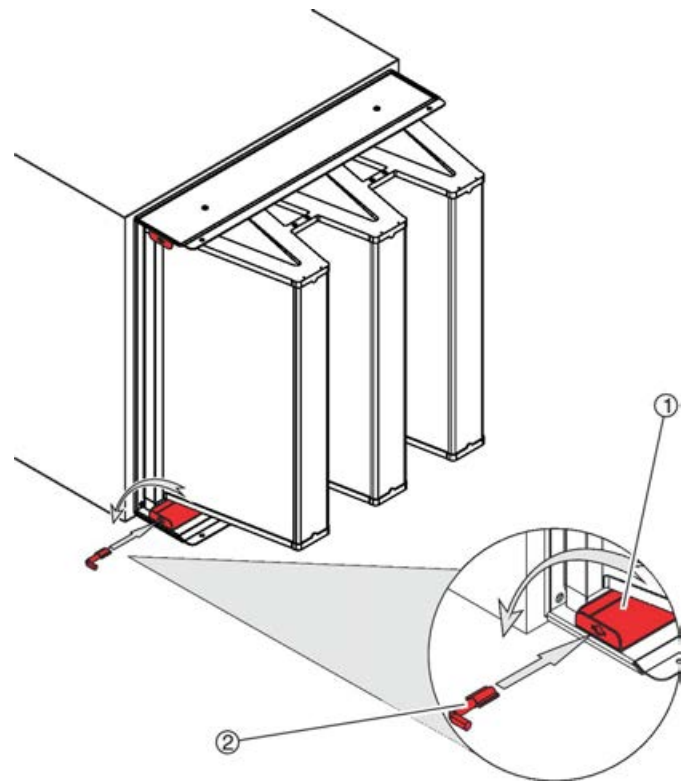


Fig. 23: Inserting the special key

3. ▶ Insert the special key (Fig. 23 /2) into the recess of each clamping rail (Fig. 23 /1) and turn it anti-clockwise by 90°.

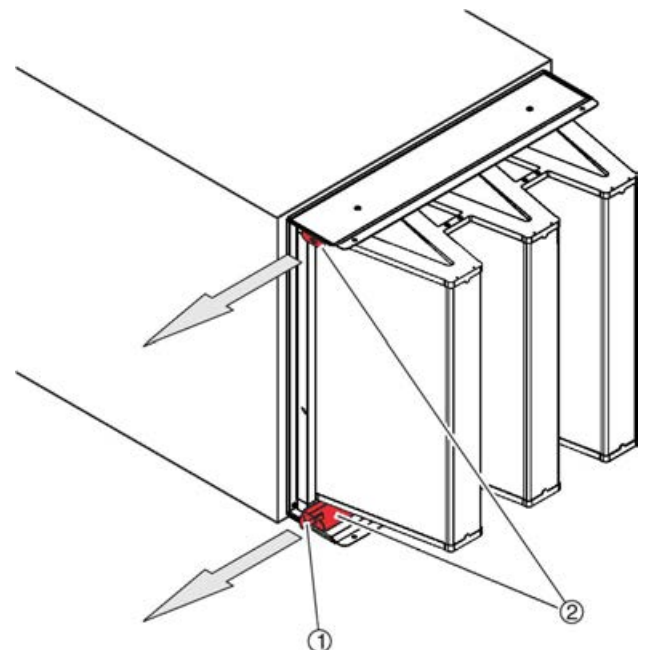


Fig. 24: Releasing the clamping rails

4. ▶ Use the special key (Fig. 24 /1) to pull out the clamping rails (Fig. 24 /2) as far as they will go.
 - ⇒ The filter element has been released.

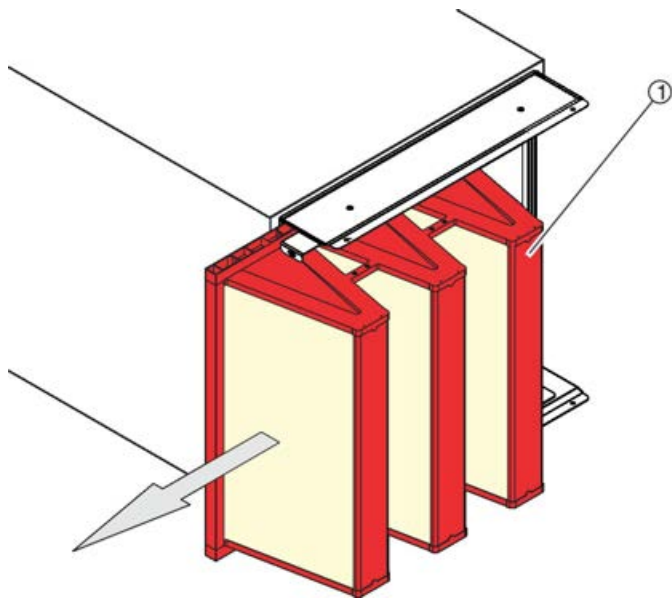


Fig. 25: Removing the filter element

5. ▶ Pull out the filter element (Fig. 25 /1) sideways.

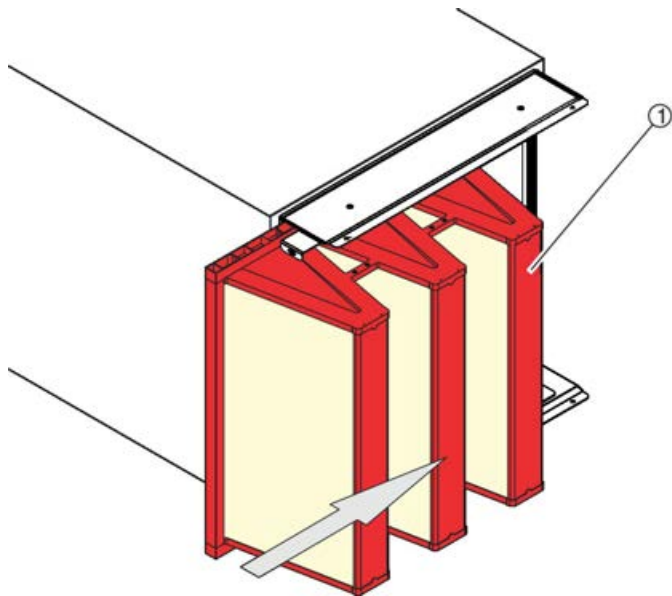


Fig. 26: Replacing the filter element

6. ▶ Slide the new filter element (Fig. 26 /1) in from the side.

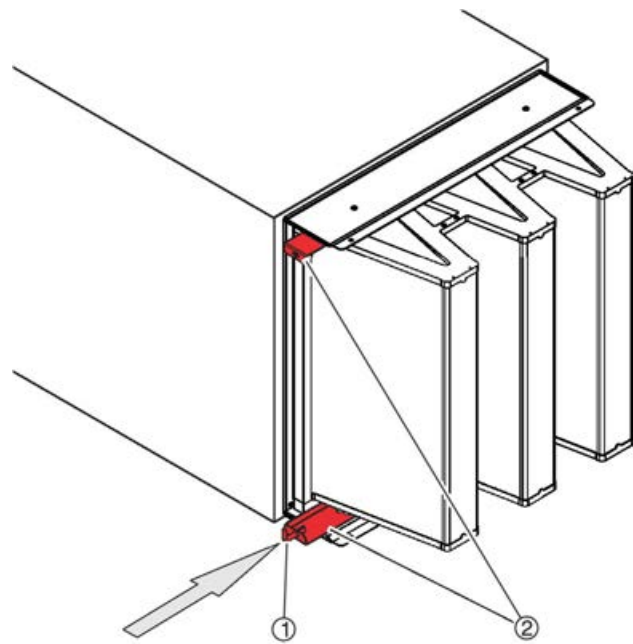


Fig. 27: Pushing the clamping rails in

7. ▶ Use the special key (Fig. 27 /1) to push the clamping rails (Fig. 27 /2) in as far as they will go.
 - ⇒ The filter element has been fitted.
8. ▶ Close the inspection access doors.
9. ▶ Prepare restart, ⚡ 'Before you start the AHU' on page 27 .
10. ▶ Remove the padlock from the mains isolator.
11. ▶ Restart the air handling unit, ⚡ 'Switching the mains isolator on' on page 27 .

4.5 After maintenance

Personnel:

- Instructed person
1. ▶ Prepare restart, ⚡ 'Before you start the AHU' on page 27 .
 2. ▶ Remove the padlock from the mains isolator.
 3. ▶ Restart the air handling unit, ⚡ 'Switching the mains isolator on' on page 27 .

5 Faults

5.1 Safety notes regarding troubleshooting

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 1.7 'Securing the unit against being switched on accidentally' on page 13*. 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 Faults displayed on the AHU

Differential pressure measuring devices

The differential pressure is indicated on the digital pressure measuring device that is attached to the AHU casing, [↪ Chapter 2.5.3 'Filter monitoring' on page 25](#) . If the differential pressure exceeds the maximum final differential pressure, this indicates a fault.



The maximum final differential pressure (ΔP_{max}) for a filter is given on a sticker on the inspection access door to the filter chamber.

5.3 List of faults

5.4 Troubleshooting

➤ Replacing a filter element

See: [↪ Chapter 4.4.4](#) [➤ Replacing a filter element' on page 44](#)

5.5 After troubleshooting

Personnel:

- Instructed person
1. ▶ Prepare restart, [↪ 'Before you start the AHU' on page 27](#) .
 2. ▶ Remove the padlock from the mains isolator.
 3. ▶ Restart the air handling unit, [↪ 'Switching the mains isolator on' on page 27](#) .

6 Replacement parts

6.1 Safety notes regarding replacement parts

Incorrect replacement parts

 **WARNING!**

Risk of injury from the use of incorrect replacement parts!

Incorrect or faulty replacement parts pose a risk to health and safety, and their use can cause malfunction, damage to property and total failure of equipment.

- Use only original replacement parts from TROX.

 **WARNING!**

Risk of injury from the incorrect installation of replacement parts!

Incorrect installation of replacement parts can lead to dangerous situations.

- Filter elements may be replaced by instructed persons.
- All other replacement parts have to be installed by the TROX Technical Service, skilled qualified electricians or HVAC technicians.

6.2 Ordering replacement parts



One spare set of filter elements should always be available so that the air handling unit does not have to be switched off.

Replacement parts can be ordered from the TROX Technical Service, ☎ 'TROX Technical Service' on page 3.

7 Accessories

Accessories

TROX special key

8 Removal and disposal

8.1 Safety notes regarding disassembly and disposal

Incorrect disassembly

DANGER!

Risk to life from incorrect assembly and disassembly!

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

- Before you start disassembly, professionally disconnect all electrical cables.
 - Only a skilled qualified electrician must disconnect the power supply.
 - Ensure that no voltage is present.
- Before you start disassembly, correctly drain all operating fluids.
 - Disconnect operating fluid pipes and hoses.
 - Ensure that operating fluids are disposed of correctly.
- If you have any questions regarding disassembly, refer to the assembly instructions in this manual. Pay attention to the component manufacturers' documentation.
- Only trained specialist personnel must remove any components.
- If necessary, use additional personal protective equipment for outdoor installations, e.g. a safety harness.

Improper transport equipment

WARNING!

Risk to life from using improper transport equipment!

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

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

 1.9 'Residual risks' on page 15

Unbalanced loads and centre of gravity

WARNING!

Risk of injury from falling or toppling loads!

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

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

Crushing hazard.

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

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

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

Inspection access doors slamming shut

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

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

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

Sharp edges, sharp corners and thin sheet metal parts

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

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

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

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

Incorrect disposal can harm the environment.

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

8.2 Disassembly

Personnel:

- HVAC technician
- Skilled qualified electrician

Protective equipment:

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

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

8.3 Disposal

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

Components that are no longer required should be recycled:

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

Electrical and electronic components

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

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

Chemicals

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

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

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

Refrigerant R-410A

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

Coolant, glycol

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

Batteries

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

Lubricants

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

Compressor oil

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

9 Technical data

9.1 Operating conditions

Data	Value	Unit
Operating temperature	-30...50	°C

9.2 Technical data sheet

An illustration and the technical data should already have been provided to you for information and acceptance. We recommend that you keep those documents with this manual.

9.3 Rating plate

You will find the rating plate on the operating side of the AHU.

9.4 CE declaration of conformity

The EU declaration of incorporation or the EU declaration of conformity for the air handling unit should have been provided together with the technical data sheets.

We recommend that you keep those documents with this manual.

10 Glossary

Exhaust air – EHA

Air that flows from an internal space to the outside.

Extract air – ETA

Air that flows out of a conditioned room.

HVAC technician

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

Indoor air – IDA

Air in a conditioned internal space.

ODA – Outdoor air

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

Recirculated air – RCA

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

Secondary air – SEC

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

Skilled qualified electrician

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

Skilled qualified refrigeration technicians

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

Supply air – SUP

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

Transfer air – TRA

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

11 Index

A			
Accessories.....	50	Filter element	
C		Checking.....	29
Checking the differential pressure.....	29	Replacing.....	44 , 45
Cleaning		Functional description	
Cooling coil.....	42	Air recirculation chamber.....	24
General.....	41	Centrifugal fan.....	23
Heating coil.....	41	Condenser.....	23
Plate heat exchanger.....	43	Connections and interfaces.....	25 , 26
Rotary heat exchanger.....	42	Cooling coil.....	23
Compressor oil.....	20	Electric air heater.....	23
Connections for heat transfer fluids		Evaporative humidifier.....	24
Condensate drain.....	26	Evaporator.....	23
Cooling coil/heating coil.....	26	FanArray.....	23
Coolant.....	20	Filter.....	23
Cooling coil, cleaning.....	42	Function of the air handling unit.....	22
Copyright.....	3	Heating coil.....	23
D		High-pressure spray humidifier.....	24
Declaration of Incorporation.....	54	Inspection access doors.....	24
Decommissioning		Local isolator.....	24
3 months or longer.....	28	Mains isolator.....	24
Downtime of 1 year or longer.....	28	Multileaf dampers.....	23
Downtime up to 3 months.....	28	Noise insulating connector.....	24
Motor, remove.....	28	Overview.....	22
Risk of frost.....	28	Plate heat exchanger.....	23
Defects liability.....	3	Rotary heat exchanger.....	23
Display elements		Run around coil system.....	24
Analogue differential pressure gauge.....	25	Sound attenuator.....	23
Digital differential pressure monitor.....	25	Steam heated register.....	23
Duct connections.....	25	Steam heat exchanger.....	23
E		Steam humidifier.....	24
Electric current.....	15	H	
Emergency.....	27	Hazardous areas.....	14
Environmental protection		Heating coil, cleaning.....	41
Chemicals.....	53	Hotline.....	3
Compressor oil.....	20	Hygiene requirements.....	7
Electrical and electronic components.....	52	I	
Glycol.....	20	Instruction.....	8
Lubricants.....	20	J	
Refrigerant.....	20	Jet of liquid.....	17
EU declaration of conformity.....	54	L	
EU declaration of incorporation.....	54	Limitation of liability.....	3
F		Local isolator.....	11
Faults		Lubricants.....	21
After troubleshooting.....	48	M	
Faults displayed on the AHU.....	48	Maintenance	
Troubleshooting.....	48	After maintenance.....	46
		Checking a filter for contamination.....	40
		Cooling coil, cleaning.....	42

Filter element, replacing.....	44 , 45	Other applicable documentation.....	3
General cleaning procedure.....	41	Overview.....	22
Heating coil, cleaning.....	41	P	
Opening inspection access doors on the discharge side.....	40	Passwords.....	8
Opening inspection access doors with safety locks.....	39	Personnel.....	8
Opening standard inspection access doors.....	39	Plate heat exchanger, cleaning.....	43
Plate heat exchanger, cleaning.....	43	Protective equipment.....	9
Rotary heat exchanger, cleaning.....	42	Q	
Maintenance plan.....	30 , 31	Qualification.....	8
AHU casing.....	32	R	
AHU hygiene inspection.....	32	Rating plate.....	54
Air recirculation chamber.....	36	Refrigerant.....	20
Compressor.....	37	Release of harmful substances.....	20 , 21
Condenser.....	37	Removal and disposal.....	52
Control valves.....	36	Replacement parts.....	49
Cooling coil.....	33	Order.....	49
Direct drive fan.....	35	Residual risks.....	15
Ducting and air terminal devices.....	32	Rotary heat exchanger, cleaning.....	42
Electric air heater.....	34	S	
Electrical components and devices.....	38	Safeguards	
Electric motors.....	34	AHU casing.....	11
Evaporative humidifier.....	38	Hold open device.....	12
Evaporator.....	37	Inside door handle.....	12
FanArray.....	35	Inside door handle with pressure relief.....	12
Filter.....	33	Local isolator.....	11
Heating coil.....	33	Motor protection switch.....	12
High-pressure spray humidifier.....	34	Safety catch.....	11
Multileaf dampers.....	34	Safety lock.....	11
Plate heat exchanger.....	36	Securing the unit against being switched on accidentally.....	13
Pumps.....	36	Service.....	3
Rotary heat exchanger.....	34	Signs.....	10
Sound attenuator in the AHU.....	36	Specific hazards.....	15
Steam heated register.....	33	Starting the air handling unit.....	27
Steam humidifier.....	38	Switching the AHU off	
Switch cabinet.....	38	Emergency switch-off.....	27
O		Symbols.....	4
Opening inspection access doors		System owner.....	7
Inspection access doors on the discharge side... ..	40	System owner's obligations.....	7
Inspection access doors with safety locks.....	39	T	
Standard inspection access doors.....	39	Technical data.....	54
Operating conditions.....	54	Technical data sheet.....	54
Operation		Technical Service.....	3
Before you start the AHU.....	27	Tips for operation.....	28
Decommissioning.....	28	W	
Reading the differential pressure.....	29	Warranty claims.....	3
Starting.....	27	Work areas.....	14
Tips.....	28		

Appendix

A Safety data sheets

A.1 Compressor oil

EMKARATE RL 32-3MAF
Material Safety Data Sheet
Date(s) : 2005-09-12 15:50:00
Version 3
MSDS#: 808802

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name	EMKARATE RL 32-3MAF
Product Use	Lubricant
Address/Telephone number	Uniqema Uniqema Corporate Center 1000 Uniqema Boulevard New Castle, DE 19720-2790 Uniqema Operator (Mon.-Fri., 8:15 AM - 4:30 PM Eastern): (302) 574-5000 Medical Emergency (24 hr.): (888) 456-6218 Transportation Emergency Involving Chemical Spills, Leaks, Fires, or Accidents (24 hr.): (800) 424-9300

Uniqema is an international business of Imperial Chemical Industries PLC.
Uniqema operates through ICI affiliated companies in the relevant countries such as ICI Americas Inc., Unichema, a division of ICI Uniqema Inc., and Mona Industries Inc. in the USA.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% (w/w)	OSHA PEL	ACGIH TLV
Polyol ester	---	>99	No PEL established	No TLV established
Additives	---	<1	No PEL established	No TLV established

Ingredients not precisely identified are proprietary or nonhazardous.
Values are not product specifications.

3. HAZARDS IDENTIFICATION

EMKARATE RL 32-3MAF
Material Safety Data Sheet
Date(s) : 2005-09-12 15:50:00
Version 3
MSDS#: 808802

Emergency Overview

Color	clear yellow
Form	Liquid
Odor	No data.

INHALATION OR INGESTION MAY CAUSE MUCOUS MEMBRANE IRRITATION.
MAY CAUSE EYE IRRITATION
REPEATED/PROLONGED CONTACT MAY CAUSE SKIN IRRITATION.

Routes of Exposure Eye contact Skin contact Inhalation

Eye contact	May cause eye irritation in man.
Skin contact	Short contact periods with human skin are not usually associated with skin irritation. Repeated contact can result in slight skin irritation. Prolonged contact can result in slight skin irritation. Systemically toxic concentrations of this product will probably not be absorbed through human skin.
Inhalation	High concentrations of mists or aerosols may irritate respiratory passages. No toxic effects are known to be associated with inhalation of this material.
Ingestion	In humans, irritation of the mouth, pharynx and esophagus can develop following ingestion of this product. No toxic effects are expected following ingestion of this product.
Other	Not listed by ACGIH, IARC, NIOSH, NTP OR OSHA.

4. FIRST AID MEASURES

EMKARATE RL 32-3MAF
Material Safety Data Sheet
Date(s) : 2005-09-12 15:50:00
Version 3
MSDS#: 808802

Eye contact	Immediately flush with plenty of water for at least 15 minutes. If redness, itching, or a burning sensation develops, have eyes examined and treated by medical personnel.
Skin contact	Wash material off of the skin with plenty of soap and water. If redness, itching, or a burning sensation develops, get medical attention.
Inhalation	Remove victim to fresh air. If a cough or other respiratory symptoms develop, consult medical personnel.
Ingestion	DO NOT INDUCE VOMITING. Give one or two glasses of water to drink and refer to medical personnel or take direction from either a physician or a poison control center. Never give anything by mouth to an unconscious person.

5. FIRE-FIGHTING MEASURES

Flash Point (°F)	> 392
Flash Point (°C)	> 200
Autoignition Temperature (°F)	No data.
Autoignition Temperature (°C)	No data.
Flammable Limits	No data.
Extinguishing Media	Water fog, alcohol foam, carbon dioxide, dry chemical.
Special fire-fighting protective equipment	A self contained breathing apparatus and suitable protective clothing must be worn in fire conditions.
Fire and explosion hazards	None known.
Explosion data	
Sensitivity to mechanical impact	No data.
Sensitivity to static discharge	No data.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	Refer to section 8 for proper personal protective equipment.
-----------------------------	--

EMKARATE RL 32-3MAF
Material Safety Data Sheet
Date(s) : 2005-09-12 15:50:00
Version 3
MSDS#: 808802

Steps to be taken in case material is released or spilled

Contain spill.
Soak up material with absorbent and shovel into a chemical waste container.
Wash residue from spill area with water containing detergent and flush to a sewer serviced by a permitted wastewater treatment facility.

7. HANDLING AND STORAGE

Handling

Prevent eye contact.
Prevent skin contact.
Avoid breathing this material.
Do not swallow.

Storage

50 - 70 ° F
Store in original containers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limits

OSHA PEL

Component Name

No OSHA PEL assigned. Minimize exposure in accordance with good hygiene practice.

Exposure limits

Notes

ACGIH TLV

Component Name

No ACGIH TLV assigned. Minimize exposure in accordance with good hygiene practice.

Exposure limits

Notes

Engineering controls

Eye protection

Protective clothing

Provide adequate ventilation.
Chemical tight goggles.
Impervious gloves.

EMKARATE RL 32-3MAF

Material Safety Data Sheet

Date(s) : 2005-09-12 15:50:00

Version 3

MSDS#: 808802

Respiratory protection

Respiratory protection is not normally needed if controls are adequate.

Other

Eyewash and safety shower easily accessible to the work area.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color	clear yellow
Form	Liquid
Odor	No data.
pH	No data.
Boiling Point (°F)	No data.
Boiling Point (°C)	No data.
Flash Point (°F)	> 392
Flash Point (°C)	> 200
Autoignition Temperature (°F)	No data.
Autoignition Temperature (°C)	No data.
Flammable Limits	No data.
Explosive Properties	No data.
Oxidizing Properties	No data.
Specific Gravity	~1
Solubility (water)	Insoluble
Solubility (other)	No data.
Partition Coefficient	No data.

10. STABILITY AND REACTIVITY

Stability	Stable under normal conditions.
Materials to avoid	Strong oxidizing agents.
Conditions to avoid	None known.
Hazardous decomposition products	Carbon dioxide, carbon monoxide.
Hazardous polymerization	Will not occur.

11. TOXICOLOGICAL INFORMATION

No data available on this material.

EMKARATE RL 32-3MAF
Material Safety Data Sheet
Date(s) : 2005-09-12 15:50:00
Version 3
MSDS#: 808802

14. TRANSPORT INFORMATION

Department of Transportation:
Not regulated.

TDG (Transportation of Dangerous Goods):
Not regulated.

Not classified in RID/ADR - ADNR - IMDG - ICAO/IATA-DGR.

15. REGULATORY INFORMATION

Inventory Status

USA (TSCA) Compliant.

OSHA Hazard Communication Standard, 29 CFR 1910.1200, Hazard Summary:

Health Hazards Irritant (eye)
Physical Hazards None

WHMIS Classification Class D, Division 2 -- Toxic.

CERCLA and SARA Regulations (40 CFR 355, 370, and 372):

**This material contains the following
chemicals subject to the reporting
requirements of SARA 313:** No 313-listed
chemicals in this
product

SARA 311/312 Hazard Categories:

EMKARATE RL 32-3MAF

Material Safety Data Sheet

Date(s) : 2005-09-12 15:50:00

Version 3

MSDS#: 808802

Immediate	Y
Delayed	N
Fire	N
Pressure	N
Reactivity	N

16. OTHER INFORMATION

We assigned NFPA ratings and HMIS ratings to this product based on the hazards of its ingredient(s). Because the customer is most aware of the application of the product, he must ensure that the proper personal protective equipment (PPE) is provided consistent with information contained in the product MSDS.

HMIS Information

Health	1
Flammability	1
Physical Hazards	0

The HMIS ratings displayed above are from the HMIS III Third Edition. There have been significant changes made to the system. "Physical hazard" stands for physical hazard as defined in the OSHA Hazard Communication Standard and replaces the former code for reactivity. For a more detailed explanation of the system and the ratings, please contact our Product Safety and Regulatory Affairs group.

NFPA Information

Health	1
Flammability	1
Reactivity	0

This information is intended solely for the use of individuals trained in the particular hazard rating system.

EMKARATE RL 32-3MAF

Material Safety Data Sheet

Date(s) : 2005-09-12 15:50:00

Version 3

MSDS#: 808802

The following sections contain revisions or new statements:

The information herein is given in good faith but no warranty, expressed or implied, is made. (R) is a Registered Trademark of ICI Americas. (TM) is a Trademark of ICI Americas.

See also www.uniqema.com

A.2 Freezing agent

**DuPont™ Suva® 410A Refrigerant**

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

This SDS adheres to the standards and regulatory requirements of the United States and may not meet the regulatory requirements in other countries.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : DuPont™ Suva® 410A Refrigerant
Tradename/Synonym : Suva® 9100
R-410A
Suva® R-410A
410A
HFC 410A

Product Grade/Type : ASHRAE Refrigerant number designation: R-410A

Product Use : Refrigerant, For professional users only.

Restrictions on use : Do not use product for anything outside of the above specified uses
Manufacturer/Supplier : DuPont
1007 Market Street
Wilmington, DE 19898
United States of America

Product Information : +1-800-441-7515 (outside the U.S. +1-302-774-1000)
Medical Emergency : 1-800-441-3637 (outside the U.S. 1-302-774-1139)
Transport Emergency : CHEMTREC: +1-800-424-9300 (outside the U.S. +1-703-527-3887)

SECTION 2. HAZARDS IDENTIFICATION

Product hazard category
Gases under pressure Liquefied gas

DuPont™ Suva® 410A Refrigerant

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

Label content

Pictogram

:



Signal word

: Warning

Hazardous warnings

: Contains gas under pressure; may explode if heated.

Hazardous prevention
measures

: Protect from sunlight. Store in a well-ventilated place.

Other hazards

Misuse or intentional inhalation abuse may lead to death without warning.

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

Rapid evaporation of the liquid may cause frostbite.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Pentafluoroethane (HFC-125)	354-33-6	50 %
Difluoromethane (HFC-32)	75-10-5	50 %

**DuPont™ Suva® 410A Refrigerant**

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

SECTION 4. FIRST AID MEASURES

- General advice : Never give anything by mouth to an unconscious person. When symptoms persist or in all cases of doubt seek medical advice.
- Inhalation : Remove from exposure, lie down. Move to fresh air. Keep patient warm and at rest. Artificial respiration and/or oxygen may be necessary. Consult a physician.
- Skin contact : Take off contaminated clothing and shoes immediately. Flush area with lukewarm water. Do not use hot water. If frostbite has occurred, call a physician.
- Eye contact : Rinse immediately with plenty of water and seek medical advice.
- Ingestion : Is not considered a potential route of exposure.
- Most important symptoms/effects, acute and delayed : Anaesthetic effects Light-headedness irregular heartbeat with a strange sensation in the chest, heart thumping, apprehension, feeling of fainting, dizziness or weakness
- Protection of first-aiders : If potential for exposure exists refer to Section 8 for specific personal protective equipment.
- Notes to physician : Because of possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, that may be used in situations of emergency life support should be used with special caution.

SECTION 5. FIREFIGHTING MEASURES

- Suitable extinguishing media : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
- Unsuitable extinguishing media : No applicable data available.

**DuPont™ Suva® 410A Refrigerant**

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

- Specific hazards** : Cylinders are equipped with pressure and temperature relief devices, but may still rupture under fire conditions. Decomposition may occur. Contact of welding or soldering torch flame with high concentrations of refrigerant can result in visible changes in the size and colour of the torch flame. This flame effect will only occur in concentrations of product well above the recommended exposure limit. Therefore stop all work and ventilate to disperse refrigerant vapors from the work area before using any open flames. This substance is not flammable in air at temperatures up to 100 deg. C (212 deg. F) at atmospheric pressure. However, mixtures of this substance with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. This substance can also become combustible in an oxygen enriched environment (oxygen concentrations greater than that in air). Whether a mixture containing this substance and air, or this substance in an oxygen enriched atmosphere become combustible depends on the inter-relationship of 1) the temperature 2) the pressure, and 3) the proportion of oxygen in the mixture. In general, this substance should not be allowed to exist with air above atmospheric pressure or at high temperatures; or in an oxygen enriched environment. For example this substance should NOT be mixed with air under pressure for leak testing or other purposes. Experimental data have also been reported which indicate combustibility of this substance in the presence of certain concentrations of chlorine.
- Special protective equipment for firefighters** : In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment. Wear neoprene gloves during cleaning up work after a fire.
- Further information** : Cool containers/tanks with water spray. Self-contained breathing apparatus (SCBA) is required if containers rupture and contents are released under fire conditions.
Water runoff should be contained and neutralized prior to release.

SECTION 6. ACCIDENTAL RELEASE MEASURES

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

- Safeguards (Personnel)** : Evacuate personnel to safe areas. Ventilate area, especially low or enclosed places where heavy vapours might collect.

**DuPont™ Suva® 410A Refrigerant**

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

- Environmental precautions : Should not be released into the environment. In accordance with local and national regulations.
- Spill Cleanup : Evaporates. Ventilate area using forced ventilation, especially low or enclosed places where heavy vapors might collect.
- Accidental Release Measures : Avoid open flames and high temperatures. Self-contained breathing apparatus (SCBA) is required if a large release occurs.

SECTION 7. HANDLING AND STORAGE

- Handling (Personnel) : Avoid breathing vapours or mist. Avoid contact with skin, eyes and clothing. Provide sufficient air exchange and/or exhaust in work rooms. For personal protection see section 8.
- Handling (Physical Aspects) : The product should not be mixed with air for leak testing or used with air for any other purpose above atmospheric pressure. Contact with chlorine or other strong oxidizing agents should also be avoided.
- Dust explosion class : Not applicable
- Storage : Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems. Never attempt to lift cylinder by its cap. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Cylinders should be stored upright and firmly secured to prevent falling or being knocked over.
Separate full containers from empty containers. Keep at temperature not exceeding 52°C. Do not store near combustible materials. Avoid area where salt or other corrosive materials are present.
The product has an indefinite shelf life when stored properly.
- Storage period : > 10 yr
- Storage temperature : < 52 °C (< 126 °F)

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION



DuPont™ Suva® 410A Refrigerant

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

- Engineering controls : Use sufficient ventilation to keep employee exposure below recommended limits. Local exhaust should be used when large amounts are released. Mechanical ventilation should be used in low or enclosed places. Refrigerant Concentration monitors may be necessary to determine vapor concentrations in work areas prior to use of torches or other open flames, or if employees are entering enclosed areas.
- Personal protective equipment
 - Respiratory protection : Under normal manufacturing conditions, no respiratory protection is required when using this product.
 - Hand protection : Additional protection: Impervious gloves
 - Eye protection : Wear safety glasses with side shields. Additionally wear a face shield where the possibility exists for face contact due to splashing, spraying or airborne contact with this material.
- Protective measures : Self-contained breathing apparatus (SCBA) is required if a large release occurs.

Exposure Guidelines
Exposure Limit Values

Pentafluoroethane AEL *	(DUPONT)	1,000 ppm	8 & 12 hr. TWA
Difluoromethane AEL *	(DUPONT)	1,000 ppm	8 & 12 hr. TWA

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

- Appearance
 - Physical state : gaseous
 - Form : Liquefied gas
 - Color : colourless

**DuPont™ Suva® 410A Refrigerant**

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

Odor	: slight, ether-like
Odor threshold	: No applicable data available.
pH	: neutral
Melting point/range	: No applicable data available.
Boiling point/boiling range	: Boiling point -51.4 °C (-60.5 °F)
Flash point	: does not flash
Evaporation rate	: > 1 (CCL4=1.0)
Flammability (solid, gas)	: No applicable data available.
Upper explosion limit	: Method: None per ASTM E681
Lower explosion limit	: Method: None per ASTM E681
Vapor pressure	: 16,574 hPa at 25 °C (77 °F)
Vapor density	: 2.5 at 25°C (77°F) and 1013 hPa (Air=1.0)
Density	: 1.062 g/cm ³ at 25 °C (77 °F) (as liquid)
Density	: 0.0066 g/cm ³ at ca. 26 °C (79 °F) at (1,013 hPa)
Specific gravity (Relative density)	: 1.06 at 25 °C (77 °F)
Water solubility	: not determined
Solubility(ies)	: No applicable data available.
Partition coefficient: n-octanol/water	: No applicable data available.
Auto-ignition temperature	: No applicable data available.
Decomposition temperature	: No applicable data available.


DuPont™ Suva® 410A Refrigerant

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

Viscosity, kinematic : No applicable data available.

Viscosity : No applicable data available.

% Volatile : 100 %

SECTION 10. STABILITY AND REACTIVITY

Reactivity : Stable at normal ambient temperature and pressure.

Chemical stability : Stable under recommended storage conditions.

Possibility of hazardous reactions : Polymerization will not occur.

Conditions to avoid : Avoid open flames and high temperatures.

Incompatible materials : Alkali metals Alkaline earth metals, Powdered metals, Powdered metal salts

Hazardous decomposition products : Decomposition products are hazardous., This material can be decomposed by high temperatures (open flames, glowing metal surfaces, etc.) forming hydrofluoric acid and possibly carbonyl fluoride., These materials are toxic and irritating., Avoid contact with decomposition products

SECTION 11. TOXICOLOGICAL INFORMATION
Pentafluoroethane (HFC-125)

Inhalation 4 h LC50 : > 800000 ppm , Rat

Inhalation No Observed Adverse Effect Concentration : 100000 ppm , Dog
Cardiac sensitization

Inhalation Low Observed Adverse Effect Concentration (LOAEC) : 75000 ppm , Dog
Cardiac sensitization

Skin sensitization : Does not cause respiratory sensitisation., human

Repeated dose toxicity : Inhalation
Rat
-
gas
NOAEL: > 50000,
No toxicologically significant effects were found.


DuPont™ Suva® 410A Refrigerant

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

- Carcinogenicity** : Not classifiable as a human carcinogen.
Overall weight of evidence indicates that the substance is not carcinogenic.
- Mutagenicity** : Animal testing did not show any mutagenic effects.
Evidence suggests this substance does not cause genetic damage in cultured mammalian cells.
Did not cause genetic damage in cultured bacterial cells.
- Reproductive toxicity** : No toxicity to reproduction
Animal testing showed no reproductive toxicity.
- Teratogenicity** : Animal testing showed no developmental toxicity.
- Further information** : Cardiac sensitisation threshold limit : 490000 mg/m3

Difluoromethane (HFC-32)

- Inhalation 4 h LC50** : > 520000 ppm , Rat
- Inhalation Low Observed Adverse Effect Concentration (LOAEC)** : > 350000 ppm , Dog
Cardiac sensitization
- Inhalation No Observed Adverse Effect Concentration** : 350000 ppm , Dog
Cardiac sensitization
- Skin irritation** : No skin irritation, Not tested on animals
Not expected to cause skin irritation based on expert review of the properties of the substance.
- Eye irritation** : No eye irritation, Not tested on animals
Not expected to cause eye irritation based on expert review of the properties of the substance.
- Skin sensitization** : Does not cause skin sensitisation., Not tested on animals
Not expected to cause sensitization based on expert review of the properties of the substance.

There are no reports of human respiratory sensitization.
- Repeated dose toxicity** : Inhalation
Rat
-
No toxicologically significant effects were found.

**DuPont™ Suva® 410A Refrigerant**

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

- Mutagenicity : Animal testing did not show any mutagenic effects.
Tests on bacterial or mammalian cell cultures did not show mutagenic effects.
- Reproductive toxicity : No toxicity to reproduction
Animal testing showed no reproductive toxicity.
Information given is based on data obtained from similar substances.
- Teratogenicity : Animal testing showed no developmental toxicity.
- Further information : Cardiac sensitisation threshold limit : > 735000 mg/m3

Carcinogenicity

The carcinogenicity classifications for this product and/or its ingredients have been determined according to HazCom 2012, Appendix A.6. The classifications may differ from those listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or those found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest edition).

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, or OSHA, as a carcinogen.

SECTION 12. ECOLOGICAL INFORMATION**Aquatic Toxicity****Pentafluoroethane (HFC-125)**

- 96 h LC50 : Oncorhynchus mykiss (rainbow trout) 450 mg/l
Information given is based on data obtained from similar substances.
- 96 h ErC50 : Algae 142 mg/l
Information given is based on data obtained from similar substances.
- 72 h NOEC : Pseudokirchneriella subcapitata (green algae) 13.2 mg/l
Information given is based on data obtained from similar substances.
- 48 h EC50 : Daphnia magna (Water flea) 980 mg/l
Information given is based on data obtained from similar substances.

Difluoromethane (HFC-32)

- 96 h LC50 : Fish 1,507 mg/l


DuPont™ Suva® 410A Refrigerant

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

96 h EC50 : Algae 142 mg/l
 48 h EC50 : Daphnia (water flea) 652 mg/l
 30 d : NOEC Fish (unspecified species) 65.8 mg/l

Environmental Fate

Difluoromethane (HFC-32)
 Biodegradability : 5 % OECD Test Guideline 301D
 Not readily biodegradable.

SECTION 13. DISPOSAL CONSIDERATIONS

Waste disposal methods - Product : Can be used after re-conditioning. Recover by distillation or remove to a permitted waste disposal facility. Comply with applicable Federal, State/Provincial and Local Regulations.

Contaminated packaging : Empty pressure vessels should be returned to the supplier.

SECTION 14. TRANSPORT INFORMATION

DOT	UN number	: 3163
	Proper shipping name	: Liquefied gas, n.o.s. (Pentafluoroethane, Difluoromethane)
	Class	: 2.2
	Labelling No.	: 2.2
IATA_C	UN number	: 3163
	Proper shipping name	: Liquefied gas, n.o.s. (Pentafluoroethane, Difluoromethane)
	Class	: 2.2
	Labelling No.	: 2.2
IMDG	UN number	: 3163
	Proper shipping name	: LIQUEFIED GAS, N.O.S. (Pentafluoroethane, Difluoromethane)
	Class	: 2.2
	Labelling No.	: 2.2

**DuPont™ Suva® 410A Refrigerant**

Version 2.0

Revision Date 03/23/2015

Ref. 130000050990

SECTION 15. REGULATORY INFORMATION

TSCA	: On the inventory, or in compliance with the inventory
SARA 313 Regulated Chemical(s)	: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.
PA Right to Know Regulated Chemical(s)	: Substances on the Pennsylvania Hazardous Substances List present at a concentration of 1% or more (0.01% for Special Hazardous Substances): Difluoromethane
NJ Right to Know Regulated Chemical(s)	: Substances on the New Jersey Workplace Hazardous Substance List present at a concentration of 1% or more (0.1% for substances identified as carcinogens, mutagens or teratogens): Difluoromethane
California Prop. 65	: Chemicals known to the State of California to cause cancer, birth defects or any other harm: none known

SECTION 16. OTHER INFORMATION

Suva® is a registered trademark of E. I. du Pont de Nemours and Company
® DuPont's registered trademark
Before use read DuPont's safety information.
For further information contact the local DuPont office or DuPont's nominated distributors.

Revision Date : 03/23/2015

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Significant change from previous version is denoted with a double bar.



DuPont™ Suva® 410A Refrigerant

Version 2.0

Revision Date 03/23/2015

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TROX[®] TECHNIK

The art of handling air

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