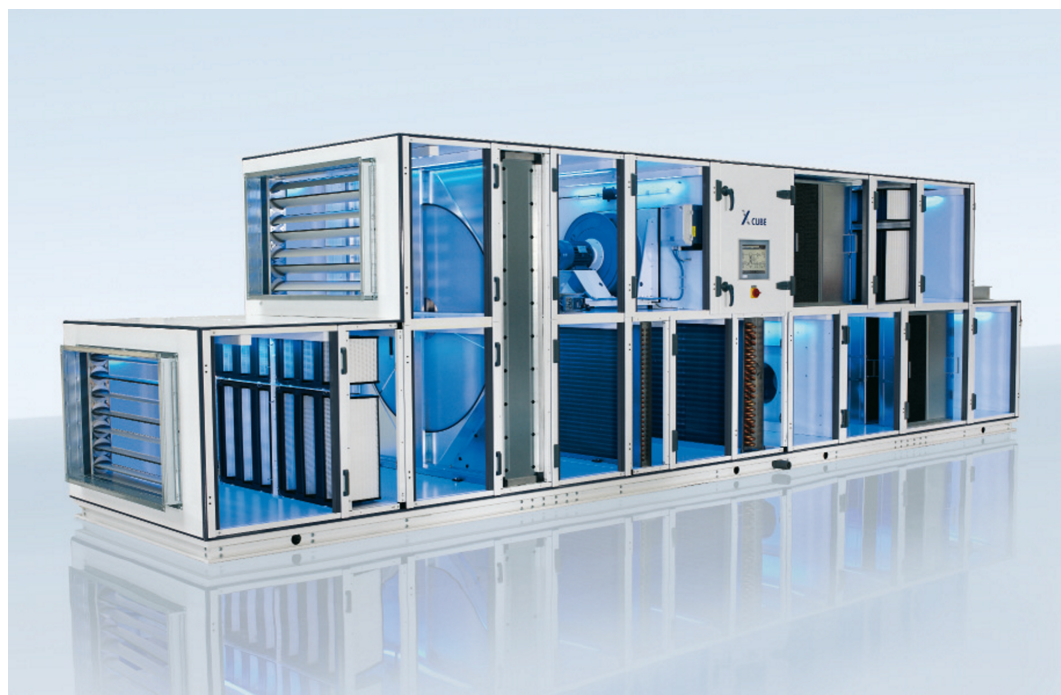




Air handling unit

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
- Data sheets for components from other suppliers, ↪ Appendix
- 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

Online	www.troxtechnik.com
Phone	+49 2845 202-400

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Limitation of liability

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

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

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

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

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

We reserve the right to make technical changes.

Warranty claims

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

Safety notes

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

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

DANGER!

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

WARNING!

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

CAUTION!

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

NOTICE!

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

ENVIRONMENT!

Environmental pollution hazard.

Tips and recommendations



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

Specific safety notes




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

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

Additional markers

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

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

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1 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.

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

Warnung!

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

Warning!

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

Avertissement!

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

A0000050972

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

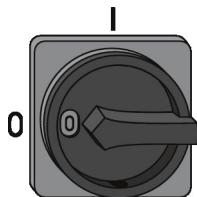


Fig. 2: Local isolator



As long as the AHU remains switched on (mains isolator in '1' 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

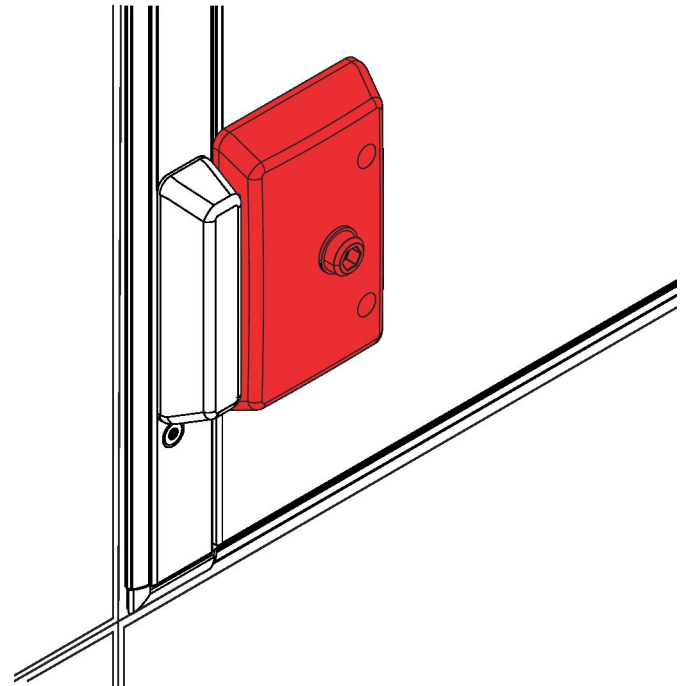


Fig. 3: Safety lock

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

Safety catch on discharge side inspection access doors

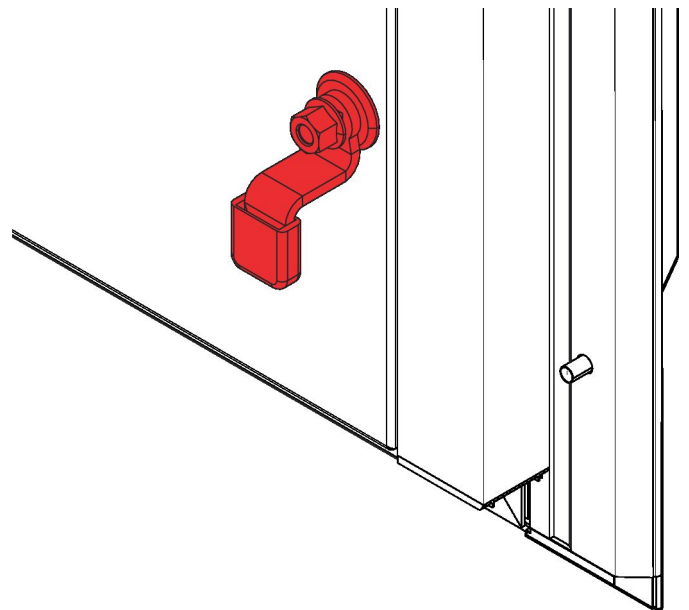


Fig. 4: Safety catch

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

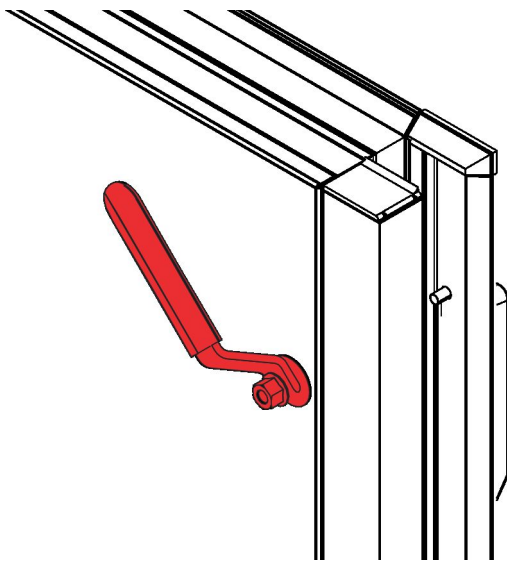


Fig. 5: Inside door handle on an inspection access door
 If an AHU casing unit is higher than 1836 mm, the inspection access doors are factory fitted with an inside door handle. The inside door handle prevents people from becoming trapped inside the unit.

Inside door handle with safety catch

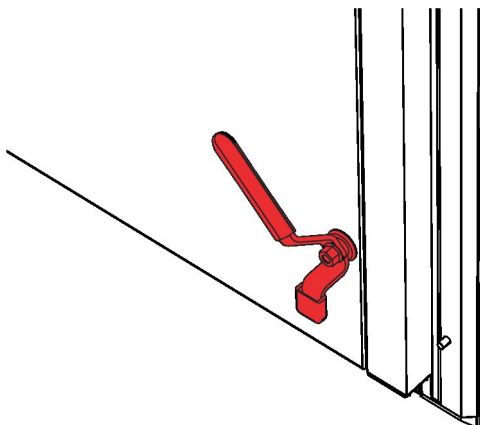


Fig. 6: Inside door handle with safety catch
 If an AHU casing unit is higher than 1836 mm, the inspection access doors on the discharge side are factory fitted with an inside door handle with safety catch. This safeguard prevents:

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

Hold open device

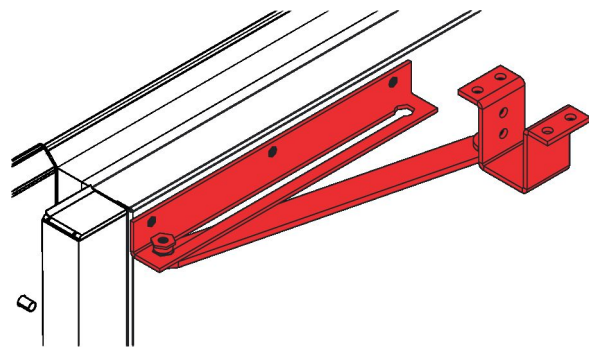


Fig. 7: Hold open device for outdoor air handling units

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

1. ▶ Switch off the AHU at the mains isolator (provided by others).

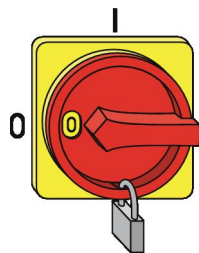


Fig. 8: Securing the mains isolator

2. ▶

⚠ 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'.

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

1.8 Work areas and hazardous areas

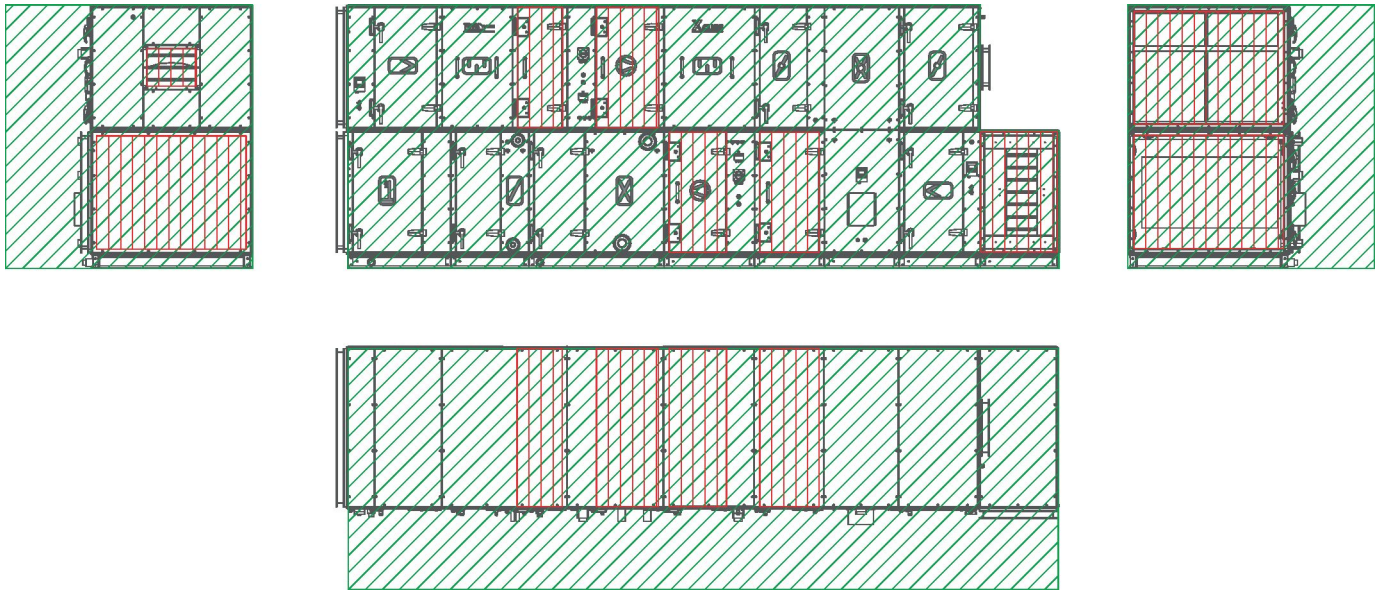




Fig. 9: Hazardous areas

-  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 B.2 'Freezing agent' on page 126*

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 B.2 'Freezing agent' on page 126*
- 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 B.1 'Compressor oil' on page 116*

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 B.2 'Freezing agent'](#) on page 126.

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 B.1 'Compressor oil'](#) on page 116.

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

The operating modes have been configured based on information by the system owner and the manufacturer of the central BMS.

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

The air handling unit does not have a factory fitted mains isolator. The mains isolator has to be provided by others.

Local isolator

☞ 'Local isolator' on page 11

2.5.2 Inspection access doors with a lock

Inspection access doors

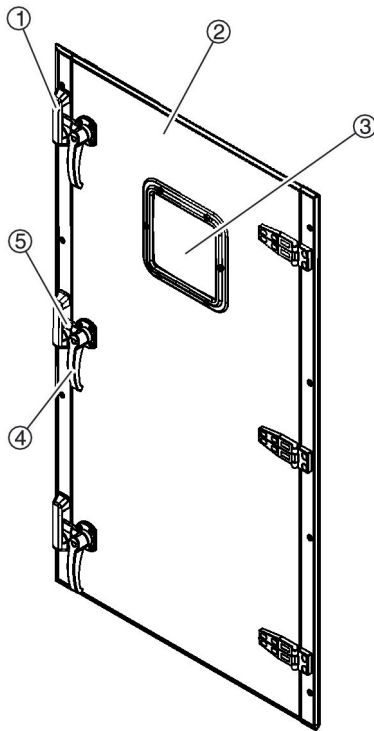


Fig. 10: Inspection access door

- 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 gauge

The current differential pressure is shown on the display, further information ☞ [Appendix A.1 'TROX MD-DPC-24 digital pressure monitor'](#) on page 60 .



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.

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 state), 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.
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.

3 Software use

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

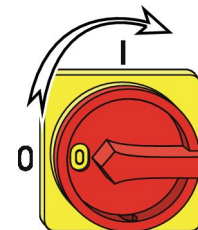


Fig. 13: How to turn the mains isolator

1. ▶ Turn the mains isolator (provided by others) for the AHU to the 'I' position.

After shutdown

2. ▶ Start up the AHU from the central BMS (by others) and according to the system owner's instructions.
 - ⇒ The AHU is now ready for operation.

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 3.10 '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 Shutting the AHU down

Personnel:

- Instructed person
1. ▶ Shut down the air handling unit from the central BMS (by others) and according to the system owner's instructions.
 2. ▶ Secure the AHU against being switched on accidentally, *↪ Chapter 1.7 'Securing the unit against being switched on accidentally' on page 13*.
 - ⇒ The AHU has been secured against being switched on accidentally. It is safe to start working now.

3.9 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.

3.10 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. 14: Analogue and digital differential pressure measuring devices

- ▶ Read the differential pressure from the inspection window (Fig. 14 /1) or the display (Fig. 14 /2).
- ⇒ If the maximum final differential pressure has been reached, you have to replace the filter element, [Chapter 4.4.4 !\[\]\(a43b62a38b6e2844e794f4301a08d3ba_img.jpg\) '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



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



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



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 3.8 'Shutting the AHU down' on page 28
-  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 3.10 '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 drive

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.	Instructed person
	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 or replace bearings if necessary.	Instructed person

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

Maintenance plan

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

Maintenance plan

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

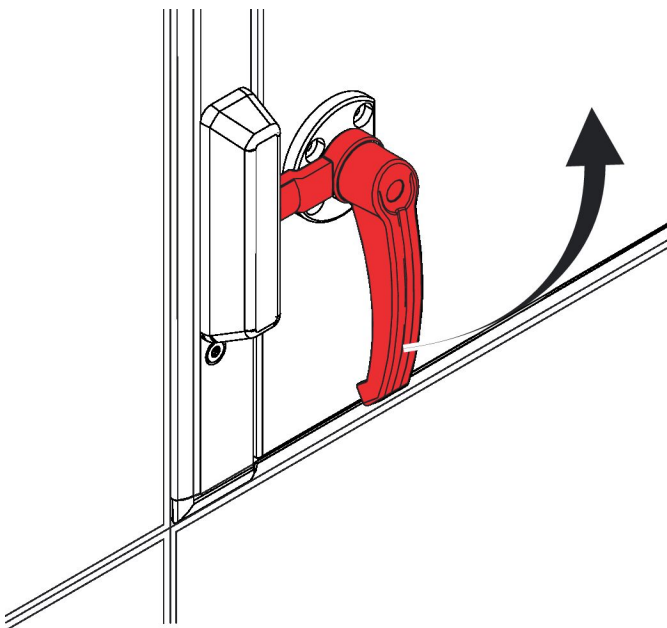


Fig. 15: Opening a door lock

- ▶ Turn the door handle anti-clockwise by 90° (Fig. 15).
- ⇒ This unlocks the door; it can now be opened.

Tool:

- TROX special key

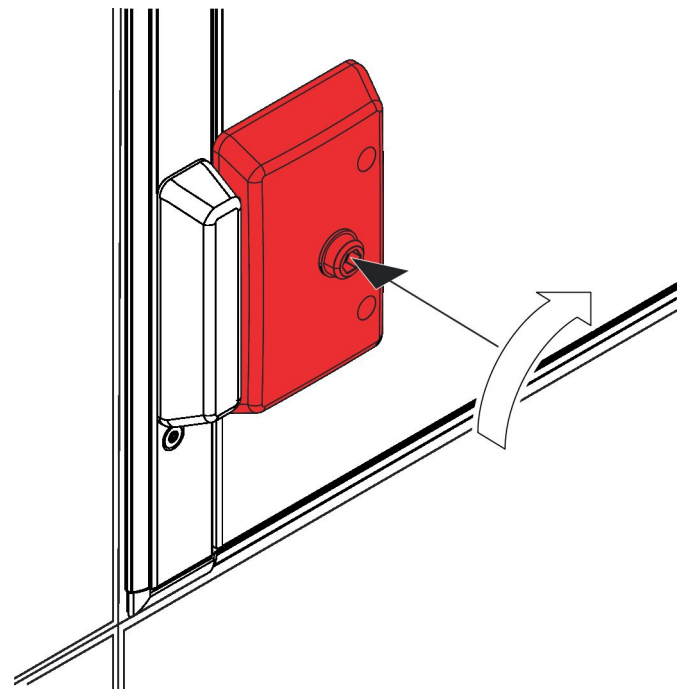


Fig. 16: Opening a lock with the special key (hazardous areas)

- ▶ Insert the TROX special key into the lock and turn it anti-clockwise as far as it will go (Fig. 16).
- ⇒ 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.

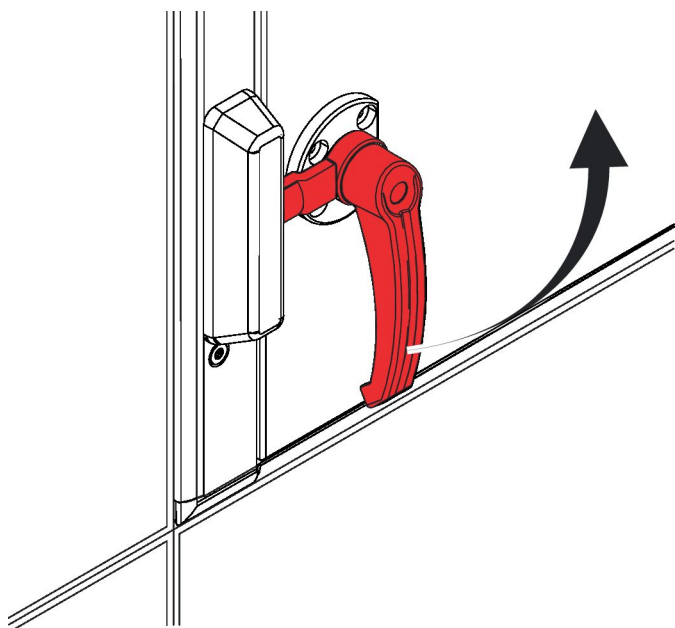


Fig. 17: Opening a door lock

1. ▶ Turn the door handle anti-clockwise by 90° (Fig. 17).
⇒ The door has been unlocked.

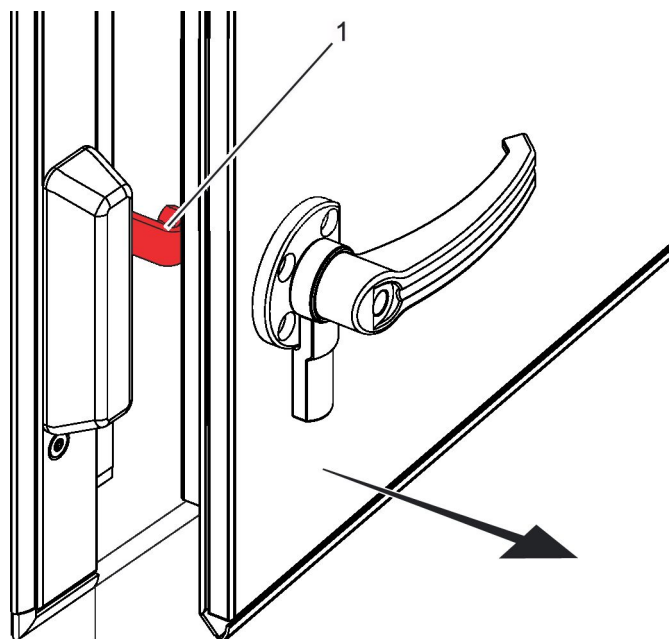


Fig. 18: Safety catch

2. ▶ Carefully open the inspection access door until it is caught by the safety catch (Fig. 18 /1).

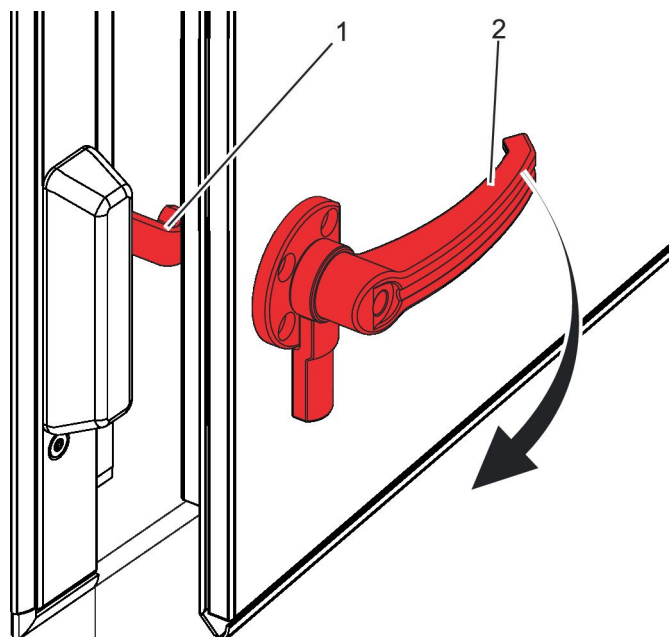




Fig. 19: Releasing the safety catch

3. ▶ Turn the door handle (Fig. 19 /2) clockwise by 90° .
⇒ This releases the safety catch (Fig. 19 /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 3.10 '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

General cleaning procedure

Unless specified otherwise, use

- lint free cloths
- non-corrosive and silicone free cleaning agents

to clean the AHU.

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, see 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, see 'Opening inspection access doors on the discharge side' on page 40.

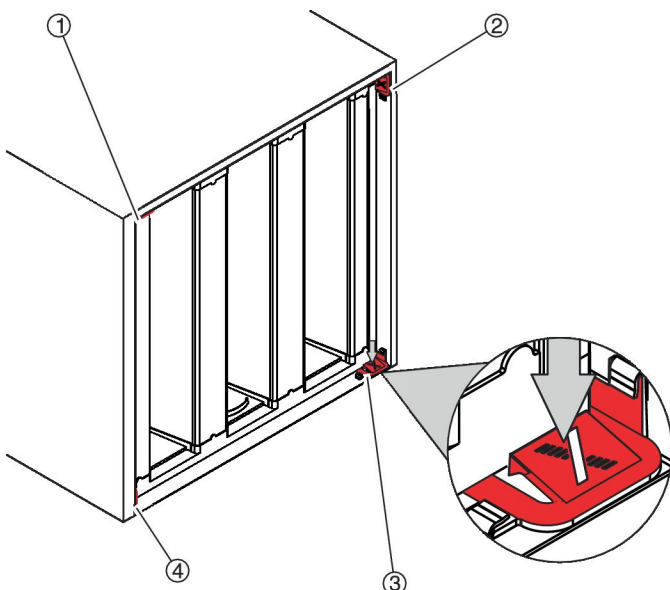


Fig. 20: Loosening the quick release fasteners

3. ▶ Press down the quick release fasteners (Fig. 20 /1 to 4).
⇒ The filter element can now be removed.

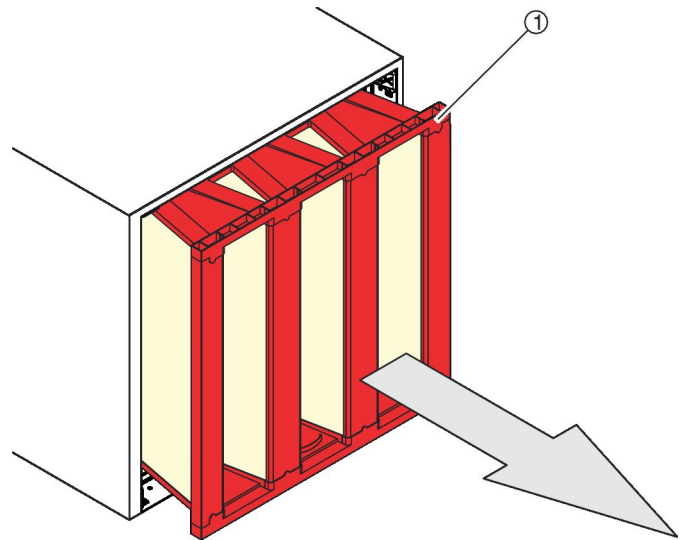


Fig. 21: Removing the filter element

4. ▶ Pull out the filter element (Fig. 21 /1).

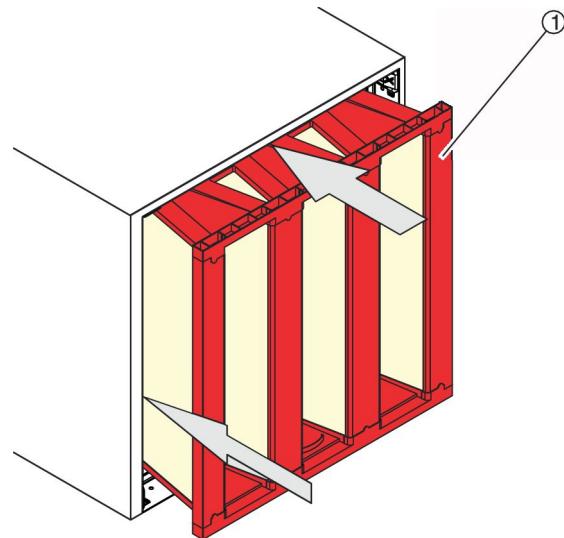


Fig. 22: Replacing the filter element

5. ▶ Insert a new filter element.

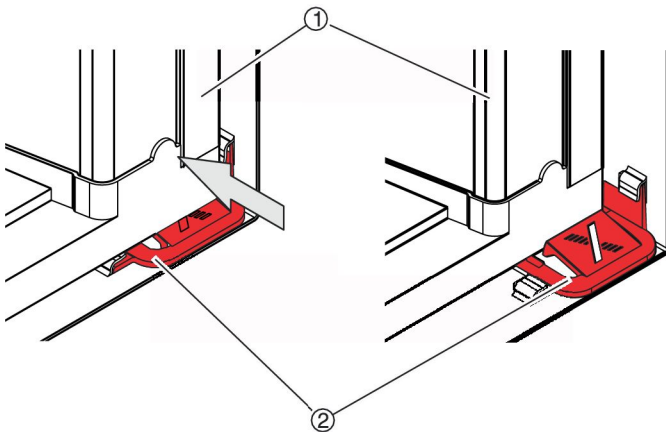


Fig. 23: Filter element locks in place

6. ▶ Push the new filter element (Fig. 23 /1) in and over the quick release fasteners (Fig. 23 /2) until it locks into place.
7. ▶ Close the inspection access doors.
8. ▶ Carry out a zero point correction for the pressure monitor, ↪ *Appendix A.1 'TROX MD-DPC-24 digital pressure monitor' on page 60 .*
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 .*
- 12.▶ If software by others is used, enter the new filter element in that software or central BMS.

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, .

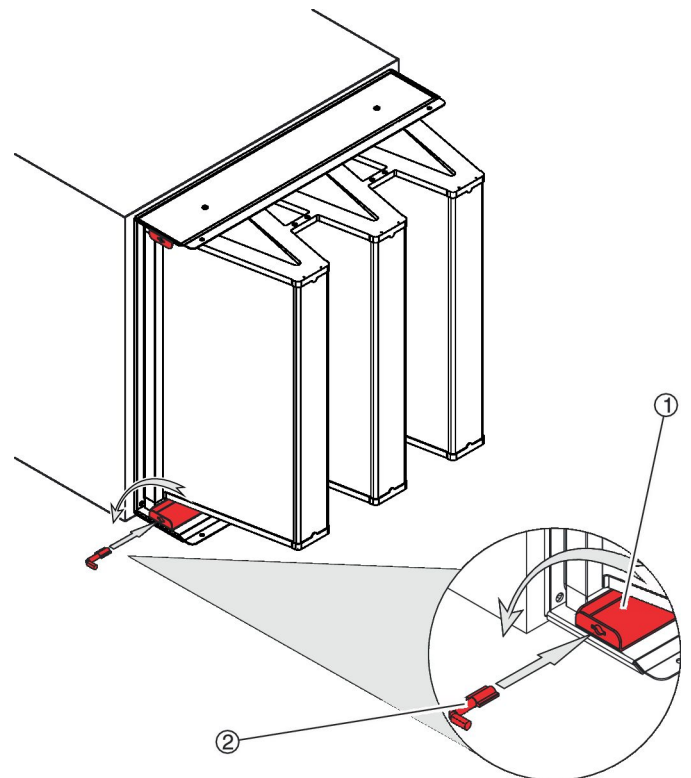


Fig. 24: Inserting the special key

3. ▶ Insert the special key (Fig. 24 /2) into the recess of each clamping rail (Fig. 24 /1) and turn it anti-clockwise by 90°.

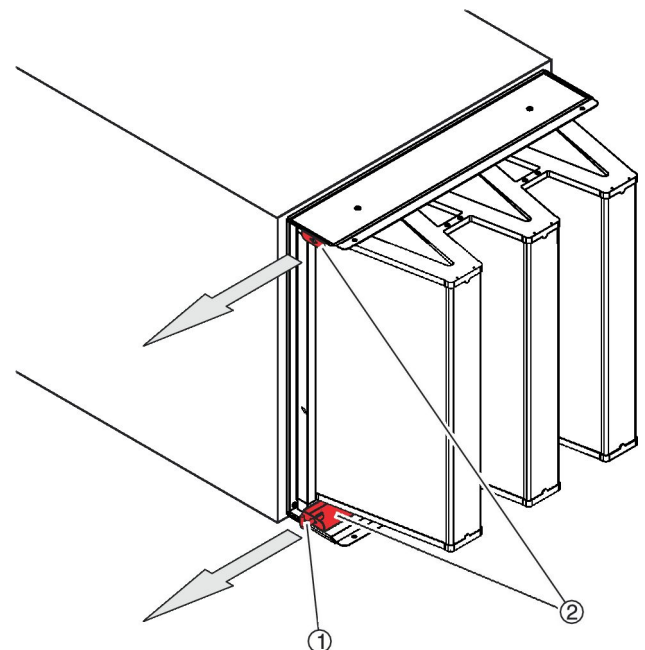


Fig. 25: Releasing the clamping rails

4. ▶ Use the special key (Fig. 25 /1) to pull out the clamping rails (Fig. 25 /2) as far as they will go.
 - ⇒ The filter element has been released.

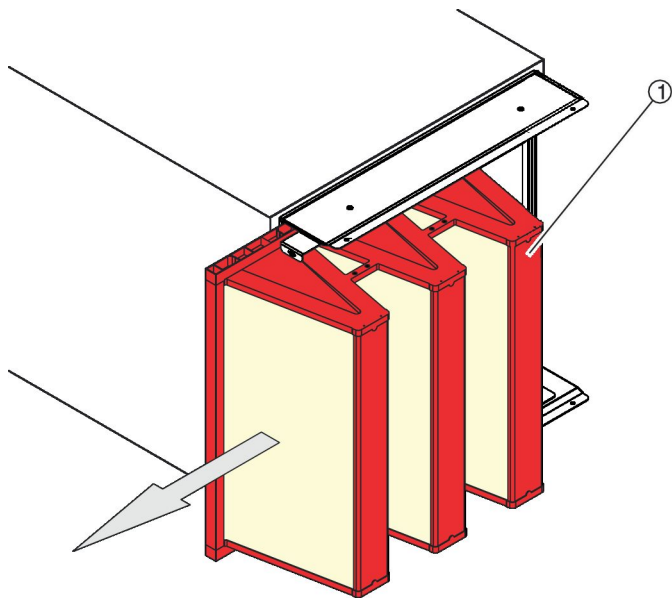


Fig. 26: Removing the filter element

5. ▶ Pull out the filter element (Fig. 26 /1) sideways.

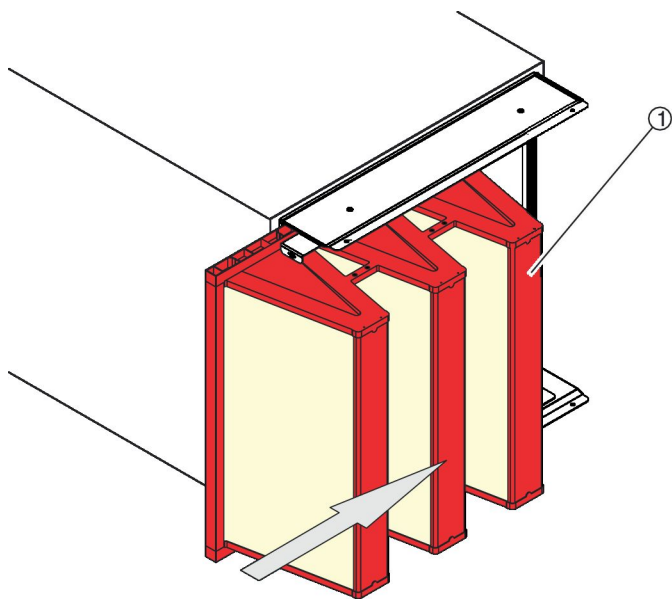


Fig. 27: Replacing the filter element

6. ▶ Slide the new filter element (Fig. 27 /1) in from the side.

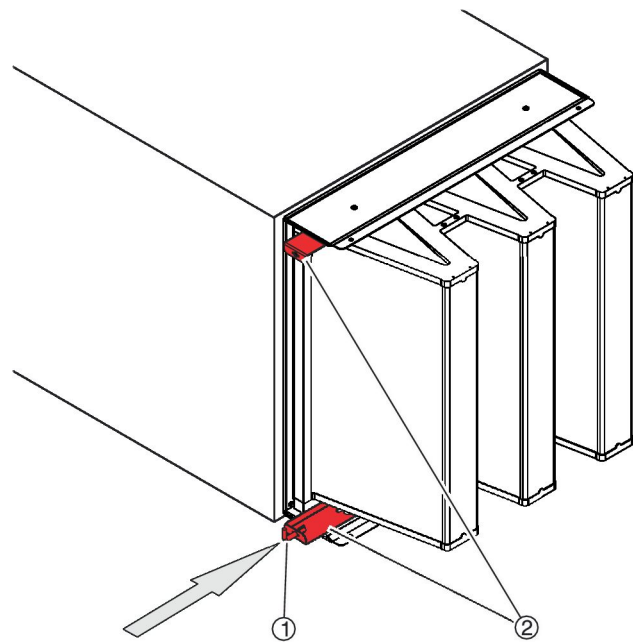


Fig. 28: Pushing the clamping rails in

7. ▶ Use the special key (Fig. 28 /1) to push the clamping rails (Fig. 28 /2) in as far as they will go.
⇒ The filter element has been fitted.
8. ▶ Close the inspection access doors.
9. ▶ Carry out a zero point correction for the pressure monitor, ☞ *Appendix A.1 'TROX MD-DPC-24 digital pressure monitor' on page 60* .
10. ▶ Prepare restart, ☞ *'Before you start the AHU' on page 27* .
11. ▶ Remove the padlock from the mains isolator.
12. ▶ Restart the air handling unit, ☞ *'Switching the mains isolator on' on page 27* .
13. ▶ If software by others is used, enter the new filter element in that software or central BMS.

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, see *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.

Faults displayed on the AHU

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

Fault description	Cause	Remedy	Personnel
No air is being supplied to the connected ventilation system.	Fan in FanArray is not functioning correctly.	In this order: <ul style="list-style-type: none"> Switch off the air handling unit and secure it against restarting, ↪ Chapter 1.7 'Securing the unit against being switched on accidentally' on page 13. Cover the fan by inserting a baffle. Shut off the pressure measurement hose for volume flow rate measurement at the bellmouth inlet. Cover the pressure tap on the inside of the bellmouth inlet with adhesive strips. Contact the TROX Technical Service, ↪ 'TROX Technical Service' on page 3. 	
The yellow LED is flashing and the message 'Minor maintenance due' appears on the display.	Steam humidifier is not functioning correctly.	In this order: <ul style="list-style-type: none"> Carry out weekly maintenance interval of the steam humidifier, ↪ 'Steam humidifier' on page 38. Drain steam cylinder and clean scale collector tank. 	
The yellow LED is lighting up and the message 'Major maintenance due' appears on the display.	Steam humidifier is not functioning correctly.	Carry out full maintenance on the steam humidifier, ↪ 'Steam humidifier' on page 38 .	
The maximum differential pressure for the filter has been exceeded.	The filter element is contaminated.	In this order: <ul style="list-style-type: none"> Switch off the AHU (via the central BMS) and secure it against being switched on accidentally, ↪ Chapter 1.7 'Securing the unit against being switched on accidentally' on page 13. Replace the filter element, ↪ Chapter 4.4.4  Replacing a filter element' on page 44 	Instructed person
The pressure of the heat transfer fluid in the systems provided by others is too high or too low.	Systems provided by others are not working properly.	In this order: <ul style="list-style-type: none"> Switch off the AHU (via the central BMS) and secure it against being switched on accidentally, ↪ Chapter 1.7 'Securing the unit against being switched on accidentally' on page 13. Rectify faults in the systems provided by others according to the system manufacturers' instructions. 	Instructed person

5.4 Troubleshooting

Replacing a filter element

See: [↪ Chapter 4.4.4 !\[\]\(10f8862fc183b400327470ea85afe9ae_img.jpg\) Replacing a filter element' on page 44](#)

5.5 After troubleshooting

Personnel:

- Instructed person

- ▶ Prepare restart, [↪ 'Before you start the AHU' on page 27](#).
- ▶ Remove the padlock from the mains isolator.

- ▶ 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.

Disposal

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.

Important notes:

- In compliance with Directive 2009/125/EC the unit has to be fitted with a suitable speed control, unless a speed control is already part of the supply package.
- The CE mark on the air handling unit is of no relevance with regard to 2006/42/EC, Machinery Directive; according to the Machinery Directive, an air handling unit without integral controls is considered partly completed machinery.
- The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared to be in conformity with the provisions of Directive 2006/42/EC, where appropriate.

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.

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Appendix

A Supplier documents**A.1 TROX MD-DPC-24 digital pressure monitor**

Name	Data
Designation	Pressure monitor
Type	MD-DPC-24
Number	
Type of manual	Technical data sheet
Manufacturer	TROX GmbH

INSTRUCTIONS

MD-DPC-24

67677 10/16 - (KPA)

TROX® TECHNIK



- English
- Deutsch
- Français

English

LIST OF FIGURES

The following figures are located at the back of the instructions:

- Fig. 1: Menu scheme
- Fig. 2: Dimensioned drawing
- Fig. 3: Position of transmitter in relation to bends and branches
- Fig. 4: Wiring diagram
- Fig. 5: Relay operation diagram
- Fig. 6: Orientation of MD

INTRODUCTION

MD-DPC-24 is electronic air pressure / flow transmitter with integrated relay. The relay can be used as feedback to a BMS system or to control an audio/visual alarm. MD has an 0-10V and 0-20mA analog output for read-out of air pressure / flow.

MD use a semiconductor pressure element with no air throughput, thus protecting the unit from dust in the ventilation system. The pressure element is temperature compensated to provide accurate pressure measurement throughout the specified temperature range. See 'Technical Data'.

INSTALLATION

MD should be attached to a firm, level surface using two screws. The pressure controller also functions with only one tube fitted to the tube connectors (+ or -). However, two tubes should always be fitted to maintain the enclosure rating.

Pressure is supplied to the measurement unit by tubes, the higher pressure being connected to the '+ tube connector' and the lower pressure to the '- tube connector' (see fig. 4).

The pressure tubes must be as short as possible and must be secured in position to prevent vibration.

To obtain the best possible results, pressure must be measured where there is least risk of turbulence, i.e. in the centre of the ventilation duct and at a distance of at least twice the width of the duct from bends and six times the width from branches (see fig. 3).

The housing is opened without the use of tools by pressing the snap lock beside the tube connectors.

Cable connection

The output from the MD is either voltage or current controlled. The MD must be provided with a 24 VAC/DC power supply, see figure 4.

Setup menu

Use the buttons \blacktriangle , \blacktriangledown and **OK** to navigate the menu. The buttons can be found on the backside off the lid. The menu is divided into three parts - Setup [Set], Relay [ReL] and Calibration [CAL]. Follow the menu scheme in figure 1 from the bottom up. Note the shown menus depends on the selection of Pressure or flow mode.

Setup - Pressure or flow mode [5E1]

Use Setup menu 1 to choose between Pressure or Flow mode.

Setup - Pressure range [5E2]

Use Setup menu 2 to enter the pressure range. Pressure range defines the pressure at which the analogue output reaches the maximum value.

Setup - Pressure setpoint [5E3]

Use Setup menu 3 to enter the pressure setpoint. Minimum is 0 Pa and maximum is 2500 Pa.

Setup - k-factor [5E4]

Use Setup menu 4 to enter the k-factor. The scale is 0.001 to 9999. The dot position shall be set before entering the value. The selected dot position will also apply to the display, when showing the current flow. After entering the k-factor, place the correct unit stamp on the MD front.

Setup - Flow range [5E5]

Use Setup menu 5 to enter the flow range. Flow range defines the flow at which the analogue output reaches the maximum value.

Setup - Flow setpoint [5E6]

Use Setup menu 6 to enter the air flow setpoint. The scale is 0.000 to 9999. The dot position shall be set before entering the value. The selected dot position will also apply to the display, when showing the current flow.

Setup - Damping [5E7]

Use Setup menu 7 to enter the damping. Minimum damping is 1 seconds and maximum damping is 30 seconds. A low damping can result in unsteady readings, while a higher damping gives a more steady reading but also a slower response time for the regulation. MD uses a $\pm 2\%$ dynamic average correction.

Setup - Analog output type [5E8]

Use Setup menu 8 to enter the analog output mode. It is possible to switch between 0 - 10 VDC, 0 - 20 mA, 2 - 10 VDC and 4 - 20 mA as transmitter output.

Relay menu

Relay - Activation delay [rEL 1]

Use Relay menu 1 to enter the relay activation delay. Minimum delay is 0 seconds and maximum delay is 3600 seconds.

Relay - Hysteresis [rEL 2]

Use Relay menu 2 to enter the pressure hysteresis. Minimum hysteresis is 1% and maximum hysteresis is 50% of the pressure /

flow setpoint.

Relay - Invert relay [rEL 3]

Use Relay menu 3 to invert the default output state for the relay. This feature allow applications where an alarm can be sent both on out of range and on power supply failure. Invert relay has to be set to ON to obtain this function.

Relay - Invert LED [rEL 4]

Use Relay menu 4 to invert the default LED colour from Green to Red. This feature is useful when the MD is used as a pressure guard when controlling a heater element. Here, the LED should be Red until the setpoint is reached.

Calibration menu

When calibrating, make sure the MD are in a pressure free environment. To obtain a pressure free environment remove the two air tubes on the MD. For caution reasons, each calibration will only calibrate ± 5 Pa.

Calibration [CAL 1]

Use Calibration menu 1 to calibrate. Confirm by pressing [Y E 5].

Factory reset [CAL 2]

Use Calibration menu 2 to set the MD back to factory reset. Confirm by pressing [Y E 5].

LED INDICATOR

An LED on the front side of the MD indicates the operating status. Operating range is defined as the setpoint \pm hysteresis.

Non-inverted LED: A red light indicates that the operating range has not been reached. Conversely, a green light indicates that the operating range has been reached.

Inverted LED: A green light indicates that the current pressure/flow is below the operating range. Conversely, a red light indicates that the pressure/flow is above the operating range.

A flashing red light indicates that an error is active. See Troubleshooting for more information.

TECHNICAL DATA

Supply voltage..... 24 VAC/VDC $\pm 15\%$. 50/60 Hz
Power consumption 0.5 W
with relay active 1.0 W
Output 0-10 VDC, 2-10 VDC,
0-20 mA, 4-20 mA
Electrical connection 7 x spring terminals,
max. 1.5 mm²
Measuring range, pressure 0-2500 Pa
Accuracy relay setpoint 0.5% x MV ± 2.5 Pa
Accuracy output signal.....
1,5 % x MV + 0,3% x SR + 2,5 Pa
(MV=measured value / SR=set measuring range)
Maximum pressure..... 20 kPa
Ambient air humidity 10-95 %RH,
non-condensing
Housing dimensions [h x w x d] .. 91 x 75 x 38 mm
Cable gland PG11
Cable dimension..... $\varnothing 3-10$ mm
Pressure tubes..... 2 x $\varnothing 6,2$ mm.
Maximum load
0 - 10 VDC > 2.5 k Ω
0 - 20 mA ≤ 450 Ω
Relay SPDT 30VDC/AC, 1A
Relay power consumption..... 0.1 VA

Environment data

Ambient temperature

Display *	0°C / +50°C
Constant operation	-20°C / +40°C
Transient <2 hours	-30°C / +50°C
Storage	-40°C / +70°C
Enclosure rating	IP54
Weight	110 g

* Note: At temperatures below 0°C, it can be expected that the display will progressively lose intensity. The display may also be slower to update.

SERVICE AND MAINTENANCE

MD contains no components which require service or maintenance. Please contact your supplier if faults arise.

DISPOSAL AND ENVIRONMENTAL PROTECTION

Help protect the environment by disposing of the packaging and redundant products in a responsible manner.

Product disposal



Products marked with this symbol must not be disposed of along with household refuse but must be delivered to a waste collection centre in accordance with current local regulations.

MANUFACTURER

TROX GmbH
Heinrich-Trox-Platz
D-47504 Neukirchen-Vluyn
Germany

CE MARKING

Regulations

The manufacturer herewith declares that the product is in conformity with the following directives of the European parliament:

LVD - Low Voltage Directive

EMC - Electromagnetic Compatibility

RoHS - Restriction of the use of certain Hazardous Substances

WEEE - Waste Electrical and Electronic Equipment directive

Applied standards

EMC emission EN 61000-6-3
EMC immunity EN 61000-6-2

Deutsch

VERZEICHNIS DER ABBILDUNGEN

Die folgenden Abbildungen finden sich am Ende der Anleitung:

Abb. 1: Menü-Schema

Abb. 2: Maßskizze

Abb. 3: Anordnung des Messumformers bei Bögen und Abzweigungen

Abb. 4: Schaltplan

Abb. 5: Relaisbetrieb-Diagramm

Abb. 6: Ausrichtung des MD

EINFÜHRUNG

MD-DPC-24 ist ein elektronischer Luftdruck-/Luftstrom-Messumformer mit integriertem Relais. Das Relais kann für Rückmeldung an ein GLT-System oder zum Steuern eines akustischen/visuellen Alarmsignals dienen. MD verfügt über einen 0-10V- und 0-20mA-Analogausgang zum Auslesen von Luftdruck/Luftstrom.

MD benutzt ein Halbleiter-Druckelement ohne Luftdurchsatz und schützt so das Gerät vor in der Lüftungsanlage befindlichem Staub. Das Druckelement ist temperaturkompensiert, um eine genaue Druckmessung über den gesamten

TROUBLESHOOTING

Symptom	Cause	Action
Relay and front LED toggles	Hysteresis set to low	Raise the value at the hysteresis menu
Error code E101 displayed	Pressure element out of range	Check for clogged filters
Error code E102 displayed	Pressure element temperature out of range	Check external heating or cooling units
Error code E103 displayed	Pressure element defective	Replace MD
Negative measured value displayed	Tubes interchanged	Exchange tubes on plus (+) and minus (-) tube connectors
Measurement deviation	MD positioned where temperature is out side specified temperature range	Adjust ambient temperature to range specified in these instructions
	No or reduced pressure at measuring point	Check that pressure measurement tubes are correctly fitted
	Zero pressure at measuring points	Check connection to fan
Zero point deviation	Zero calibration not carried out	Depressurise MD, if necessary by removing both pressure tubes and carry out zero calibration

angegebenen Temperaturbereich zu gewährleisten. Siehe 'Technische Daten'.

INSTALLATION

MD ist mit zwei Schrauben auf einer festen, ebenen Fläche anzubringen. Der Druckregler funktioniert auch mit nur einem an den Schlauchverbindern angeschlossenen Schlauch (+ oder -). Allerdings sollten immer, um der Schutzart zu entsprechen, zwei Schläuche angeschlossen werden.

Der Druck wird über Schläuche der Messeinheit zugeführt; der höhere Druck ist an den '+ Schlauchverbinder' und der niedrigere Druck an den '- Schlauchverbinder' anzuschließen (siehe Abb. 4).

Die Druckschläuche sind so kurz wie möglich zu halten und müssen in ihrer Position gesichert sein, um ein Vibrieren zu vermeiden.

Um bestmögliche Ergebnisse zu erzielen, muss der Druck an Stellen mit dem geringsten Turbulenzrisiko gemessen werden, d. h. in der Mitte des Lüftungskanals und im Abstand von mindestens der doppelten Kanalbreite von Bögen und der sechsfachen von Abzweigungen (siehe Abb. 3).

Das Gehäuse lässt sich ohne Verwendung von Werkzeugen durch Drücken auf den Schnappverschluss neben den Schlauchverbindern öffnen.

Kabelanschluss

Der Ausgang des MD ist entweder spannungs- oder stromgeregelt. MD ist mit 24 V_{-/±} zu versorgen, siehe Abb. 4.

Einstellungsmenü

Zur Navigation im Menü die Tasten ▲, ▼ und OK benutzen. Die Tasten befinden sich rechts unten auf der Frontabdeckung. Das Menü teilt sich in drei Abschnitte auf – Einstellung [Set], Relais [ReL] und Kalibrierung [CAL]. Siehe Menü-Schema in Abbildung 1 von unten nach oben. Hinweis: Das angezeigte Menü hängt vom gewählten Modus, Luftdruck oder Luftstrom, ab.

Einstellung – Luftdruck- oder Luftstrommodus [5Et 1]
Mit Einstellungsmenü 1, zwischen Luftdruck- oder Luftstrommodus wählen.

Einstellung – Druckbereich [5Et 2]
Mit Einstellungsmenü 2, den Druckbereich eingeben. Der Druckbereich definiert den Druck, bei dem der analoge Ausgang den Maximalwert

erreicht.

Einstellung – Drucksollwert [5Et 3]
Mit Einstellungsmenü 3, den Drucksollwert eingeben. Minimum ist 0 Pa und Maximum ist 2500 Pa.

Einstellung – k-Faktor [5Et 4]
Mit Einstellungsmenü 4, den k-Faktor eingeben. Die Skala reicht von 0,001 bis 9999. Die Dezimalstelle ist vor Eingabe des Werts einzustellen. Die eingestellte Dezimalstelle wird auch bei Anzeige des aktuellen Luftstroms am Display beibehalten. Nach der Eingabe des k-Faktors, die korrekte Einheitsmarkierung auf der MD-Front anbringen.

Einstellung – Luftstrombereich [5Et 5]
Mit Einstellungsmenü 5, den Luftstrombereich eingeben. Der Luftstrombereich definiert den Luftstrom, bei dem der analoge Ausgang den Maximalwert erreicht.

Einstellung – Luftstromsollwert [5Et 6]
Mit Einstellungsmenü 6, den Luftstromsollwert eingeben. Die Skala reicht von 0,000 bis 9999. Die Dezimalstelle ist vor Eingabe des Werts einzustellen. Die eingestellte Dezimalstelle wird auch bei Anzeige des aktuellen Luftstroms am Display beibehalten.

Einstellung – Dämpfung [5Et 7]

Mit Einstellungsmenü 7, die Dämpfung einstellen. Die Dämpfung kann mindestens 1 Sekunde und maximal 30 Sekunden betragen. Eine kurze Dämpfung bewirkt eine instabile Anzeige, eine längere Dämpfung hingegen eine konstantere Anzeige, sowie eine langsamere Reaktionszeit der Regelung. MD benutzt eine dynamische Durchschnittskorrektur von ±2 %.

Einstellung – Analoger Ausgangstyp [5Et 8]
Mit Einstellungsmenü 8, den analogen Ausgangsmodus einstellen. Zur Wahl stehen als Messumformerausgang 0-10 V₌, 0-20 mA, 2-10 V₌ und 4-20 mA.

Relaismenü

Relais – Einschaltverzögerung [rEL 1]
Mit Relaismenü 1, die Einschaltverzögerung des Relais eingeben. Die Verzögerung kann mindestens 0 Sekunden und maximal 3600 Sekunden betragen.

Relais – Hysteresis [rEL 2]
Mit Relaismenü 2, die Druckhysteresis eingeben. Als Minimum der Hysteresis lässt sich 1 %, als

Maximum 50 % des Luftdruck-/Luftstromsollwerts festlegen.

Relais – Relais umkehren [rEL3]

Mit Relaismenü 3, den standardmäßigen Ausgangszustand des Relais umkehren. Diese Funktion ermöglicht Anwendungen, in denen sowohl bei Außerhalb-des-erlaubten-Bereichs-Zuständen als auch bei Stromausfall ein Alarm gesendet werden kann. Um die Funktion zu aktivieren, Relais umkehren auf ON einstellen.

Relais – LED umstellen [rEL4]

Mit Relaismenü 4, die vorgegebene LED-Farbe von Grün auf Rot umstellen. Diese Funktion ist nützlich, wenn der MD als Druckwächter verwendet wird, um ein Heizelement zu steuern. Hier sollte die LED rot leuchten, bis der Sollwert erreicht ist.

Kalibrierungsmenü

Beim Kalibrieren darauf achten, dass sich MD in druckfreiem Zustand befindet. Dazu die beiden Luftschläuche von MD abkoppeln. Sicherheits- halber erfolgt jede Kalibrierung nur mit ±5 Pa.

Kalibrierung [CAL1]

Mit Kalibrierungsmenü 1, kalibrieren. Mit [YES] bestätigen.

Zurücksetzen auf die Werkseinstellung [RL2]

Mit Kalibrierungsmenü 2, MD auf die Werkseinstellung zurücksetzen. Mit [YES] bestätigen.

LED-ANZEIGE

Eine LED auf der Front des MDs zeigt den Betriebszustand an. Der Betriebsbereich ist mit Sollwert ± Hysterese festgelegt.

Nicht umgestellte LED: Rotes Licht zeigt an, dass der Betriebsbereich noch nicht erreicht ist. Grünes Licht hingegen bedeutet, dass der Betriebsbereich erreicht ist.

Umgestellte LED: Grünes Licht zeigt an, dass der aktuelle Druck/Luftstrom unterhalb des Betriebsbereichs liegt. Rotes Licht hingegen bedeutet, dass der Druck/Luftstrom oberhalb des Betriebsbereichs liegt.

Blinkendes rotes Licht zeigt an, dass ein Fehler

auftrat. Siehe Fehlerbehebung für weitere Informationen.

Innen im Gerät

Eine weitere LED befindet sich innen im Gerät. Grünes Licht bedeutet, die Stromversorgung ist korrekt angeschlossen.

TECHNISCHE DATEN

Spannungsversorgung.. 24 V~/± 15%, 50/60 Hz	
Leistungsaufnahme	0,5 W
mit Relais aktiv	1,0 W
Ausgang	0-10 V=, 2-10 V=, 0-20 mA, 4-20 mA
Elektrischer Anschluss	7 Federkraftklemmen, max. 1,5 mm ²
Messbereich, Luftdruck	0-2500 Pa
Sollwert-Genauigkeit des Relais	0,5 % × MW ±2,5 Pa
Ausgangssignal-Genauigkeit.....	1,5 % × MW + 0,3 % × MB + 2,5 Pa (MW = gemessener Wert / MB = eingestellter Messbereich)
Maximaler Druck	20 kPa
Umgebungsluftfeuchtigkeit	10-95 %rF, nicht kondensierend
Gehäuseabmessungen [h×b×t]	91 × 75 × 38 mm
Kabelgröße	ø3-10 mm
Druckschläuche.....	2 × ø6,2 mm
Maximale Last	
0-10 V=.....	>2,5 kΩ
0-20 mA	≤450 Ω
Relais.....	SPDT 30 V~/-, 1 A
Leistungsaufnahme des Relais.....	0,1 VA

Umfeldaten

Umgebungstemperatur	
Display *	0 °C/+50 °C
Dauerbetrieb	-20 °C/+40 °C
Vorübergehend <2 Stunden..	-30 °C/+50 °C
Aufbewahrung	-40 °C/+70 °C
Schutzart	IP54
Gewicht	110 g

* Anmerkung: Bei Temperaturen unter 0 °C kann die Displayanzeige schrittweisen an Intensität verlieren. Auch die Aktualisierung des Displays kann sich verlangsamen.

SERVICE UND WARTUNG

MD enthält keine Komponenten, die Service oder Wartung erfordern. Bei Problemen bitte mit dem Zulieferer Kontakt aufnehmen.

ENTSORGUNG UND UMWELTSCHUTZ

Helfen Sie, die Umwelt zu schützen, und entsorgen Sie die Verpackung und überschüssigen Teile verantwortungsbewusst.

Entsorgung (Produkt)



Mit diesem Symbol gekennzeichnete Produkte dürfen nicht gemeinsam mit Haushaltsmüll entsorgt werden, sondern müssen entsprechend den geltenden lokalen Richtlinien bei einer Abfallsammelstelle abgeliefert werden.

HERSTELLER

TROX GmbH
Heinrich-Trox-Platz
D-47504 Neukirchen-Vluyn
Deutschland

CE-KENNZEICHNUNG

Verordnungen

Der Hersteller erklärt hiermit, dass das Produkt in Übereinstimmung mit den folgenden Richtlinien des Europäischen Parlaments ist:

- NSR – Niederspannungsrichtlinie
- EMV – Elektromagnetische Verträglichkeit
- RoHS – Beschränkung der Verwendung bestimmter gefährlicher Stoffe
- WEEE – Elektro- und Elektronik-Altgeräte

Angewandte Normen

- EMV-Emission EN 61000-6-3
- EMV-Störfestigkeit EN 61000-6-2

Français

LISTE DES FIGURES

Les figures suivantes sont situées au dos des instructions :

- Fig. 1: Plan du menu
- Fig. 2: Dessin avec dimensions
- Fig. 3: Position du transmetteur par rapport aux coudes et embranchements
- Fig. 4: Schéma de filerie
- Fig. 5: Diagramme de fonctionnement du relais
- Fig. 6: Orientation du MD

INTRODUCTION

Le MD-DPC-24 est un transmetteur électronique de pression / débit d'air avec relais intégré. Le relais peut être utilisé en rétroaction pour un système GTB ou pour contrôler une alarme audio/visuelle. Le MD possède une sortie analogique de 0-10 V et 0-20 mA pour la lecture de la pression/du débit d'air.

Le MD utilise un élément de pression à semi-conducteur sans débit d'air ce qui protège l'appareil contre la poussière dans le système de ventilation. L'élément de pression est compensé en température afin de fournir des mesures de pression précises pour toute la plage de températures spécifiée. Voir "Caractéristiques techniques".

INSTALLATION

Le MD doit être fixé sur une surface solide et de niveau avec deux vis. Le contrôleur de pression fonctionne également avec seulement un tube raccordé aux connecteurs de tube (+ ou -). Cependant, deux tubes devraient toujours être raccordés pour conserver la classe du boîtier. La pression est fournie à l'unité de mesure par des tubes, le tube de pression la plus élevée étant raccordé au "connecteur de tube +" et celui de basse pression au "connecteur de tube -" (voir fig. 4). Les tubes pression doivent être les plus courts possible et fixés pour prévenir leur vibration.

FEHLERSUCHE UND -BEHEBUNG

Symptom	Ursache	Behebung
Relais und Front-LED schalten hin und her	Hysterese zu niedrig eingestellt	Höheren Wert für Hysterese im Relaismenü eingeben.
Fehlercode E101 wird angezeigt	Druckelement außerhalb des Bereichs	Kontrollieren, ob Filter verstopft ist.
Fehlercode E102 wird angezeigt	Druckelementtemperatur außerhalb des Bereichs	Externe Heiz- oder Kühleinheiten kontrollieren.
Fehlercode E103 wird angezeigt	Druckelement defekt	MD austauschen.
Negativer Messwert wird angezeigt	Schläuche vertauscht	Schläuche auf den (+)- und (-)-Schlauchverbindern miteinander austauschen.
Messabweichung	Temperatur am MD-Standort außerhalb des spezifizierten Temperaturbereichs	Umgebungstemperatur auf den in dieser Anleitung spezifizierten Bereich anpassen.
	Kein oder verminderter Druck am Messpunkt	Kontrollieren, dass die Druckmessschläuche korrekt angebracht sind.
	Kein Druck an den Messpunkten	Verbindung zum Lüfter kontrollieren.
Nullpunktabweichung	Nullpunkt-Kalibrierung nicht durchgeführt	MD drucklos machen, falls erforderlich beide Druckschläuche entfernen, und Nullpunkt-Kalibrierung vornehmen.

Pour obtenir les meilleurs résultats possible, la pression doit être mesurée où il y a le moins de risque de turbulence, c.-à-d. au centre de la conduite de ventilation à une distance d'au moins deux fois la largeur de la conduite au droit des coudes, et six fois la largeur au droit des embranchements (voir fig. 3).

Le boîtier s'ouvre sans l'utilisation d'outils en appuyant sur la fermeture à pression au côté des connecteurs de tube.

Raccordement du câble

La sortie du MD est contrôlée soit par tension soit par courant. Le MD doit être alimenté par une source de 24 VCA/VCC, voir figure 4.

Menu de réglage

Utilisez les boutons ▲, ▼ et OK pour naviguer dans le menu. Les boutons se trouvent à l'arrière du couvercle. Le menu est subdivisé en trois parties - Réglage [Set], Relais [ReL] et Calibration [CAL]. Suivez le plan du menu à la figure 1 de bas en haut. Notez que le menu affiché dépend de la sélection du mode pression ou du mode débit.

Réglage - Mode pression ou débit [5E1]
Utilisez le menu 1 du réglage pour choisir entre le mode pression ou le mode débit.

Réglage - Plage de pression [5E2]
Utilisez le menu 2 du réglage pour saisir la plage de pression. La plage de pression définit la pression à laquelle la sortie analogique atteint la valeur maximum.

Réglage - Point de consigne de la pression [5E3]
Utilisez le menu 3 du réglage pour entrer le point de consigne de la pression. Le minimum est 0 Pa et le maximum 2500 Pa.

Réglage - coefficient-K [5E4]
Utilisez le menu 4 du réglage pour saisir le coefficient-K. L'échelle est de 0,001 à 9999. Il faut fixer la position décimale avant de saisir la valeur. La position décimale choisie s'appliquera également à l'affichage du débit actuel. Après avoir entré le coefficient-K, appliquez l'étiquette appropriée d'unité sur le devant du MD

Réglage - Plage de débit [5E5]
Utilisez le menu 5 du réglage pour saisir la plage de débit. La plage de débit définit le débit auquel la sortie analogique atteint la valeur maximum.

Réglage - Point de consigne du débit [5E6]
Utilisez le menu 6 du réglage pour saisir le point de consigne du débit d'air. L'échelle est de 0,000 à 9999. Il faut fixer la position décimale avant de saisir la valeur. La position décimale choisie s'appliquera également à l'affichage du débit actuel.

Réglage - Amortissement [5E7]
Utilisez le menu 7 du réglage pour entrer la valeur de l'amortissement. Valeur d'amortissement minimum de 1 seconde et valeur d'amortissement maximum de 30 secondes. Un faible amortissement peut engendrer des lectures non stables alors qu'un amortissement plus élevé donne des lectures plus stables, mais aussi une régulation plus lente. Le MD applique une correction dynamique moyenne de ±2 %.

Réglage - Type de sortie analogique [5E8]
Utilisez le menu 8 du réglage pour saisir le mode de sortie analogique. Il est possible de basculer entre 0 - 10 VCC, 0 - 20 mA, 2 - 10 VCC et 4 - 20 mA pour la sortie du transmetteur.

Menu relais

Relais - Délai d'activation [rEL 1]
Utilisez le menu 1 de relais pour saisir le délai

d'activation du relais. Le délai minimum est 0 seconde et le maximum est 3600 secondes.

Relais - Hystérésis [rEL 2]
Utilisez le menu 2 de relais pour saisir l'hystérésis de pression. L'hystérésis minimum est 1 % et l'hystérésis maximum est 50 % du point de consigne de pression/de débit.

Relais - Inversion du relais [rEL 3]
Utilisez le menu 3 de relais pour inverser l'état de sortie par défaut du relais. Cette fonction accorde des applications où une alarme peut être déclenchée pour une sortie de plage et une perte d'alimentation. L'inversion du relais doit être réglée à ON pour obtenir cette fonction.

Relais - Inversion DEL [rEL 4]
Utilisez le menu 4 de relais pour inverser la couleur par défaut de la DEL du vert au rouge. Cette option est utile quand le MD est utilisé comme limiteur de pression pour le contrôle d'un élément de chauffage. La DEL devrait être rouge jusqu'à ce que le point de consigne soit atteint.

Menu de calibration

Lors de la calibration, assurez-vous que le MD est dans un environnement sans pression. Pour obtenir un environnement sans pression, retirez les deux tubes d'air du MD. Pour être prudent, chaque calibration ne calibrera que ±5 Pa.

Calibration [CAL 1]
Utilisez le menu 1 de calibration pour calibrer. Confirmez en appuyant sur [yes].

Réinitialisation aux valeurs d'usine [CAL 2]
Utilisez le menu 2 de calibration pour réinitialiser le MD à ses valeurs d'usine. Confirmez en appuyant sur [YES].

INDICATEUR DEL

Une DEL sur le devant du MD indique l'état du fonctionnement. La plage de fonctionnement est définie comme le point de consigne ± l'hystérésis.

DEL non inversée : Une lumière rouge signifie que la plage de fonctionnement n'a pas été atteinte. Autrement, une lumière verte signifie

que la plage de fonctionnement a été atteinte.

DEL inversée : Une lumière verte signifie que la pression actuelle ou le débit actuel sont inférieurs à la plage de fonctionnement. Autrement, une lumière rouge indique que la pression ou le débit sont supérieurs à la plage de fonctionnement.

Une lumière rouge clignotante indique qu'une erreur est active. Voir le diagnostic de pannes pour plus d'information.

CARACTÉRISTIQUES TECHNIQUES

Tension d'alimentation	..... 24 VCA/VCC ±15 %, 50/60 Hz
Consommation d'énergie	..... 0,5 W avec relais actif..... 1,0 W
Sortie	..... 0-10 VCC, 2-10 VCC 0-20 mA, 4-20 mA
Raccordement électrique	..... 7 x bornes à vis, max. 1,5 mm ²
Plage de mesure de pression	..... 0-2500 Pa
Précision du point de consigne du relais	..... 0,5 % x MV ±2,5 Pa
Précision du signal de sortie	..... 1,5 % x MV + 0,3 % x SR + 2,5 Pa (MV = valeur mesurée / SR = plage de mesure réglée)
Pression maximum	..... 20 kPa
Humidité de l'air ambiant	..... 10-95 % RH, sans condensation
Dimensions du boîtier [h x l x p]	..... 91 x 75 x 38 mm
Dimension du câble	..... ø3-10 mm
Tubes de pression	..... 2 x ø6,2 mm.
Charge maximum	..... 0 - 10 VCC > 2,5 kΩ
	..... 0 - 20 mA ≤ 450 Ω
Relais	..... Unipolaire bidirectionnel (SPDT) 30 VCC/CA, 1A
Consommation d'énergie du relais	..... 0,1 VA

Données environnementales

Température ambiante	Écran..... 0 °C / +50 °C
	Fonctionnement continu..... -20 °C / +40 °C
	Transitoire <2 heures -30 °C / +50 °C
	Entreposage -40 °C / +70 °C
Norme du boîtier	..... IP54
Poids	..... 110 g

DIAGNOSTIC DE PANNES

Symptôme	Cause	Action
Les DEL du relais et du devant alternent	Hystérésis réglée trop basse	Augmentez la valeur dans le menu hystérésis
Code d'erreur E101 affiché	Élément de pression hors plage	Vérifiez si les filtres sont bouchés
Code d'erreur E102 affiché	Température d'élément de pression hors plage	Vérifiez les appareils externes de chauffage ou de refroidissement
Code d'erreur E103 affiché	Élément de pression défectueux	Remplacez le MD
Valeurs négatives mesurées affichées	Les tubes sont interchangés	Permuter les tubes sur les connecteurs de tube plus (+) et moins (-)
Déviation de mesure	Le MD est situé où la température est en dehors de la plage précisée	Ramenez la température ambiante à l'intérieur de la plage précisée dans ces instructions
	Pas de pression ou pression réduite au point de mesure	Vérifiez que les tubes de mesure de pression sont bien ajustés
	Pression zéro aux points de mesure	Vérifiez le raccordement du ventilateur
Déviations du point zéro	La calibration à zéro n'est pas faite	Dépressurisez le MD, si nécessaire, en enlevant les deux tubes de pression et exécutez la calibration à zéro.

* Note: Pour des températures inférieures à 0 °C, l'écran perdra graduellement de l'intensité. L'affichage peut également être plus lent pour les mises à jour.

SERVICE ET ENTRETIEN

Le MD ne comporte aucun composant qui requiert un entretien ou une maintenance. Veuillez communiquer avec votre fournisseur si un défaut apparaît.

MISE AU REBUT ET PROTECTION DE L'ENVIRONNEMENT

Aidez à la protection de l'environnement en jetant l'emballage et les produits superflus de façon responsable.

Mise au rebut de produits



Les produits marqués de ce symbole ne doivent pas être rebutés avec les déchets domestiques, mais doivent être livrés à un centre de collecte de rebuts en conformité avec la réglementation locale en vigueur.

LE FABRICANT

TROX GmbH
Heinrich-Trox-Platz
D-47504 Neukirchen-Vluyn
Allemagne

HOMOLOGATION CE Réglementation

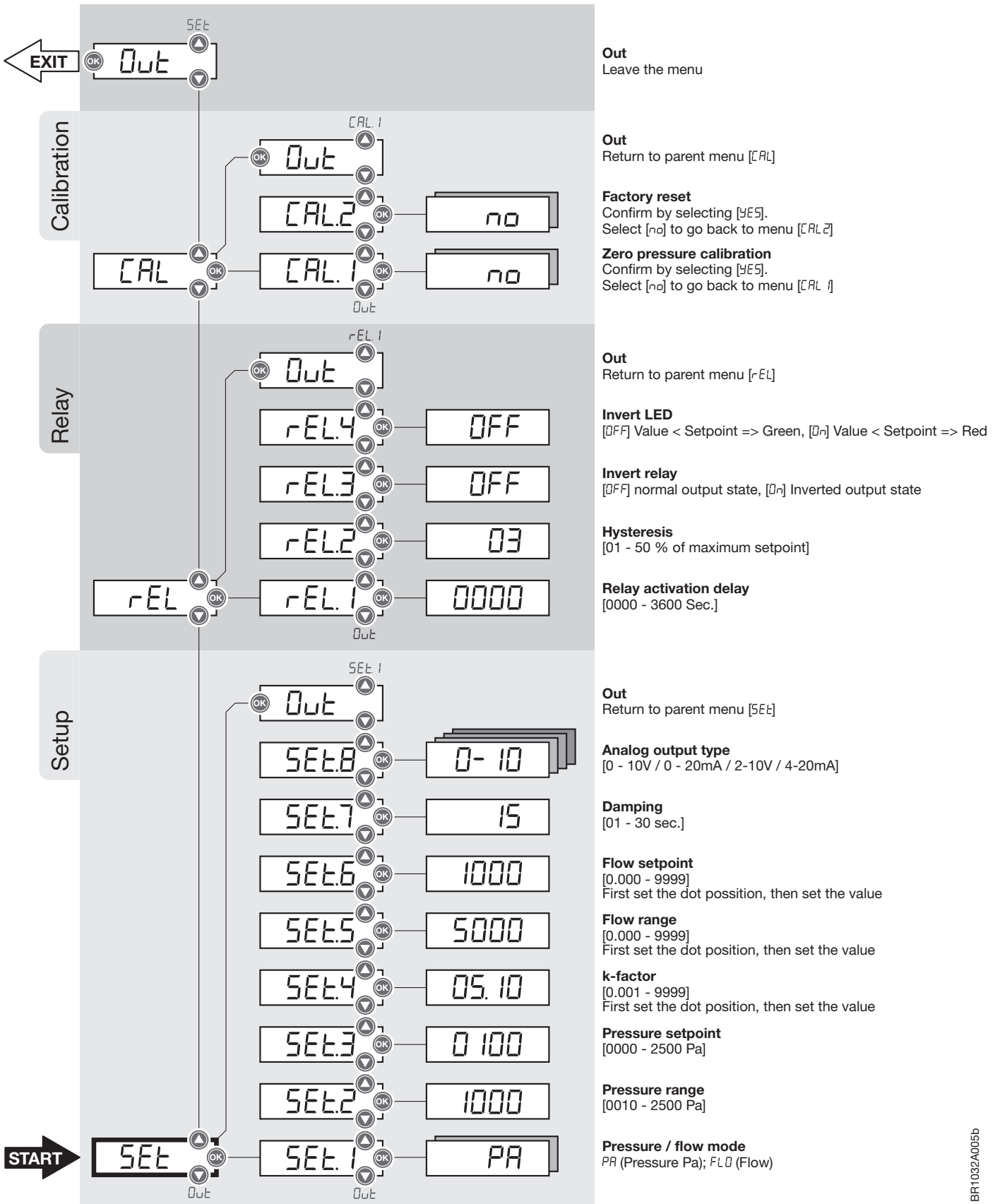
Le Fabricant déclare par la présente que le produit est conforme aux directives suivantes du Parlement européen :

- DBT - Directive basse tension
- CEM - Compatibilité électromagnétique
- RoHS - Restriction pour l'utilisation de certaines matières dangereuses
- DEEE - Directive à propos des déchets d'équipements électriques et électroniques

Normes appliquées

Émission CEM EN 61000-6-3
Immunité CEM EN 61000-6-2

Fig. 1 Menu scheme



BR1032A005b

K-factor conversion table (Flow only)

The k-factor given by the equipment (k_1) is entered into the equation and the result (k_2) is entered into the MD.

Example of calculation:

The k-factor data for the equipment is declared to be 5.6 based on liter per seconds [l/s]. You want the MD to handle flow in cubicmeters per hours [m^3/h].

On the second row you will find the equations for k_1 in [l/s].

In the first column you will find equations for k_2 in [m^3/h].

$$k_2 = k_1 * 3.6$$

$$k_2 = 5.6 * 3.6$$

$$k_2 = 20.16$$

Enter 20.16 into menu point Set4 [5E4]. Please remember to set the dot position before setting the value.

The MD display will now show the calculated air flow in cubicmeters per hours. Remember to place the m^3/h sticker on the MD front.

		$k_2 = k_1 * \text{value (k-factor to enter into MD-DPC-24)}$					
		m^3/h	l/s	$m^3/h \times 1000$	l/s x 1000	m^3/s	cfm
k ₁ (k-factor given from equipment)	m^3/h		0.278	1000			0.589
	l/s	3.6		0.0036	0.001	0.001	2.119
	$m^3/h \times 1000$	0.001			0.278	0.278	588.6
	l/s x 1000	3600	1000			1000	2119
	m^3/s	3600	1000				2119
	cfm	1.699	0.472	1699		471.9	

k-Factor conversion table

BR1032A010a

Fig. 2 Dimensioned drawing

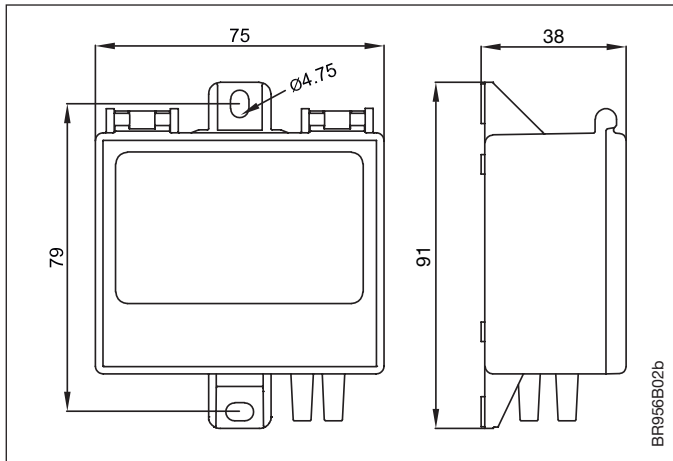


Fig. 3 Position of transmitter in relation to bends and branches

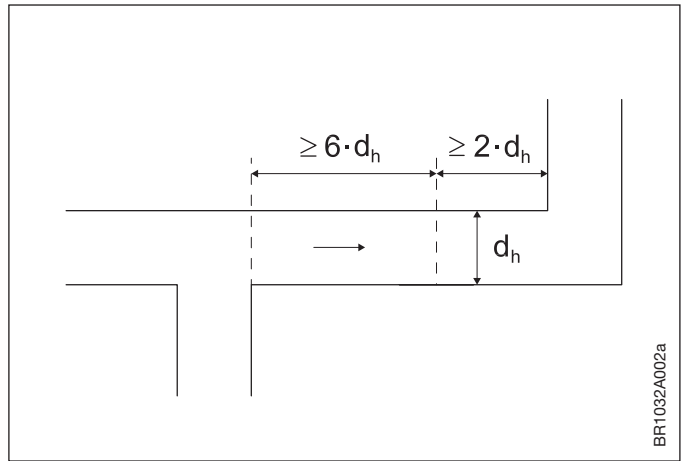


Fig. 4 Wiring diagram

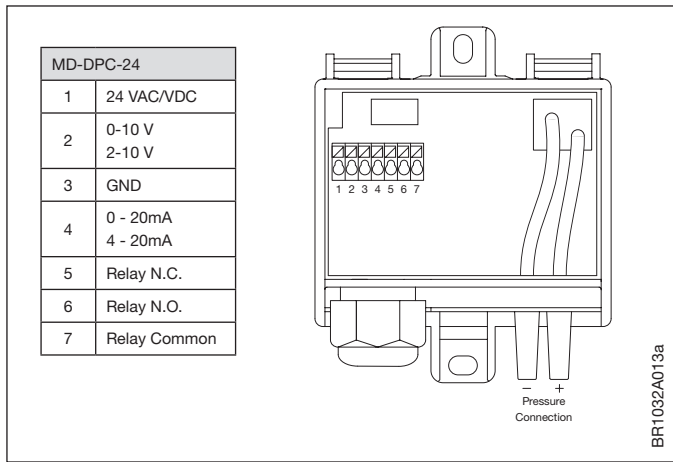


Fig. 5 Relay operation diagram

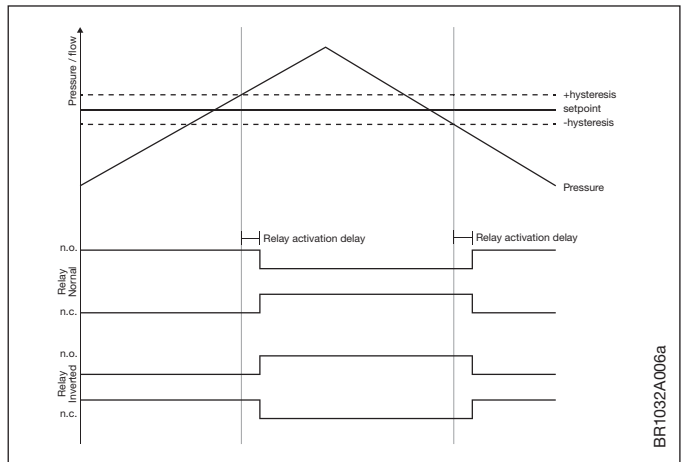
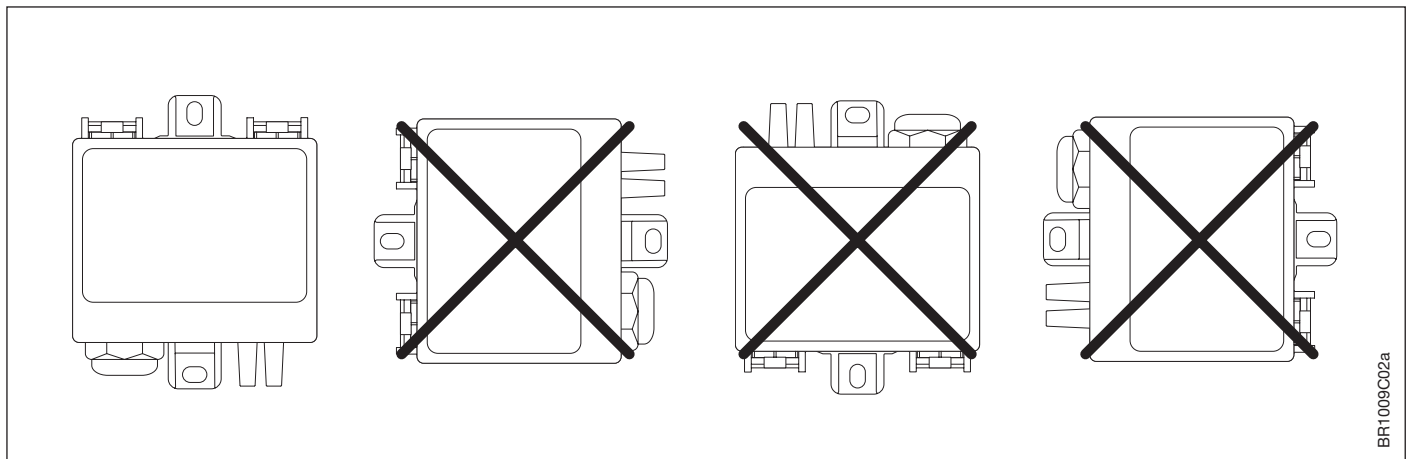


Fig. 6 Orientation



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A.2 Belimo NM24A-SR damper actuator

Name	Data
Designation	Damper actuator
Type	NM24A-SR
Number	
Type of manual	Technical data sheet
Manufacturer	Belimo

Damper actuator for operating air control dampers in ventilation and air-conditioning systems for building services installations

- For air control dampers up to approx. 2 m²
- Torque 10 Nm
- Nominal voltage AC/DC 24 V
- Control: modulating DC 0 ... 10 V, position feedback DC 2 ... 10 V


Technische Daten

Electrical data	Nominal voltage	AC 24 V, 50/60 Hz DC 24 V
	Nominal voltage range	AC/DC 19.2 ... 28.8 V
	Power consumption	In operation 2 W @ nominal torque At rest 0.4 W For wire sizing 4 VA
	Connection	Cable 1 m, 4 x 0.75 mm ²
Functional data	Torque (nominal torque)	Min. 10 Nm @ nominal voltage
	Control	Control signal Y DC 0 ... 10 V, typical input impedance 100 kΩ Working range DC 2 ... 10 V
	Position feedback (Measuring voltage)	DC 2 ... 10 V, max. 1 mA
	Position accuracy	±5%
	Direction of rotation	Reversible with switch 0 / 1
	Direction of rotation at Y = 0 V	at switch position 0 ↺ resp. 1 ↻
	Manual override	Gearing latch disengaged with pushbutton, self-resetting
	Angle of rotation	Max. 95° ↺, limited on both sides by means of adjustable, mechanical end stops
	Running time	150 s
	Sound power level	Max. 35 dB (A)
Safety	Position indication	Mechanical, pluggable
	Protection class	III Safety extra-low voltage
	Degree of protection	IP54 in any mounting position
	EMC	CE according to 89/336/EEC
	Mode of operation	Type 1 (to EN 60730-1)
	Ambient temperature range	-30 ... +50 °C
	Non-operating temperature	-40 ... +80 °C
	Ambient humidity range	95% r.H., non-condensating (EN 60730-1)
	Maintenance	Maintenance-free
	Dimensions / Weight	Dimensions	See «Dimensions» on page 2
Weight		Approx. 800 g

Safety notes


- The damper actuator is not allowed to be used outside the specified field of application, especially in aircraft or any other form of air transport.
- Assembly must be carried out by trained personnel. Any legal regulations or regulations issued by authorities must be observed during assembly.
- The device may only be opened at the manufacturer's site. It does not contain any parts that can be replaced or repaired by the user.
- The cable must not be removed from the device.
- When calculating the required torque, the specifications supplied by the damper manufacturers (cross section, design, installation site), and the air flow conditions must be observed.
- The device contains electrical and electronic components and is not allowed to be disposed of as household refuse. All locally valid regulations and requirements must be observed.

Product features

Mode of operation	The actuator is controlled by means of a standard control signal DC 0 ... 10 V. It opens to the position dictated by this signal. The measuring voltage U allows the damper position (0 ... 100%) to be electrically indicated and serves as a follow-up control signal for other actuators.
Simple direct mounting	Simple direct mounting on the damper spindle with a universal spindle clamp, supplied with an anti-rotation strap to prevent the actuator from rotating.
Manual override	Manual operation is possible with the self-resetting pushbutton (the gearing latch remains disengaged as long as the pushbutton is pressed).
Adjustable angle of rotation	Adjustable angle of rotation with mechanical end stops.
High functional reliability	The actuator is overload-proof, requires no limit switches and automatically stops when the end stop is reached.

Accessories

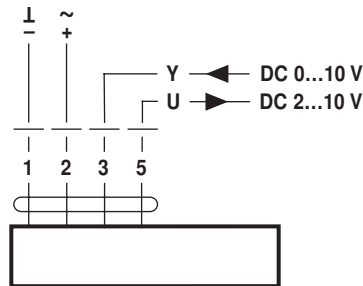
	Description	Data sheet
Electrical accessories	Auxiliary switch S..A..	T2 - S..A..
	Feedback potentiometer P..A..	T2 - P..A..
	Range controller SBG24	T2 - SBG24
	Positioner SG..24	T2 - SG..24
	Digital position indication ZAD24	T2 - ZAD24
Mechanical accessories	Various accessories (clamps, shaft extensions etc.)	T2 - Z-NM..A..

Electrical installation

Wiring diagrams

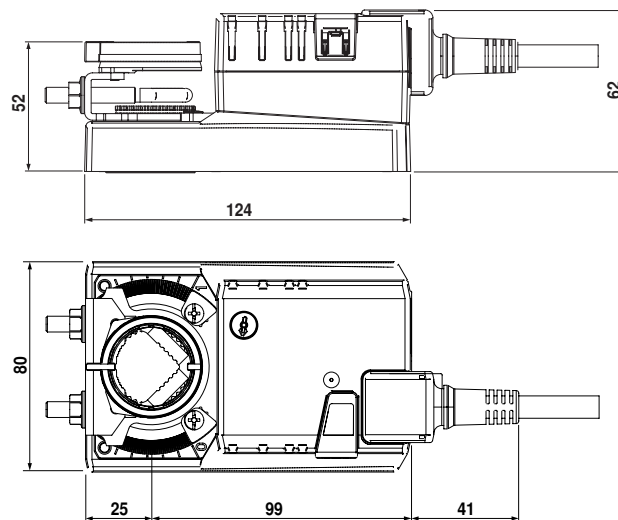
Notes

- Connection via safety isolating transformer.
- Other actuators can be connected in parallel. Please note the performance data.



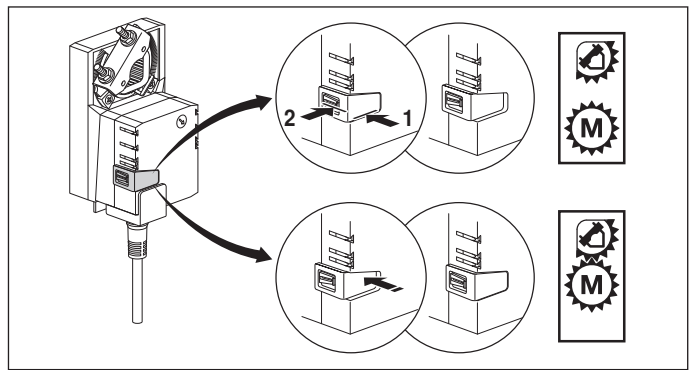
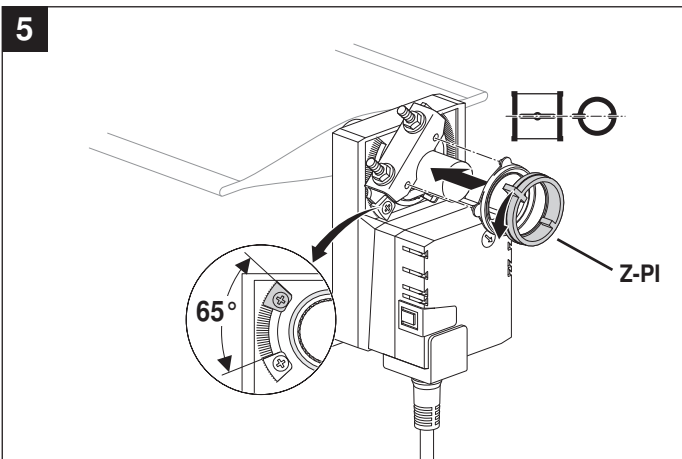
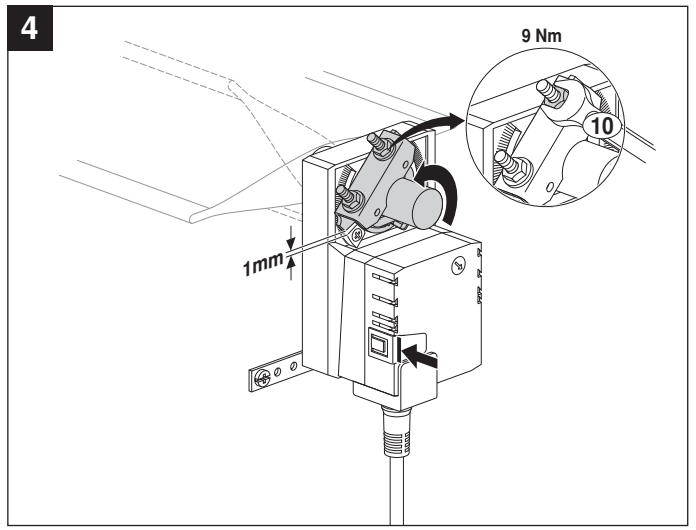
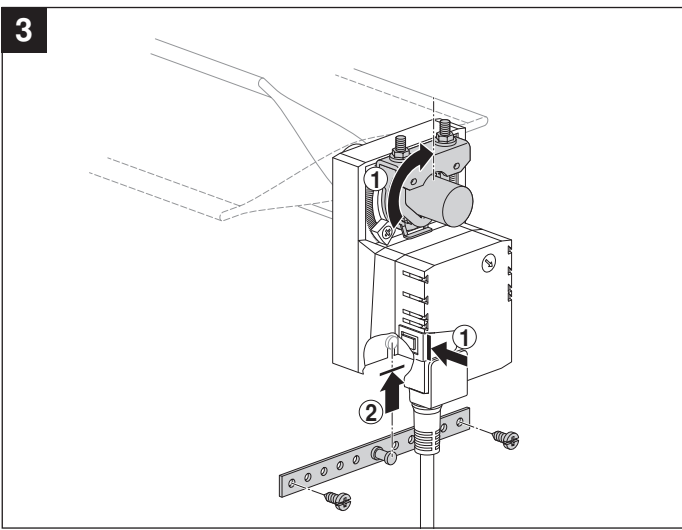
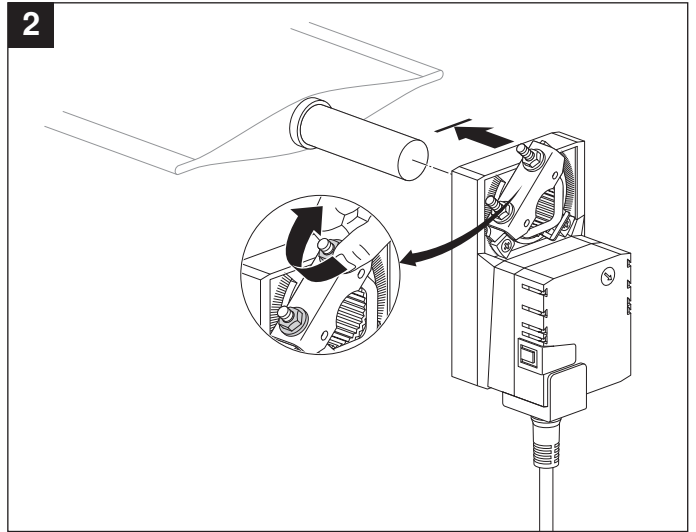
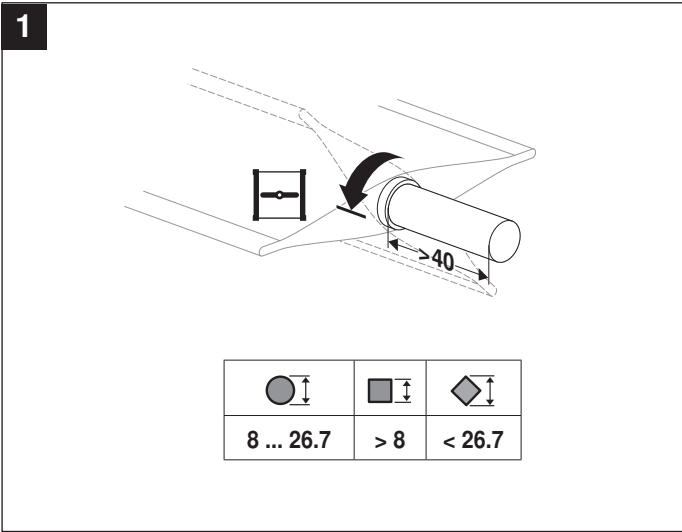
Dimensions [mm]

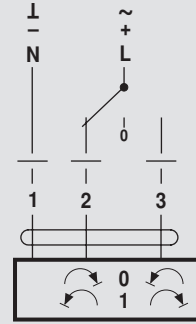
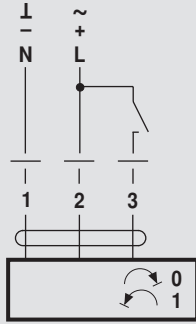
Dimensional drawings



Damper spindle	Length	
Clamp on top	min. 40	8 ... 26.7
Clamp on bottom *	min. 20	8 ... 20

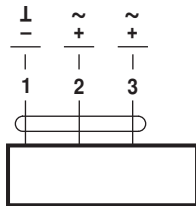
* Option (Accessory K-NA)



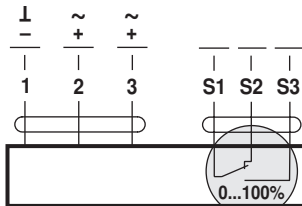


AC 24 V / DC 24 V

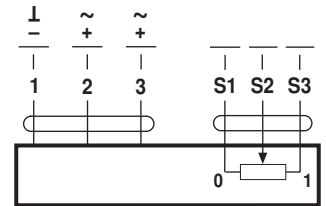
DC 48 ... 110 V
(NM72A..)



NM24A..
NM72A..

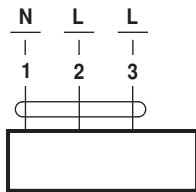


NM24A-S..

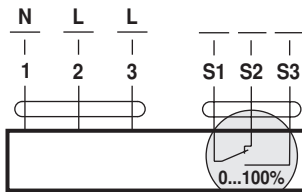


NM24AP5..

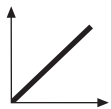
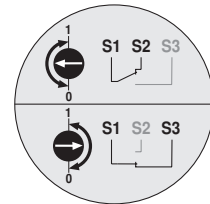
AC 100 ... 240 V



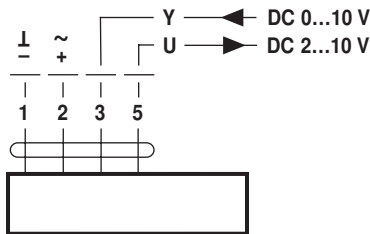
NM230A..



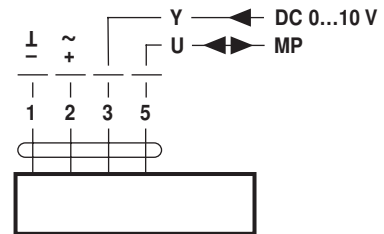
NM230A-S..



AC 24 V / DC 24 V

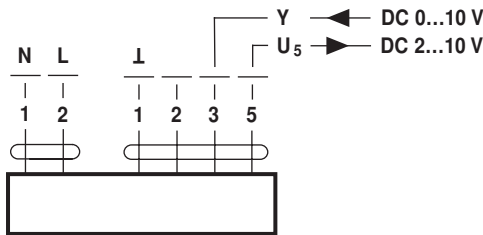


NM24A-SR..
NM24A-MF..



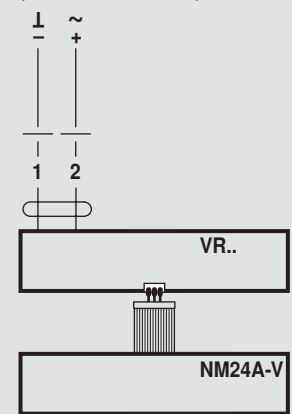
NM24A-MP..

DC 48 ... 110 V
(NM72A-SR..)



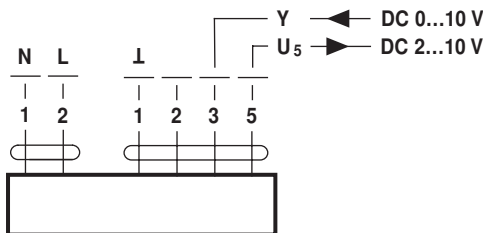
NM72A-SR..

AC 24 V / DC 24 V
(NM24A-V / VR..)



NM230A-V / VR..

AC 100 ... 240 V



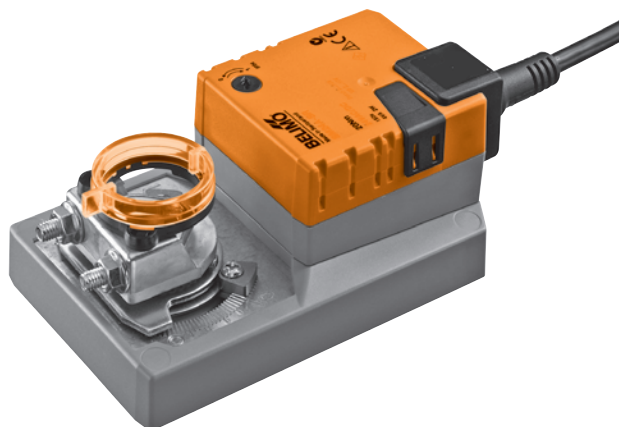
NM230ASR..

A.3 Belimo SM24A-SR damper actuator

Name	Data
Designation	Damper actuator
Type	SM24A-SR
Number	
Type of manual	Technical data sheet
Manufacturer	Belimo

Modulating damper actuator for adjusting air dampers in ventilation and air-conditioning systems for building services installations

- For air dampers up to approx. 4 m²
- Torque 20 Nm
- Nominal voltage AC/DC 24 V
- Control: Modulating DC 0 ... 10 V
- Position feedback DC 2 ... 10 V



Technical data

Electrical data	Nominal voltage	AC 24 V, 50/60 Hz / DC 24 V
	Nominal voltage range	AC 19.2 ... 28.8 V / DC 21.6 ... 28.8 V
	Power consumption	In operation 2 W @ nominal torque
		At rest 0.4 W
	For wire sizing	4 VA
	Connection	Cable 1 m, 4 x 0.75 mm ²
Functional data	Torque (nominal torque)	Min. 20 Nm @ nominal voltage
	Control	Control signal Y DC 0 ... 10 V, typical input impedance 100 kΩ
		Operating range DC 2 ... 10 V
	Position feedback (Measuring voltage U)	DC 2 ... 10 V, max. 1 mA
	Position accuracy	±5%
	Direction of rotation	Reversible with switch 0 / 1
	Direction of motion at Y = 0 V	In switch position 0 ↺ resp. 1 ↻
	Manual override	Gearing latch disengaged with pushbutton, can be locked
	Angle of rotation	Max. 95° ↺, can be limited at both ends with adjustable mechanical end stops
	Running time	150 s / 90° ↺
	Sound power level	Max. 45 dB (A)
	Position indication	Mechanical, pluggable
Safety	Protection class	III Safety extra-low voltage / UL Class 2 Supply
	Degree of protection	IP54 in any mounting position NEMA 2, UL Enclosure Type 2
	EMC	CE according to 2004/108/EC
	Certification	cULus according to UL 60730-1A and UL 60730-2-14 and CAN/CSA E60730-1:02 Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
	Mode of operation	Type 1
	Rated impulse voltage	0.8 kV
	Control pollution degree	3
	Ambient temperature range	-30 ... +50 °C
	Non-operating temperature	-40 ... +80 °C
	Ambient humidity range	95% r.h., non-condensating
	Maintenance	Maintenance-free
Dimensions / Weight	Dimensions	See «Dimensions» on page 2
	Weight	Approx. 1.05 kg

Safety notes



- The actuator is not allowed to be used outside the specified field of application, especially in aircraft or any other form of air transport.
- Assembly must be carried out by trained personnel. Any legal regulations or regulations issued by authorities must be observed during assembly.
- The device may only be opened at the manufacturer's site. It does not contain any parts that can be replaced or repaired by the user.
- The cable must not be removed from the device.
- When calculating the required torque, the specifications supplied by the damper manufacturers (cross section, design, installation site), and the air flow conditions must be observed.

Safety notes

(Continued)

- The device contains electrical and electronic components and is not allowed to be disposed of as household refuse. All locally valid regulations and requirements must be observed.

Product features

- Mode of operation** The actuator is controlled with a standard modulating signal of DC 0 ... 10 V and travels to the position defined by the control signal. Measuring voltage U serves for the electrical display of the damper position 0 ... 100% and as slave control signal for other actuators.
- Simple direct mounting** Simple direct mounting on the damper spindle with a universal spindle clamp, supplied with an anti-rotation strap to prevent the actuator from rotating.
- Manual override** Manual override with push-button possible (the gear is disengaged for as long as the button is pressed or remains locked).
- Adjustable angle of rotation** Adjustable angle of rotation with mechanical end stops.
- High functional reliability** The actuator is overload-proof, requires no limit switches and automatically stops when the end stop is reached.

Accessories

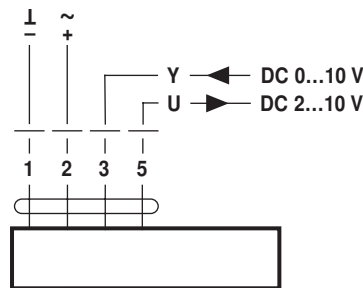
	Description	Data sheet
Electrical accessories	Auxiliary switch S..A..	T2 - S..A..
	Feedback potentiometer P..A..	T2 - P..A..
	Range controller SBG24	T2 - SBG24
	Position sensor SGA24, SGE24 and SGF24	T2 - SG..24
	Digital position indication ZAD24	T2 - ZAD24
Mechanical accessories	Various accessories (clamps, shaft extensions etc.)	T2 - Z-SM..A..

Electrical installation

Wiring diagram

Notes

- Connection via safety isolating transformer.
- Other actuators can be connected in parallel. Please note the performance data.

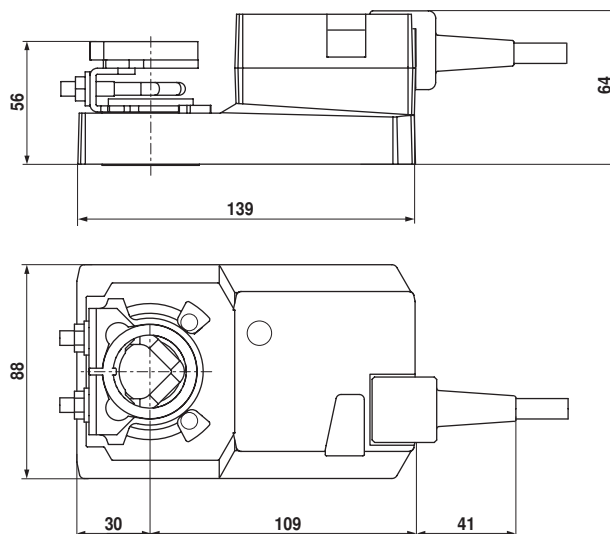


Cable colours:

- 1 = black
- 2 = red
- 3 = white
- 5 = orange

Dimensions [mm]

Dimensional drawings






Damper spindle	Length			
	≥48	10 ... 20 ¹⁾	≥10	≤20
	≥20	10 ... 20 ¹⁾	≥10	≤20

¹⁾ CrNi (INOX) 12 ... 20

70214-00003.D

1

			
	10 ... 20	≥10	≤20
CrNi (INOX)	12 ... 20	≥10	≤20

2

3

4

9 Nm
CrNi (INOX) 15 Nm

1 mm

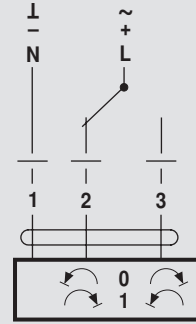
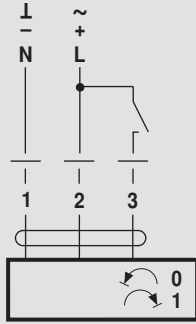
5

Z-PI

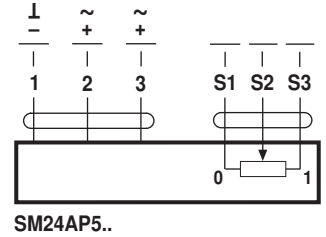
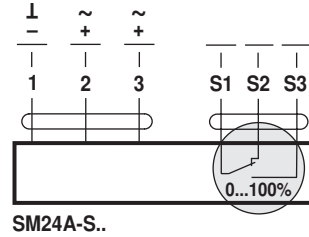
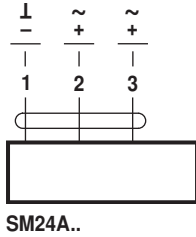
65°

>=20

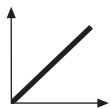
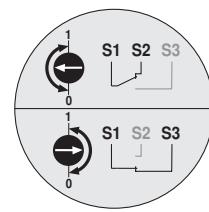
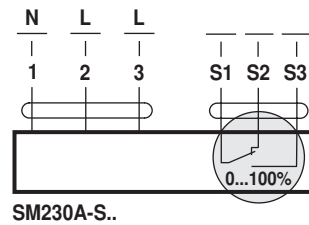
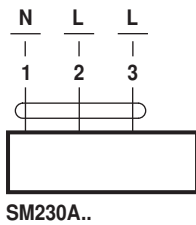
65°



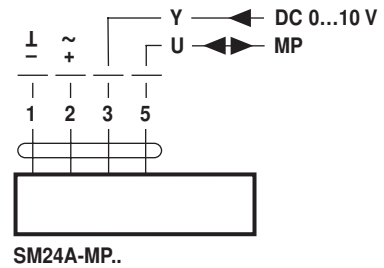
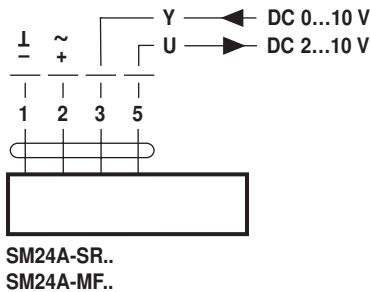
AC 24 V / DC 24 V



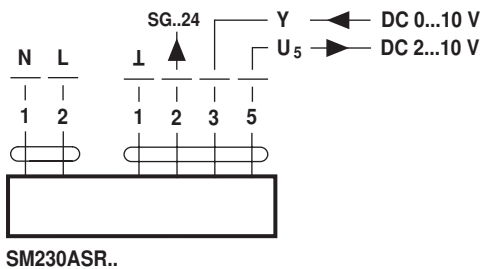
AC 100 ... 240 V ⚠



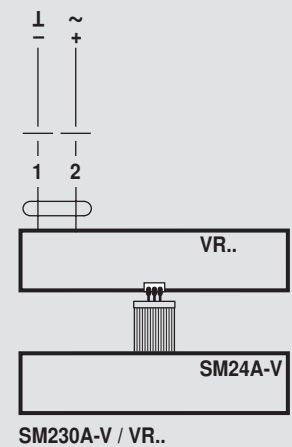
AC 24 V / DC 24 V



AC 100 ... 240 V ⚠



AC 24 V / DC 24 V
(SM24A-V / VR..)



A.4 WIKA A2G-10 and -15 differential pressure gauge

Name	Data
Designation	Differential pressure measuring device
Type	A2G-10 und -15
Number	
Type of manual	Technical data sheet
Manufacturer	WIKA

Commissioning

- During the commissioning process pressure surges must be avoided at all costs
- Install the pressure connection according to the symbols
⊕ high pressure ⊖ low pressure
- Use the pressure gauge only if the diaphragm is undamaged and if it is in perfect condition with regard to safety.

7. Output signal (model A2G-15)

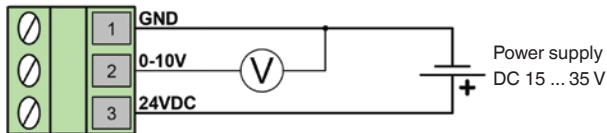
Output signal 0 ... 10 V, 3-wire

Power supply U_B DC 15 ... 35 V

Measuring accuracy of sensor $\pm 3\%$ of end value of measuring range

Electrical connection M12 cable gland with screw terminals

Terminal configuration



8. Zero point adjustment

In general, the zero point should only be checked and adjusted after the system has been depressurised.

Mechanical and electrical zero point

If there is a zero point deviation (in depressurised condition), the mechanical as well as the electrical zero point can be adjusted simultaneously by turning the adjustment screw located in the front.

A.5 WIKA A2G-90 differential pressure gauge

Name	Data
Designation	Differential pressure measuring device
Type	A2G-90
Number	
Type of manual	Technical data sheet
Manufacturer	WIKA

6. Commissioning, operation

6. Commissioning, operation

Installation

The specifications for the switching pressure refer to a vertical mounting position. For a horizontal mounting position, the switching pressure is changed as follows:

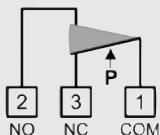
Case cover to the top: +15 Pa

Case cover to the bottom: -15 Pa

Electrical connection

Cable gland M16, screw terminals max. 1.5 mm²

Contact arrangement



1-3 opens / 1-2 closes on reaching the differential pressure

Contact rating

Measuring ranges	Contact rating		Contact material
	With resistive load	With inductive load	
20 ... 200 Pa	0.1 A / AC 250 V	-	Gold
30 ... 300 Pa	3 A / AC 250 V	2 A / AC 250 V	Silver
30 ... 500 Pa	3 A / AC 250 V	2 A / AC 250 V	Silver
40 ... 600 Pa	3 A / AC 250 V	2 A / AC 250 V	Silver
100 ... 1,500 Pa	3 A / AC 250 V	2 A / AC 250 V	Silver
500 ... 4,500 Pa	5 A / AC 250 V	2 A / AC 250 V	Silver

A.6 thermokon PS differential pressure switch

Name	Data
Designation	Differential pressure switch
Type	PS
Number	
Type of manual	Technical data sheet
Manufacturer	thermokon

PS

Differenzdruckschalter
Differential Pressure Switch

thermokon
Sensortechnik GmbH

DE - Datenblatt

Technische Änderungen vorbehalten
Stand: 25.03.2009

EN - Datasheet

Subject to technical alteration
Issue date: 2009/03/25



Anwendung

Differenzdruckschalter zur Überwachung des Differenzdrucks in Luft und anderen nichtbrennbaren und nichtaggressiven Gasen.

Mögliche Einsatzgebiete sind:
Überwachung von Luftfiltern, Gebläsen, industriellen Kühlluftkreisen, Strömungen in Lüftungskanälen sowie Überhitzungsschutz bei Lufterhitzern, Regelung von Luft- und Brandschutzklappen, Frostschutz bei Wärmetauschern.

Application

Differential pressure switch for monitoring the differential pressure of air and other nonflammable and non-aggressive gases.

Possible applications: Monitoring of air filters, fans, industrial cooling air cycles as well as overheating protection, control of air and fire dampers, anti-freeze with heat exchangers.

Typenübersicht

Typ	Messbereich
PS200	20...200 Pa
PS300	30...300 Pa
PS500	30...500 Pa
PS600	40...600 Pa
PS1500	100...1500 Pa
PS4500	500...4500 Pa

Types Available

Type	Measuring range
PS200	20...200 Pa
PS300	30...300 Pa
PS500	30...500 Pa
PS600	40...600 Pa
PS1500	100...1500 Pa
PS4500	500...4500 Pa

Normen und Standards

Konformität: Niederspannungsrichtlinie 2006/95/EC
EMV-Richtlinie 2004/108/EC

Norms and Standards

Conformity: Low-voltage Directive 2006/95/EC
EMC-Directive 2004/108/EC

Technische Daten

Allgemein:

Gehäuse:	ABS
Gehäusedeckel:	PC
Membrane:	Silikon
Anschlussstutzen:	ABS
Anschlusschlauch:	PVC, soft
Schutzart:	IP54
Abmessungen:	105 x 73 x 63mm (LxBxH)
Max. Druck:	50kPa
Medium:	Luft und nichtaggressive Gase
Arbeitstemperatur:	-20...60°C
Lagertemperatur:	-40...85°C
Mikroschalter:	Goldkontakte: PS200 Silberkontakte: PS300 / PS500 / PS600 / PS1500 / PS4500
Lebensdauer:	>1.000.000 Schaltspiele
Anschluss:	Schraubklemmen
Kabeleinführung:	M16
Gewicht:	150g (ohne Zubehör)

PS200:	Messbereich:	20...200Pa
	Schaltdifferenz:	10Pa
	Schaltleistung:	0,1A ohmsche Last (max. 250VAC)
PS300:	Messbereich:	30...300Pa
	Schaltdifferenz:	20Pa
	Schaltleistung:	3A ohmsche Last 2A induktive Last (250VAC) (max. 250VAC)
PS500:	Messbereich:	30...500Pa
	Schaltdifferenz:	20Pa
	Schaltleistung:	3A ohmsche Last 2A induktive Last (250VAC) (max. 250VAC)
PS600:	Messbereich:	40...600Pa
	Schaltdifferenz:	30Pa
	Schaltleistung:	3A ohmsche Last 2A induktive Last (250VAC) (max. 250VAC)
PS1500:	Messbereich:	100...1500Pa
	Schaltdifferenz:	80Pa
	Schaltleistung:	3A ohmsche Last 2A induktive Last (250VAC) (max. 250VAC)
PS4500:	Messbereich:	500...4500Pa
	Schaltdifferenz:	180Pa
	Schaltleistung:	5A ohmsche Last 2A induktive Last (250VAC) (max. 250VAC)

Technical Data

General:

Housing:	ABS
Housing cover:	PC
Membrane:	Silicone
Duct connectors:	ABS
Tubing:	PVC, soft
Protection:	IP54
Dimensions:	105 x 73 x 63mm (LxWxH)
Max. pressure:	50kPa
Media:	Air and non-aggressive gases
Operation temperature:	-20...60°C
Storage temperature:	-40...85°C
Sub miniature switches:	Gold contacts: PS200 Silver contacts: PS300 / PS500 / PS600 / PS1500 / PS4500
Service life:	>1.000.000 switching operations
Connections:	Screw terminals
Cable entry:	M16
Weight:	150g (without accessories)

PS200:	Measuring range:	20...200Pa
	Switching difference:	10Pa
	Switching load:	0,1A resistive load (max. 250VAC)
PS300:	Measuring range:	30...300Pa
	Switching difference:	20Pa
	Switching load:	3A resistive load 2A inductive load (max. 250VAC)
PS500:	Measuring range:	30...500Pa
	Switching difference:	20Pa
	Switching load:	3A resistive load 2A inductive load (max. 250VAC)
PS600:	Measuring range:	40...600Pa
	Switching difference:	30Pa
	Switching load:	3A resistive load 2A inductive load (max. 250VAC)
PS1500:	Measuring range:	100...1500Pa
	Switching difference:	80Pa
	Switching load:	3A resistive load 2A inductive load (max. 250VAC)
PS4500:	Measuring range:	500...4500Pa
	Switching difference:	180Pa
	Switching load:	5A resistive load 2A inductive load (max. 250VAC)

Sicherheitshinweis Achtung

Einbau und Montage elektrischer Geräte dürfen nur durch eine Fachkraft erfolgen.

Die Module dürfen nicht in Verbindung mit Geräten benutzt werden, die direkt oder indirekt menschlichen, gesundheits- oder lebenssichernden Zwecken dienen oder durch deren Betrieb Gefahren für Menschen, Tiere oder Sachwerte entstehen können.

Security Advice Caution

The installation and assembly of electrical equipment may only be performed by a skilled person.

The modules must not be used in any relation with equipment that supports, directly or indirectly, human health or life or with applications that can result in danger for people, animals or real value.

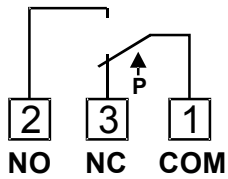
Montagehinweise

Die Angaben für den Schalldruck beziehen sich auf vertikale Einbaulage. Bei horizontaler Einbaulage verändert sich der Schalldruck wie folgt:
 - Gehäusedeckel nach oben +15 Pa
 - Gehäusedeckel nach unten -15 Pa

Inbetriebnahme

Voraussetzung für die Inbetriebnahme ist die ordnungsgemäße Installation aller elektrischen Versorgungs-, Schalt- und Messleitungen und der Druckanschlussleitungen.
 Vor Inbetriebnahme ist die Dichtigkeit der Druckanschlussleitungen zu prüfen.

Anschlussplan



Wenn der Differenzdruck erreicht ist:
 - 1-3 geöffnet
 - 1-2 geschlossen

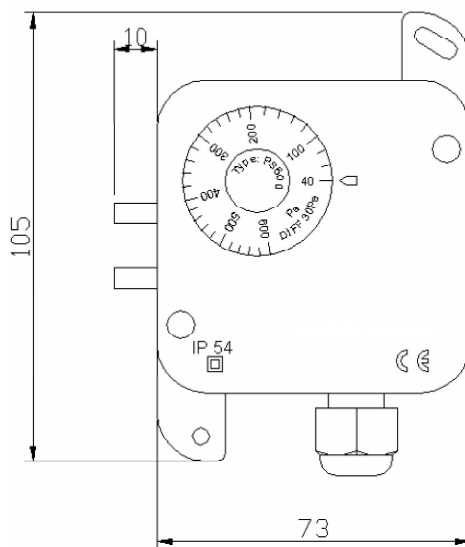
Mitgeliefertes Zubehör

- 2 Befestigungsschrauben
- 2 Kunststoffkanalstutzen
- 2m PVC-Schlauch soft, ø 4/7mm

Optionales Zubehör

- Metallkanalstutzen

Abmessungen (mm)



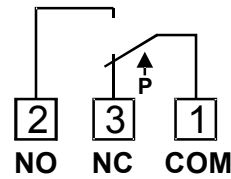
Mounting Advices

The pressure switch is factory-calibrated in the vertical position. If installed horizontally, this will affect the switching point as follows:
 - With cover facing upwards +15 Pa
 - With cover facing downwards -15 Pa

Installation

A prerequisite for the operation is a proper installation of all electrical supply, control and sensing leads as well as the pressurized connection line. Before installing the device, the leak tightness of the pressurized connection lines must be inspected.

Terminal Connection Plan



When differential pressure increases:
 - 1-3 open
 - 1-2 close

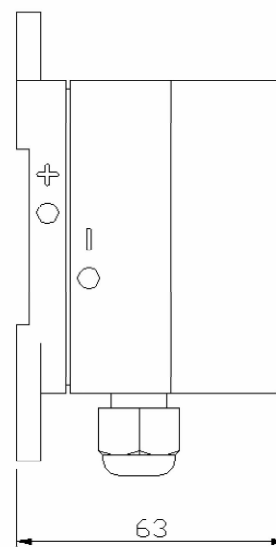
Standard accessories

- 2 fixing screws
- 2 plastic duct connectors
- 2m PVC-tube soft, ø 4/7mm

Optional accessories

- Metal duct connectors

Dimensions (mm)



A.7 Rotor controller OJ DRHX

Name	Data
Designation	Rotor controller
Type	DRHX
Number	
Type of manual	Technical data sheet
Manufacturer	OJ Electronics A/S

QUICK GUIDE

DRHX



67747 12/17 - (PDJ)



- Dansk
- English
- Deutsch
- Francais

Dansk



Advarsel

SIKKERHED FØR ARBEJDET PÅBEGYNDES

OJ-DRHX skal altid monteres af uddannede personer eller personer, som har modtaget kvalificeret oplæring og er uddannet i installation af produktet.

Uddannede personer har kendskab til anvendt installationspraksis og kan udføre installationen i overensstemmelse med relevante lokale og internationale krav, love og bestemmelser. Uddannede personer er bekendt med de vejledninger og sikkerhedsforanstaltninger, som beskrevet i denne instruktion.

OJ-DRHX indeholder livsfarlig højspænding, når den er tilsluttet netspænding.

Ved montering, service og vedligeholdelsesopgaver på produktet skal netspændingen altid afbrydes. Testknappen kan betjenes med netspændingen tilsluttet.

Når OJ-DRHX er tilsluttet netspænding, er der risiko for, at steppermotoren utilsigtet kan starte med risiko for personfarlige situationer, personskade eller beskadigelse af udstyr og ejendom. Steppermotoren/rotoren kan starte via et eksternt indgangssignal eller Modbus. Før der tilsluttes netspænding til OJ-DRHX, skal alle dele: Steppermotor, rem, remskive samt rotoren være monteret korrekt.

Før der tilsluttes netspænding til OJ-DRHX skal alle åbninger, dæksler og forskrutninger være korrekt monteret og lukket. For at opretholde den specificerede tæthedsgrad, skal ubenyttede kabelforskrutninger udskiftes med blændforskrutninger.

OJ-DRHX indeholder kondensatorer, som bliver opladet under drift. Disse kondensatorer kan forblive opladede, selv efter at netspændingen er afbrudt. Det kan medføre alvorlig personskade, hvis tilslutningsklemmer eller ledningssender berøres, inden disse kondensatorer er fuldstændig afladet. Afladningstiden er under normale forhold ca. 3 minutter.

PRODUKTETS ANVENDELSE

OJ-DRHX anvendes til regulering af hastigheden på en roterende varmeveksler i ventilationsagregater.

OJ-DRHX kan kun anvendes til styring af steppermotorer som leveres fra OJ Electronics A/S. Forsøg aldrig at tilslutte eller styre andre typer steppermotorer.

Afhængigt af anvendelsen kan OJ-DRHX bruges i enkeltstående applikationer eller udgøre en del af et større system/en maskine eller et system. Produktet kan anvendes under afgrænsede miljø- og temperaturforhold.

Drevet og steppermotoren er en slaveenhed som styres af signaler eller kommandoer fra en ekstern styreenhed.

OJ-DRHX har indbygget steppermotorbeskyttelse.

OJ-DRHX kan anvendes i bolig- og industrimiljøer og har indbygget EMC-filtre.



Advarsel

FORBUD MOD IBRUGTAGNING

Der erklæres forbud mod ibrugtagning, indtil maskinen eller produktet, hvori OJ-DRHX inkorporeres, som en helhed er erklæret i overensstemmelse med alle relevante nationale og internationale bestemmelser.

Der må først sættes spænding på produktet, når hele installationen overholder kravene i ALLE relevante EU-direktiver.

Når produktet er installeret i henhold til denne instruktion og gældende installationskrav, er produktet dækket af fabriksgarantien.

Hvis produktet er blevet beskadiget, f.eks. under transport, skal det undersøges og evt. repareres af OJ Electronics A/S, inden produktet installeres, tilsluttes forsyningsspænding og idriftsættes.

Hvis OJ-DRHX inkorporeres i et maskinanlæg med roterende dele som eksempelvis et ventilationsanlæg, transportanlæg eller lignende, skal hele maskinen opfylde maskindirektivet.

GODKENDELSER OG CERTIFICERINGER

CE-mærkning

- OJ Electronics A/S erklærer under ansvar, at produktet opfylder følgende af Europa Parlamentets direktiver:
- LVD - lavspænding: 2014/35/EU
- EMC - Elektromagnetisk kompatibilitet: 2014/30/EU
- RoHS - Begrænsning af anvendelsen af visse farlige stoffer i elektrisk og elektronisk udstyr: 2011/65/EU

Produktstandard

- I henhold til EN-61800-2 – Elektriske stepper-motordrev med variabel hastighed, generelle krav. Sikkerhed
- I henhold til EN-61800-5-1 Elektriske stepper-motordrev med variabel hastighed: Sikkerhedskrav – Elektriske, termiske og energimæssige

EMC – Elektromagnetisk støj

- I henhold til EN-61800-3 (C1 og C2) Elektriske stepper-motordrev med variabel hastighed - Del 3: EMC- produktstandard med specifikke prøvningsmetoder

RoHS-kompatibel

- Indeholder ingen skadelige stoffer i henhold RoHS-direktivet.

PRODUKTPROGRAM

Drevprogram

Tabel 1*	DRHX -1055-MNN5	DRHX -1055-MAD5	DRHX -1220-MNN5	DRHX -1220-MAD5
Modbus	Ja	Ja	Ja	Ja
0-10V	Nej	Ja	Nej	Ja
Display	Nej	Ja	Nej	Ja
Intelligent rotorvagt	Standard	Standard	Standard	Standard
Ekstern rotorvagt	Nej	Tilbehør	Nej	Tilbehør
Aut. renblæs. funktion	Nej	Ja	Nej	Ja
Deformations-sikring	Ja	Ja	Ja	Ja
Effekt (max)	55W	55W	110/220W	110/220W
Forsynings-spænding	1x230VAC	1x230VAC	1x230VAC	1x230VAC
Nominal moment	2Nm	2Nm	4/8Nm	4/8Nm
Max. omdr.	400rpm	400rpm	400rpm ¹	400rpm ¹
Motorspænding	3x0-200VAC	3x0-200VAC	3x0-200VAC	3x0-200VAC
Mål (b, h, d) (mm)	183.0x142.7x55.0	183.0x142.7x55.0	183.0x142.7x55.0	183.0x142.7x55.0
Kapslingsklasse (IP)	IP54	IP54	IP54	IP54

*1: Kun for 4Nm motor

PRODUKT LABEL

OJ-DRHX drevet er forsynet med et mærkeskilt (sølvskilt).

Se eksempel fig. 1.1 samt tabel 1.2
OBS! Kontroller, at informationerne på mærkepladen svarer til det forventede.

Fig. 1.1

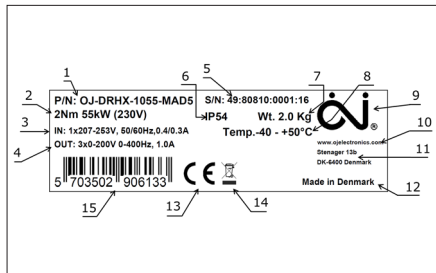


Table 1.2

1	Produkt ID, se tabel 10.6
2	Akseffekt ved nominal spænding
3	Nominal forsyning (V, Hz, A)
4	Nominal udgang (V, Hz, A)
5	Produktionskode, se tabel 10.5
6	Kapslingsklasse
7	Vægt (Kg)
8	Temperaturområde, drift (°C)
9	Fabrikant logo
10	Fabrikant web-adresse
11	Fabrikant postadresse
12	Fabrikationsland
13	CE godkendt, logo
14	Bortskaffelse, logo
15	Stregkode

ÅBNING AF DREVET

- Kontroller, at der er slukket for spændingsforsyningen til OJ-DRHX, inden låget åbnes.
- Vent ca. 3 minutter, efter at der er slukket for netspændingen, inden låget åbnes.
- Drevet åbnes ved hjælp af en skruetrækker eller lignende (se fig. 2)

OVERSIGTS- OG MÅLTEGNINGER

Se eksempel fig. 3 samt tabel 3 og 4.1

NETFORSYNING

- Spændingsforsyningen er 230VAC; +/-10%.
- Forsyningskabel tilsluttes OJ-DRHX drevet på klemmerne markeret med "L", "N" og "PE". (Se fig. 4)
- Det anbefales, at PE-ledningen er 20 mm længere end de øvrige ledere i kablet (Se fig. 4). Skulle kablet ved en fejl blive trukket ud af OJ-DRHX, mens der er spænding på kabel og klemmer, vil PE-lederen være den sidste, der bliver afbrudt. Dermed er OJ-DRHX sikret mod farlig berøring.
- Når den afsolerede ledning er korrekt indført i klemmen, spænder klemmen automatisk med korrekt moment.
- Husk at efterspænde forskruinger for at sikre tæthedegrad og trækaflastning.

INDSTILLINGER OG FUNKTIONER

DIP switch – indstillinger og funktioner

OJ-DRHX-serien er forsynet med 4 DIP switch for indstilling af bl.a. steppermotorstørrelse (se tabel 5) og indstilling af max. motorhastighed (se tabel 5.1 og fig. 5)

Testkørsel

OJ-DRHX-serien er forsynet med en testfunktion i form af en indbygget test-trykknop. Testknappen er placeret inde i drevet, øverst i højre hjørne og må betjenes med åbent drev. Ved aktivering af denne test-trykknop, vil signalet til steppermotoren bliver overstyret til max. rpm. Så længe test-trykknappen er aktiveret, vil steppermotoren være overstyret til max. rpm. Testknappen virker også når Modbus styring er aktiveret.

LED indikator

OJ-DRHX-serien er forsynet med en LED indikator - (se fig. 6)

LED kan iagttages både med åbent og med lukket dæksel.

LED indikeringer (se tabel 6.1)

Display

Display er synligt med åben og lukket lågeafdækning.

Displayet viser aktuel status på drev, steppermotor og rotor. (se tabel 2)

Visninger:

Tabel 2	
	Aktuel steppermotorhastighed vises når steppermotoren er i drift og der ikke er angivet rotor- og remskivediameter via OJ-DRHX-PC-Tool eller de respektive tilhørende Modbus registre.
	Aktuel rotorhastighed vises når steppermotoren er i drift og der er angivet rotor- og remskivediameter via OJ-DRHX-PC-Tool eller de tilhørende Modbus registre. Visning skifter mellem moment og hastighed med 2 sek. switch hastighed
	Aktuelt moment (Nm) Visning skifter mellem moment og hastighed med 2 sek. switch hastighed
	Fejlkoder*; se betydningen af de enkelte fejlkoder under punktet "Alarmer og fejlkoder"
	Drift med reduceret ydelse pga. overstrøm, overtemperatur eller anden fejl eller overbelastning. Udlæs den aktuelle fejl/alarmer via Modbus.
	Renblæsningsfunktion aktiveret
	Testfunktion er aktiveret og steppermotoren får styresignal til max. rpm omdrejninger.
	Holdefunktion er aktiveret (Holding).
	Steppermotor er i "STOP"

For mere information se den komplette instruktion på OJ's hjemmeside.

<http://www.ojelectronics.com/drxh>

MODBUS

Generelt

- OJ-DRHX kan styres via Modbus RTU i h.t. Modbus protokol.
- OJ-DRHX er fra fabrikanten indstillet til "0-10V" styring.
- Når OJ-DRHX detekterer et startsignal eller hastighedssetpunkt via Modbus, vil OJ-DRHX automatisk midlertidigt skifte til styring via Modbus RTU. "0-10V" signalet ignoreres. Funktionen resettes automatisk når OJ-DRHX genstartes.
- OJ-DRHX kan via Modbus register låses til altid at styres via Modbus. Således vil 0-10V signalet derved ignoreres også når der ikke detekteres en aktiv Modbus-kommunikation.
- Til ændring og udlæsning af Modbus registre anvendes OJ-DRHX-PC-Tool eller via f.eks. OJ-Air2 WEB brugerfladen. (se tabel 7)





English



Warning

WARNINGS BEFORE COMMENCING

OJ-DRHX must always be mounted by persons who are trained or who have completed qualifications and are trained in installation of the product.

Persons who are trained have knowledge of the applicable installation process and can carry out the installation in accordance with relevant local and international requirements, laws and regulations.

Trained persons are familiar with the guidelines and safety measures described in this guide. OJ-DRHX contains life threatening high voltage when it is connected to mains power. When mounting, servicing or maintenance tasks are done on the product always disconnect mains power. The test button can be used with mains power connected.

When OJ-DRHX is connected to mains power there is a risk that the stepper motor starts without warning with a risk of dangerous situations for people, personal injury or damage to equipment and property. The stepper motor/rotor can start via an external input signal or Modbus.

Before connecting mains power to OJ-DRHX, all parts: Stepper motor, straps, pulley and the rotor must be mounted correctly.

Before connecting mains power to OJ-DRHX, all openings, covers and couplings must be correctly mounted and closed. To maintain the specified degree of tightness unused cable couplings must be changed with gland connections.

OJ-DRHX contains capacitors that are charged during operation. These capacitors can remain charged even after mains power has been disconnected. This can result in serious personal injury if the connection terminals or cable ends are touched before these capacitors are completely discharged. The discharge time under normal circumstances is approx. 3 minutes.

USE OF THE PRODUCT

OJ-DRHX is used for regulating the speed of a rotating heat exchanger in the fan unit. OJ-DRHX can only be used for control of stepper motors which are delivered from OJ Electronics A/S. Never try to connect or control other types of stepper motors. Depending on the application, OJ-DRHX can be used in individual applications or make up part of a larger system/a machine or a system. The product can be used within limited environment and temperature ranges.

The drive and stepper motor is a save unit which is controlled by signals or commands from an external control unit.

OJ-DRHX has built-in stepper motor protection. OJ-DRHX can be used in residential and industrial environments and has built-in EMC filters.



Warning

PROHIBITED WHEN PUTTING INTO SERVICE

It is prohibited to put the unit into service until the machine or product, which OJ-DRHX is incorporated in as a whole is declared to be in accordance with the relevant national and international regulations.

The product may only be powered once the whole installation complies with the requirements in ALL relevant EU-directives. When the product is installed according to these instructions and applicable installation requirements, the product is covered by the factory guarantee.

If the product is damaged, for example, during transport, this will be investigated and possibly repaired by OJ Electronics A/S before the product is installed, connected to the power supply and operated.

If OJ-DRHX is incorporated in a machine system with rotating parts, like for example a fan unit, transport unit or the like, the whole machine must fulfil the machine directive.

APPROVALS AND CERTIFICATIONS

CE-marking

- OJ Electronics A/S declares under their responsibility that the product fulfils the following European Parliament's directives:
- LVD - Low Voltage Directive: 2014/35/EU
- EMC - Electromagnetic Compatibility: 2014/30/EU
- RoHS - Restriction of Hazardous Substances in electrical and electronic equipment: 2011/65/EU

Product standard

- In accordance with EN-61800-2 – Adjustable Speed Electrical Power Drive Systems, general requirements. Safety
- In accordance with EN-61800-5-1 Adjustable Speed Electrical Power Drive Systems: Safety requirements - electrical, thermal and energy

PRODUCT PROGRAM

Drive program

Table 1*	DRHX -1055-MNN5	DRHX -1055-MAD5	DRHX -1220-MNN5	DRHX -1220-MAD5
Modbus	Yes	Yes	Yes	Yes
0-10V	No	Yes	No	Yes
Display	No	Yes	No	Yes
Intelligent rotor	Standard	Standard	Standard	Standard
External rotor	No	Accessories	No	Accessories
Aut. purge function	No	Yes	No	Yes
Deformation assurance	Yes	Yes	Yes	Yes
Power (max)	55W	55W	110/220W	110/220W
Supply power	1x230VAC	1x230VAC	1x230VAC	1x230VAC
Nominal torque	2Nm	2Nm	4/8Nm	4/8Nm
Max rpm	400rpm	400rpm	400rpm ^{*1}	400rpm ^{*1}
Motor power	3x0-200VAC	3x0-200VAC	3x0-200VAC	3x0-200VAC
Dimensions (b, h, d)(mm)	183.0x142.7x55.0	183.0x142.7x55.0	183.0x142.7x55.0	183.0x142.7x55.0
Ingress Protection (IP)	IP54	IP54	IP54	IP54

*1: Only for 4Nm motor

EMC - Electromagnetic Compatibility

- In accordance with EN-61800-3 (C1 and C2) Adjustable Speed Electrical Power Drive Systems - Part 3: EMC requirements and specific test methods

RoHS compatible

- Contains no damaging substances in accordance with the RoHS directive.

PRODUCT LABEL

The OJ-DRHX drive comes with a marking plate (metal plate)

See example fig. 1.1 and table 1.2

OBS! Check that the information on the marking plate corresponds with what was expected.

Fig. 1.1

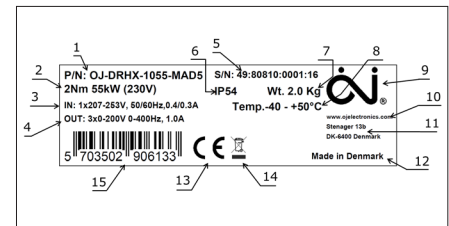


Table 1.2

Product ID, see table 10.6
Shaft power with nominal supply power
Nominal supply power (V, Hz, A)
Nominal output (V, Hz, A)
Production code, see table 10.5
Ingress protection
Weight (kg)
Temperature zone, operation (°C)
Manufacturer's logo
Manufacturer's website address
Manufacturer's postal address
Country of manufacturer
CE approval, logo
Disposal, logo
Bar-code

OPENING OF THE DRIVE

- Check that the power supply has been disconnected from OJ-DRHX before the cover is opened.
- Wait approx. 3 minutes after the mains power has been disconnected before the cover is opened.
- The drive is opened by using a screwdriver or the like (see fig. 2)

GENERAL AND DIMENSIONAL DRAWINGS

See example fig. 3 and table 3 and 4.1

MAINS POWER

- The power supply is 230VAC; +/-10%.
- Power cables are connected to the OJ-DRHX drive to the terminals marked with "L", "N" and "PE". (See fig. 4)
- It is recommended that the PE line is 20 mm longer than the other lines in the cable (See fig. 4). If a cable is accidentally pulled out of OJ-DRHX while there is power on the cable and terminals, the PE line will be the last that is disconnected. This is how OJ-DRHX is protected against dangerous touching.
- When the uninsulated lead is correctly inserted in the terminal, the terminal slides in automatically with the correct torque.
- Remember to tighten connections to ensure correct degree of tightness and torque.

SETTINGS AND FUNCTIONS

DIP switch - settings and functions

The OJ-DRHX series has a 4 DIP switch for setting of amongst other things the stepper motor size (see table 5) and setting of max. motor speed (see table 5.1 and fig. 5)

Test run

The OJ-DRHX series has a test function in the form of a built-in test push-button. The test button is placed inside the drive in the topmost right corner and may be used with an open drive. Upon activating this test button the signal to the stepper motor will be forced to max. rpm. As long as the test button is activated, the stepper motor will be forced to max. rpm. The test button also works when the Modbus control is activated.

LED indicator

The OJ-DRHX series has a LED indicator - (see fig. 6)
The LED can be observed both with an open and closed cover.
LED indicators (see table 6.1)

Display

The display is visible with open and closed covers.
The display shows the actual status of the drive, stepper motor and rotor. (See table 2)

MODBUS

General

- OJ-DRHX can be controlled via Modbus RTU according to Modbus protocol
- OJ-DRHX is factory set to "0-10V" range.
- When OJ-DRHX detects a start signal or speed set point via Modbus, the OJ-DRHX will automatically temporarily change to control via Modbus RTU. The "0-10V" signal is ignored. The function is re-set automatically when OJ-DRHX is restarted.
- The OJ-DRHX can via the Modbus register be locked so that it always is controlled via Modbus. That means the 0-10V will be ignored even when no active Modbus communication is detected.
- For changing and reading the Modbus register use the OJ-DRHX-PC-Tool or via for example, the OJ-Air2 WEB user interface. (See table 7)

Displays

Tabel 2	
	Actual stepper motor speed is shown when the stepper motor is operating and there is no given rotor and pulley diameter via OJ-DRHX PC Tool or the respective corresponding Modbus register
	Actual rotor speed is shown with the stepper motor is operating and there is a set rotor and pulley diameter via OJ-DRHX PC Tool or the corresponding Modbus register. <i>The display shifts between torque and speed with a 2 sec. switch speed</i>
	Actual torque (Nm) <i>The display shifts between torque and speed with a 2 sec. switch speed</i>
	Error codes*, see the meaning of each error code under the section "Alarms and Error Codes"
	Operation with reduced function due to over-current, over-temperature or another error or over-loading. Read the actual error/alarm via Modbus.
	Pure blowing function activated
	Test function is activated and the stepper motor receives a control signal for max. rpm revolutions.
	Hold function is activated (Holding).
	Stepper motor is in "STOP"

For more information see the unabridged instructions on OJ's website.

<http://www.ojelectronics.com/drhx>





Deutsch



Warnung

SICHERHEITSMASSNAHMEN VOR DER INSTALLATION

OJ-DRHX darf nur von qualifiziertem Personal oder Personen, die eine entsprechende Schulung erhalten haben, und damit für die Installation des Produkts qualifiziert sind, installiert werden.

Qualifiziertes Personal hat Kenntnis über die jeweiligen Installationsmethoden und kann die Installation gemäß den einschlägigen örtlichen und internationalen Anforderungen, Gesetzen und Vorschriften durchführen.

Qualifiziertes Personal kennt die in dieser Anleitung beschriebenen Anweisungen und Sicherheitsvorkehrungen.

Nach dem Anschluss an das Stromnetz ist in OJ-DRHX lebensgefährliche Hochspannung vorhanden.

Vor der Durchführung von Montage-, Service- oder Wartungsarbeiten am Produkt, stets die Netzversorgung trennen. Die Testtaste kann bei angeschlossener Netzversorgung verwendet werden.

Wird OJ-DRHX an das Stromnetz angeschlossen, besteht die Gefahr eines unbeabsichtigten Starts des Schrittmotors, was zu gefährlichen Situationen, Personenschäden oder Sachschäden an Geräten und Eigentum führen kann. Der Schrittmotor/Rotor kann über ein externes Eingangssignal oder den Modbus gestartet werden.

Vor Anschluss der Netzversorgung an OJ-DRHX, müssen alle Bauteile, d. h. Schrittmotor, Riemen, Riemenscheibe und Rotor, korrekt installiert werden.

Vor Anschluss der Netzversorgung an OJ-DRHX, müssen alle Öffnungen, Abdeckungen und Kabelverschraubungen ordnungsgemäß montiert und geschlossen werden. Um die angegebene Schutzart zu bewahren, müssen unbenutzte Kabelverschraubungen durch Stopfbuchsen ersetzt werden.

OJ-DRHX enthält Kondensatoren, die während des Betriebs aufgeladen werden. Diese Kondensatoren können auch nach dem Abschalten der Stromversorgung geladen bleiben. Es besteht schwere Verletzungsgefahr, wenn Anschlussklemmen oder Drahtenden berührt werden, bevor diese Kondensatoren vollständig entladen wurden. Die Entladezeit beträgt unter normalen Bedingungen ca. 3 Minuten.

VERWENDUNG DES PRODUKTS

OJ-DRHX dient zur Regelung der Drehzahl eines Rotationswärmetauschers in Luftaufbereitungsanlagen.

OJ-DRHX kann nur zur Steuerung von Schrittmotoren verwendet werden, die von OJ Electronics A/S geliefert wurden. Es darf auf

keinen Fall versucht werden, einen anderen Schrittmotortyp anzuschließen oder zu steuern. Je nach Anwendung eignet sich OJ-DRHX sowohl für Stand-alone-Anwendungen als auch als Teil von größeren Anlagen/Maschinen. Das Produkt kann in definierten Umwelt- und Temperaturszenarien zum Einsatz kommen.

Antrieb und Schrittmotor bilden eine Slave-Einheit, die durch Signale oder Befehle von einem externen Steuergerät gesteuert wird. OJ-DRHX verfügt über einen integrierten Schrittmotorschutz. OJ-DRHX ist in häuslichen und industriellen Umgebungen einsetzbar, und verfügt über integrierte EMV-Filter.



Warnung

NUTZUNGSVERBOT

OJ-DRHX darf erst dann in Betrieb genommen werden, wenn erklärt wird, dass das Gerät oder Produkt, in das er eingebaut wurde, in seiner Gesamtheit in Einklang mit allen relevanten nationalen und internationalen Vorschriften ist. Das Produkt darf erst dann mit Strom versorgt werden, wenn die gesamte Anlage mit ALLEN relevanten EU-Richtlinien übereinstimmt. Für dieses Produkt gilt eine Herstellergarantie, sofern es gemäß dieser Anleitung und den anwendbaren Installationsanforderungen installiert wurde.

Wird das Produkt beschädigt (z. B. während des Transports), muss es von OJ Electronics A/S überprüft und (falls erforderlich) repariert werden, bevor das Produkt installiert, an das Stromnetz angeschlossen und in Betrieb genommen wird.

PRODUKTPROGRAMM

Antriebsprogramm

Tabelle 1*	DRHX -1055-MNN5	DRHX -1055-MAD5	DRHX -1220-MNN5	DRHX -1220-MAD5
Modbus	Ja	Ja	Ja	Ja
0-10 V	Nein	Ja	Nein	Ja
Display	Nein	Ja	Nein	Ja
Intelligenter Rotorschutz	Standard	Standard	Standard	Standard
Externer Rotorschutz	Nein	Zubehör	Nein	Zubehör
Autom.Reinigungsfunktion	Nein	Ja	Nein	Ja
Verformungsschutz	Ja	Ja	Ja	Ja
Leistung (max.)	55 W	55 W	110/220 W	110/220 W
Spannungsversorgung	1x 230 V AC	1x 230 V AC	1x 230 V AC	1x 230 V AC
Nenn Drehmoment	2 Nm	2 Nm	4/8 Nm	4/8 Nm
Max. Drehzahl	400 U/min	400 U/min	400 U/min ^{*1}	400 U/min ^{*1}
Motorspannung	3x 0-200 V AC	3x 0-200 V AC	3x 0-200 V AC	3x 0-200 V AC
Abmessungen (L x H x T) (mm)	183,0 x 142,7 x 55,0	183,0 x 142,7 x 55,0	183,0 x 142,7 x 55,0	183,0 x 142,7 x 55,0
Schutzart (IP)	IP54	IP54	IP54	IP54

*1: Nur bei 4-Nm-Motor

Wird OJ-DRHX in Maschinen mit rotierenden Teilen eingebaut, z. B. in einer Luftaufbereitungsanlage, einer Förderanlage oder dergleichen, muss die gesamte Anlage der Maschinenrichtlinie entsprechen.

ZULASSUNGEN UND ZERTIFIZIERUNGEN

CE-Kennzeichnung

- OJ Electronics A/S erklärt hiermit in alleiniger Verantwortung, dass das Produkt den folgenden Richtlinien des Europäischen Parlaments entspricht:
- NSR – Niederspannungsrichtlinie: 2014/35/EU
- EMV – Elektromagnetische Verträglichkeit: 2014/30/EU
- RoHS – Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten: 2011/65/EU

Produktnorm

- Gemäß EN 61800-2 – Drehzahlveränderbare elektrische Antriebe – Teil 2: Allgemeine Anforderungen. Sicherheit
- Gemäß EN 61800-5-1 – Elektrische Leistungsantriebssysteme mit einstellbarer Drehzahl – Teil 5-1: Anforderungen an die Sicherheit – Elektrische, thermische und energetische Anforderungen

EMV – Elektromagnetische Verträglichkeit

- Gemäß EN-61800-3 (C1 und C2) – Drehzahlveränderbare elektrische Antriebe – Teil 3: EMV-Anforderungen einschließlich spezieller Prüfverfahren

RoHS-kompatibel

- Enthält keine gefährlichen Stoffe gemäß der RoHS-Richtlinie.

TYPENSCHILD

Der OJ-DRHX-Antrieb verfügt über ein metallenes Typenschild.

Siehe Beispiel in Abb. 1.1 und Tabelle 1.2. HINWEIS! Sicherstellen, dass die Angaben auf dem Typenschild der erwarteten Spezifikation entsprechen.

Abb. 1.1

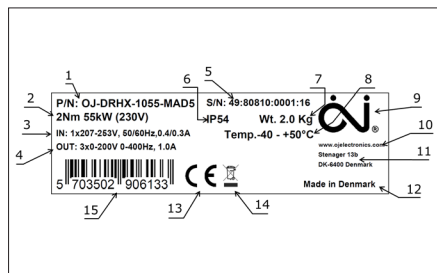


Tabelle 1.2

1	Produkt-ID, siehe Tabelle 10.6
2	Wellenleistung bei Nenningangsspannung
3	Nenningangsspannung (V, Hz, A)
4	Nennausgangsspannung (V, Hz, A)
5	Produktcode, siehe Tabelle 10.5
6	Schutzart
7	Gewicht (kg)
8	Temperaturbereich, Betrieb (°C)
9	Kennzeichen des Herstellers
10	Website des Herstellers
11	Postanschrift des Herstellers
12	Herstellungsland
13	CE-Kennzeichnung
14	Entsorgung, Symbol
15	Strichcode

ÖFFNEN DES ANTRIEBS

- Sicherstellen, dass die Spannungsversorgung des OJ-DRHX vor dem Öffnen der Abdeckung unterbrochen wurde.
- Nach Trennung der Netzversorgung mit dem Entfernen der Abdeckung ca. 3 Minuten warten.
- OJ-DRHX wird mithilfe eines Schraubendrehers oder eines ähnlichen Werkzeugs geöffnet (siehe Abb. 2).

ALLGEMEINE ZEICHNUNGEN UND MASSKIZZEN

Siehe Beispiel in Abb. 3 und Tabelle 3 und 4.1

NETZANSCHLUSS

- Die Versorgungsspannung muss 230 V AC $\pm 10\%$ betragen.
- Netzkabel sind im OJ-DRHX-Antrieb an den Klemmen mit der Kennzeichnung „L“, „N“ und „PE“ angeschlossen. (siehe Abb. 4).
- Es wird empfohlen, den PE-Leiter 20 mm länger als die anderen Leiter im Kabel vorzusehen (siehe Abb. 4). Bei versehentlich aus dem OJ-DRHX herausgezogenem Kabel und anliegender Spannung im Kabel und an den Klemmen, wird der PE-Leiter so als letztes herausgezogen. Stromschlag am OJ-DRHX wird damit vermieden.
- Wird der abisolierte Draht ordnungsgemäß in die Klemme eingesetzt, gleitet die Klemme automatisch mit der richtigen Spannkraft ein.
- Die Kabelverschraubungen wieder festziehen, um die Schutzart und die Kabelzugentlastung zu gewährleisten.

EINSTELLUNGEN UND FUNKTIONEN

DIP-Schalter – Einstellungen und Funktionen

Die OJ-DRHX-Baureihe ist mit einem DIP-Schalter (4 Positionen) u. a. für die Einstellung der Schrittmotorgröße (siehe Tabelle 5) und der max. Motordrehzahl ausgestattet (siehe Tabelle 5.1 und Abb. 5).

Testlauf

Die OJ-DRHX-Baureihe ist mit einer Testfunktion in Form einer eingebauten Testtaste ausgestattet.

Die Testtaste befindet sich im Antrieb ganz oben in der rechten Ecke und kann bei geöffnetem Antrieb verwendet werden.

Die Aktivierung der Testtaste übersteuert das Signal zum Schrittmotor auf die max. Drehzahl. Solange die Testtaste aktiviert ist, wird der Schrittmotor auf max. Drehzahl übersteuert. Die Testtaste funktioniert auch bei aktivierter Modbus-Steuerung.

LED-Anzeige

Die OJ-DRHX-Baureihe ist mit einer LED-Anzeige ausgestattet (siehe Abb. 6).

Die LED ist sowohl bei geöffneter als auch bei geschlossener Abdeckung sichtbar. LED-Anzeigecodes (siehe Tabelle 6.1)

Anzeigen

Tabelle 2	
	Die aktuelle Schrittmotordrehzahl wird angezeigt, wenn der Schrittmotor läuft und über das OJ-DRHX-PC-Tool oder das jeweilige Modbus-Register kein Rotor- oder Riemenscheibendurchmesser vorgegeben ist.
	Die aktuelle Rotordrehzahl wird angezeigt, wenn der Schrittmotor läuft und über das OJ-DRHX-PC-Tool oder das jeweilige Modbus-Register ein Rotor- oder Riemenscheibendurchmesser vorgegeben ist. Die Anzeige schaltet alle 2 Sekunden zwischen Drehmoment und Drehzahl um.
	Aktuelles Drehmoment (Nm). Die Anzeige schaltet alle 2 Sekunden zwischen Drehmoment und Drehzahl um.
	Fehlercodes*; Abschnitt „Alarmer und Fehlercodes“ enthält die Bedeutung der einzelnen Fehlercodes.
	Betrieb mit reduzierter Funktion aufgrund von Überstrom, zu hoher Temperatur oder eines anderen Fehlers oder Überlast. Den aktuellen Fehler/Alarm über Modbus auslesen.
	Reinigungsfunktion aktiviert
	Testfunktion ist aktiviert und der Schrittmotor empfängt ein Steuerungssignal für max. Drehzahl.
	Haltefunktion ist aktiviert (Holding).
	Schrittmotor befindet sich im Status „STOPP“.

Für nähere Informationen siehe die ungekürzte Anleitung auf der OJ-Website.

<http://www.ojelectronics.de/drxh>

Display

Das Display ist mit geöffneten und geschlossenen Abdeckungen sichtbar. Das Display zeigt den aktuellen Status den Antriebs, des Schrittmotors und des Rotors an (siehe Tabelle 2).

MODBUS

Allgemein

- OJ-DRHX kann über Modbus-RTU gemäß Modbus-Protokoll gesteuert werden.
- OJ-DRHX ist werkseitig auf 0-10V-Steuerung eingestellt.
- Wenn OJ-DRHX über Modbus ein Startsignal oder den Drehzahlsollwert erkennt, wechselt OJ-DRHX automatisch vorübergehend zur Steuerung über Modbus-RTU. Das 0-10V-Signal wird ignoriert. Die Funktion wird automatisch zurückgesetzt, wenn OJ-DRHX neu gestartet wird.
- OJ-DRHX kann mittels Modbus-Register so gesperrt werden, dass er immer über Modbus gesteuert wird. Das 0-10V-Signal wird also auch dann ignoriert, wenn keine aktive Modbus-Kommunikation erkannt wird.
- Zum Ändern und Anzeigen von Modbus-Registern, das OJ-DRHX-PC-Tool oder z. B. die OJ-Air2-WEB-Benutzeroberfläche verwenden (siehe Tabelle 7).





Français



Avertissement

AVERTISSEMENT PRÉALABLE

OJ-DRHX doit toujours être monté par des personnes formées ou disposant des qualifications nécessaires et ayant suivi une formation sur l'installation du produit. Les personnes formées connaissent le processus d'installation à appliquer et peuvent procéder à l'installation conformément aux exigences, lois et réglementations locales et internationales en vigueur. Les personnes formées connaissent les directives et les mesures de sécurité décrites dans le présent guide. Le produit OJ-DRHX présente une haute tension mortelle lorsqu'il est relié au réseau électrique. Lors du montage, de l'entretien ou de la maintenance, le produit doit toujours être déconnecté du réseau électrique. Le bouton de test peut être utilisé lorsqu'il est raccordé à l'alimentation électrique. Lorsque le OJ-DRHX est raccordé à l'alimentation principale, le moteur pas à pas est susceptible de démarrer de manière inopinée, créant ainsi une situation à risque pour les personnes qui peut engendrer des blessures ou endommager l'équipement et ses propriétés. Le rotor/moteur pas à pas peut démarrer en raison d'un signal d'entrée externe ou de Modbus. Avant de raccorder le OJ-DRHX au réseau électrique, il convient de monter correctement le moteur pas à pas, les courroies, les poulies et le rotor. Avant de raccorder le OJ-DRHX au réseau électrique, tous les caches, ouvertures et couplages doivent être montés correctement et fermés. Afin de maintenir le degré de serrage spécifié, les couplages de câble non utilisés doivent être remplacés par des presse-étoupes. Le OJ-DRHX contient des condensateurs qui sont chargés pendant le fonctionnement. Ces derniers peuvent rester chargés même après avoir débranché l'appareil du réseau électrique. Ceci peut engendrer des blessures graves si vous entrez en contact avec les bornes de raccordement ou les extrémités de câble avant la décharge complète de ces condensateurs. La durée nécessaire à la décharge totale, en conditions normales, est d'environ 3 minutes.

UTILISATION DU PRODUIT

Le OJ-DRHX est utilisé pour réguler la vitesse d'un échangeur thermique rotatif d'un ventilateur. Il peut être utilisé uniquement pour contrôler les moteurs pas à pas fournis par OJ Electronics A/S. N'essayez jamais de connecter ou de contrôler d'autres types de moteurs pas à pas.

Selon l'application, le OJ-DRHX peut être utilisé dans des applications individuelles ou faire partie d'un système ou d'une machine plus grande. Il peut être utilisé dans la limite des environnements et des plages de température définies.

L'entraînement et le moteur pas à pas constituent une unité de secours qui est contrôlée par des signaux ou des commandes provenant d'une unité de commande externe. Le OJ-DRHX est équipé d'une protection de moteur pas-à-pas intégrée. Il peut être utilisé dans des environnements résidentiels, ainsi qu'industriels, et est équipé de filtres CEM.



Avertissement

INTERDICTIONS PENDANT LE FONCTIONNEMENT

Il est interdit de mettre l'unité en marche avant que la machine ou le produit, dans laquelle ou lequel il est intégré, ne soit déclaré(e) comme étant conforme aux réglementations nationales et internationales. Le produit peut être mis sous tension uniquement une fois que l'installation complète est conforme à TOUTES les directives européennes pertinentes. Une fois le produit installé conformément à ces instructions et aux exigences d'installation, le produit est couvert par une garantie du constructeur. Si le produit est endommagé, par exemple lors du transport, les dégâts seront évalués et réparés par OJ Electronics A/S avant son installation, son raccordement à l'alimentation et son fonctionnement.

GAMME DE PRODUITS Gamme d'entraînement

Tableau 1*	DRHX -1055-MNN5	DRHX -1055-MAD5	DRHX -1220-MNN5	DRHX -1220-MAD5
Modbus	Oui	Oui	Oui	Oui
0-10 V	Non	Oui	Non	Oui
Écran	Non	Oui	Non	Oui
Protection de rotor intelligent	Standard	Standard	Standard	Standard
Protection de rotor externe	Non	Accessoires	Non	Accessoires
Fonction de purge automatique	Non	Oui	Non	Oui
Assurance déformation	Oui	Oui	Oui	Oui
Puissance (max.)	55 W	55 W	110/220 W	110/220 W
Alimentation électrique	1 x 230 VCA	1 x 230 VCA	1 x 230 VCA	1 x 230 VCA
Couple nominal	2 Nm	2 Nm	4/8 Nm	4/8 Nm
Régime max.	400 tr/min	400 tr/min	400 tr/min ^{*1}	400 tr/min ^{*1}
Alimentation du moteur	3 x 0-200 VCA	3 x 0-200 VCA	3 x 0-200 VCA	3 x 0-200 VCA
Dimensions (l, h, p) (mm)	183,0 x 142,7 x 55,0	183,0 x 142,7 x 55,0	183,0 x 142,7 x 55,0	183,0 x 142,7 x 55,0
Indice de protection (IP)	IP54	IP54	IP54	IP54

*1 : uniquement pour les moteurs 4 Nm

Si le OJ-DRHX est intégré au sein d'un système de machines possédant des pièces rotatives, comme un ventilateur, une unité de transport, etc., l'ensemble de la machine doit être conforme à la directive machine.

HOMOLOGATIONS ET CERTIFICATIONS

Marquage CE

- OJ Electronics A/S déclare sous sa responsabilité que le produit satisfait aux directives du Parlement européen suivantes :
- LVD - Directive basse tension 2014/35/UE
- CEM - Compatibilité électromagnétique 2014/30/UE
- RoHS - Restriction des substances dangereuses au sein des équipements électriques et électrotechniques : 2011/65/UE

Norme de produit

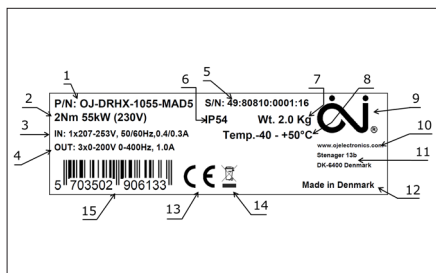
- Conforme aux exigences générales de la norme EN-61800-2 – Adjustable Speed Electrical Power Drive Systems (Systèmes d'entraînement électriques à vitesse réglable). Sécurité
- Conforme à la norme EN-61800-5-1 – Adjustable Speed Electrical Power Drive Systems (Systèmes d'entraînement électriques à vitesse réglable) : exigences en matière de sécurité électrique, thermique et énergétique
- CEM - Compatibilité électromagnétique**
- Conforme à la norme EN-61800-3 (C1 et C2) – Adjustable Speed Electrical Power Drive Systems (Systèmes d'entraînement électriques à vitesse réglable) - Partie 3 : exigence CEM et méthodes de test spécifiques
- Compatible RoHS**
- Ne contient aucune substance nuisible, conformément à la directive RoHS.

ÉTIQUETTE DU PRODUIT

Le système d'entraînement du OJ-DRHX est livré avec une plaque en métal de marquage Voir figure 1.1 et tableau 1.2

ATTENTION ! Vérifiez que l'information inscrite sur la plaque signalétique correspond bien à ce qui était attendu.

Fig. 1.1



ID	Description
1	ID du produit, voir tableau 10.6
2	Puissance de l'arbre avec alimentation électrique nominale
3	Alimentation électrique nominale (V, Hz, A)
4	Sortie nominale (V, Hz, A)
5	Code de production, voir tableau 10.5
6	Indice de protection
7	Poids (kg)
8	Plage de température, fonctionnement (°C)
9	Logo du fabricant
10	Site Internet du fabricant
11	Adresse postale du fabricant
12	Pays du fabricant
13	Homologation CE, logo
14	Élimination, logo
15	Code-barre

OUVERTURE DE L'ENTRAÎNEMENT

- Vérifiez que le OJ-DRHX a bien été débranché de l'alimentation électrique avant d'ouvrir le cache.
- Attendez environ 3 minutes avant d'ouvrir le cache pour permettre une décharge complète du système.
- Utilisez un tournevis pour ouvrir l'entraînement ou un outil similaire (voir fig. 2)

SCHEMAS GÉNÉRAUX ET PLANS DIMENSIONNELS

Voir figure 3 et tableau 3 et 4.1

ALIMENTATION ÉLECTRIQUE

- L'alimentation électrique est de 230 V CA ; +/-10 %.
- Les câbles d'alimentation sont raccordés à l'entraînement du OJ-DRHX à l'aide des bornes « L », « N » et « PE ». (voir fig. 4)
- Il est recommandé de disposer d'une ligne PE d'environ 20 mm plus longue que les autres lignes du câble (voir fig. 4). Si un câble est accidentellement retiré du OJ-DRHX lorsque les câbles et les bornes sont alimentés, la ligne PE sera alors la dernière à être débranchée. Le OJ-DRHX dispose ainsi d'une protection qui évite les dangers en cas de contact direct.
- Lorsque le conducteur non isolé est inséré correctement dans la borne, la borne s'insère automatiquement avec le couple approprié.
- Rappelez-vous de bien serrer les raccords afin que le degré de serrage et le couple soient adaptés.

PARAMÈTRES ET FONCTIONS

Commutateur DIP - paramètres et fonctions

La série OJ-DRHX dispose de 4 commutateurs DIP qui permettent le réglage, entre autres, de la taille du moteur pas à pas (voir tableau 5) et du régime maximal du moteur (voir tableau 5.1 et fig. 5)

Essai de fonctionnement

La série OJ-DRHX dispose d'une fonction de test qui se présente sous la forme d'un bouton de test intégré.

Ce dernier est placé à l'intérieur de l'entraînement dans le coin en haut à droite. Cette fonction peut être utilisée avec un entraînement ouvert.

Lorsque vous activez cette fonction de test, un signal est envoyé au moteur pas à pas afin qu'il tourne au régime maximum.

Aussi longtemps que le bouton est activé, le moteur pas à pas continuera de fonctionner à plein régime

Cette fonction peut également être utilisée lorsque le contrôle Modbus est activé.

Témoin LED

La série OJ-DRHX est équipée d'un témoin LED (voir fig. 6).

Ce dernier est visible à la fois lorsque le cache est ouvert et fermé.

Témoins LED (voir tableau 6.1)

Écran

L'écran est visible avec les caches ouverts ou fermés.

Il affiche l'état actuel de l'entraînement, du moteur pas-à-pas et du rotor. (Voir fig. 2)

MODBUS

Généralités

- Le OJ-DRHX peut être contrôlé avec Modbus RTU, conformément au protocole Modbus
- Le réglage par défaut du OJ-DRHX est de « 0-10 V ».
- Lorsque le système OJ-DRHX détecte un signal de démarrage ou un réglage de vitesse par le biais du protocole Modbus, son mode de contrôle passe automatiquement et temporairement en Modbus RTU. Le signal « 0-10 V » est ignoré. La fonction est automatiquement réinitialisée lorsque le OJ-DRHX redémarre.
- Le OJ-DRHX peut être verrouillé par le biais du registre Modbus de sorte qu'il soit toujours contrôlé par Modbus. Cela signifie que le signal 0-10 V sera ignoré même si aucune communication Modbus active n'est détectée.
- Pour modifier ou lire le registre Modbus, utilisez l'outil PC OJ-DRHX ou l'interface utilisateur Web OJ-Air2, par exemple. (voir tableau 7)

Écrans

Écran	Description
139	La vitesse actuelle du moteur pas à pas est affichée lors du fonctionnement du moteur et aucun rotor ou diamètre de poulie n'est indiqué par l'outil PC OJ-DRHX ou le registre Modbus correspondant.
719	La vitesse actuelle du rotor est affichée lors du fonctionnement du moteur pas à pas et un rotor ou diamètre de poulie est défini par l'outil PC OJ-DRHX ou le registre Modbus correspondant. L'écran passe du couple de serrage à la vitesse par intervalles de 2 secondes.
E12	Couple de serrage actuel (Nm) L'écran passe du couple de serrage à la vitesse par intervalles de 2 secondes.
E12	Codes d'erreur*, consultez la signification des différents codes d'erreur à la section « Alarmes et codes d'erreur ».
de	Fonctionnement avec fonctions réduites en raison d'une surintensité, d'une surchauffe ou d'une autre erreur de surcharge. Consulter l'erreur/l'alarme actuelle par le biais de Modbus.
PU	Fonction de purge activée
EST	La fonction de test est activée et le moteur pas à pas reçoit un signal de contrôle pour le régime maximal.
hold	Fonction « Hold » (maintien) activée.
STEP	Steppermotor en "STOP"

Pour plus d'informations, consultez les instructions complètes disponibles sur le site Internet d'OJ.

<http://www.ojelectronics.com/drhx>



Steppermotorprogram /GB /DE /FR

Tabel 3 / Table 3 / Tabelle 3 / Tableau 3	OJ-MRHX-3P02N-03C5	OJ-MRHX-3P04N-03C5	OJ-MRHX-3P08N-03C5
Effekt (W) Power (W) Leistung (W) Puissance (W)	55W @250rpm 55W @250rpm 55 W bei 250 U/min 55 W à 250 tr/min	110W @250rpm 110W @250rpm 110 W bei 250 U/min 110 W à 250 tr/min	220W @250rpm 220W @250rpm 220 W bei 250 U/min 220 W à 250 tr/min
Motor moment Motor torque Motordrehmoment Couple moteur	2Nm	4Nm	8Nm
Steppermotorspænding Stepper motor power Schrittmotorspannung Alimentation du moteur pas-à-pas	3x 0-200VAC	3x 0-200VAC	3x 0-200VAC
Omdr. minimum RPM minimum Min. Drehzahl Régime minimum	1rpm 1rpm 1 U/min 1 tr/min	1rpm 1rpm 1 U/min 1 tr/min	1rpm 1rpm 1 U/min 1 tr/min
Omdr. maksimum RPM maximum Max. Drehzahl Régime maximum	400rpm 400rpm 400 U/min 400 tr/min	400rpm 400rpm 400 U/min 400 tr/min	(400rpm 5Nm) (400rpm 5Nm) (400 U/min, 5 Nm) (400 tr/min 5 Nm)
Kabellængde Cable length Kabellänge Longueur de câble	300mm	300mm	300mm
Elektrisk tilslutning Electric connection Elektrischer Anschluss Raccordement électrique	4-pol Tyco MATE-N-LOK 4-pol Tyco MATE-N-LOK Tyco MATE-N-LOK, 4-polig Tyco MATE-N-LOK 4 pôles	4-pol Tyco MATE-N-LOK 4-pol Tyco MATE-N-LOK Tyco MATE-N-LOK, 4-polig Tyco MATE-N-LOK 4 pôles	4-pol Tyco MATE-N-LOK 4-pol Tyco MATE-N-LOK Tyco MATE-N-LOK, 4-polig Tyco MATE-N-LOK 4 pôles
Steppermotor mål (b, h, d) Stepper motor dimensions (b, h, d) Abmessungen Schrittmotor (L x H x T) Dimensions du moteur pas-à-pas (l, h, p)	85mm, 85mm, 67mm	85mm, 85mm, 97mm	85mm, 85mm, 156mm
Akseldiameter Shaft diameter Wellendurchmesser Diamètre de l'arbre	Ø12mm	Ø12mm	Ø12mm
Kapslingsklasse (IP) Ingress Protection (IP) Schutzart (IP) Indice de protection (IP)	IP54	IP54	IP54

Fig. 2 / Fig. 2 / Abb. 2 / Fig. 2

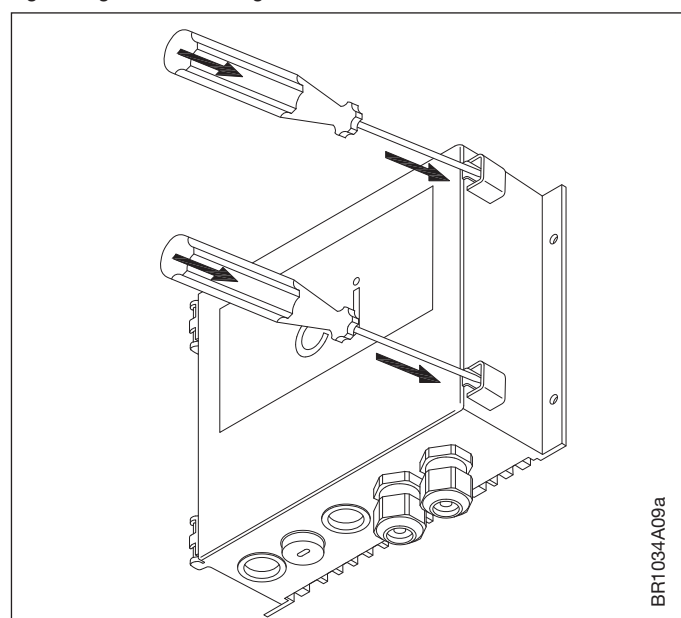
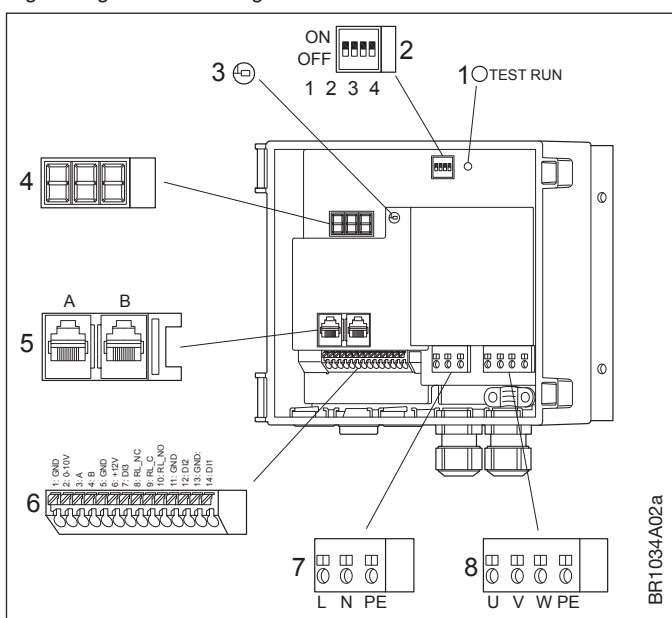


Fig. 3 / Fig. 3 / Abb. 3 / Fig. 3



Tabel 4.1	DK	Table 4.1	GB	Tabelle 4.1	DE	Tableau 4.1	FR
Nr.	Beskrivelse	No.	Description	No.	Beschreibung	N°	Description
1	Testknap	1	Test button	1	Testtaste	1	Bouton de test
2	4-pol DIP switch	2	4-pole DIP switch	2	4-poliger DIP-Schalter	2	Commutateur DIP à 4 pôles
3	LED	3	LED	3	LED	3	LED
4	3 x 7-segment display – afh. af variant	4	3 x 7 segment display – depending on variation	4	3x7-Segmentanzeige – je nach Variante	4	Écran à 3 x 7 segments : selon le modèle
5	RJ12 Modbus-stik (2 x RJ12)	5	RJ12 Modbus-plug (2 x RJ12)	5	RJ12-Modbus-Stecker (2x RJ12)	5	Plug RJ12 Modbus (2 x RJ12)
6	A/D styre- og signalklemmer – afh. af variant	6	A/D control and signal terminals - depending on variation	6	A/D-Steuer- und Signalklemmen – je nach Variante	6	Contrôle A/D et bornes de signal : selon le modèle
7	Forsyningsklemmer (L, N, PE)	7	Supply terminals (L, N, PE)	7	Versorgungsklemmen (L, N, PE)	7	Bornes d'alimentation (L, N, PE)
8	Tilslutningsklemmer for stepper motor (U, V, W, PE)	8	Connection terminals for stepper motor (U, V, W, PE)	8	Anschlussklemmen für Schrittmotor (U, V, W, PE)	8	Bornes de raccordement pour le moteur pas-à-pas (U, V, W, PE)

Fig. 4 / Fig. 4 / Abb. 4 / Fig. 4

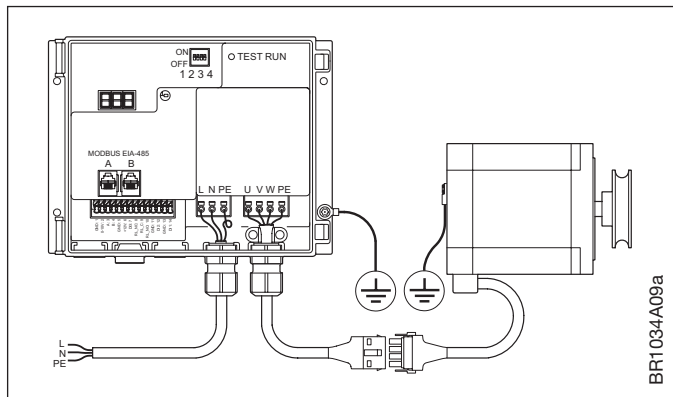


Table 5	DIP1	DIP2
Steppermotor = 2Nm	OFF	OFF
Steppermotor = 4Nm	ON	OFF
Steppermotor = 8Nm	OFF	ON
n/a	ON	ON

Table 5.1	DIP3	DIP4
Max RPM = 250 (Modbus*)	OFF	OFF
Max RPM = 200	ON	OFF
Max RPM = 170	OFF	ON
Max RPM = 150	ON	ON

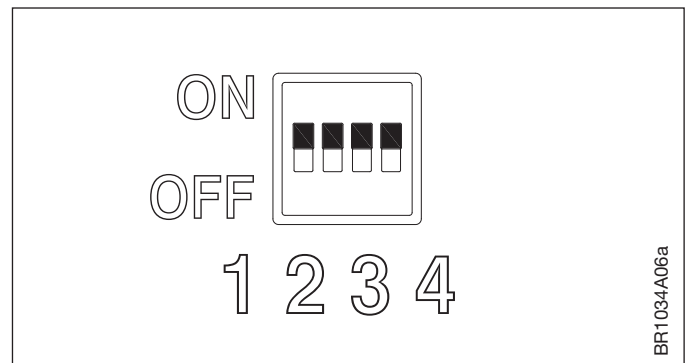
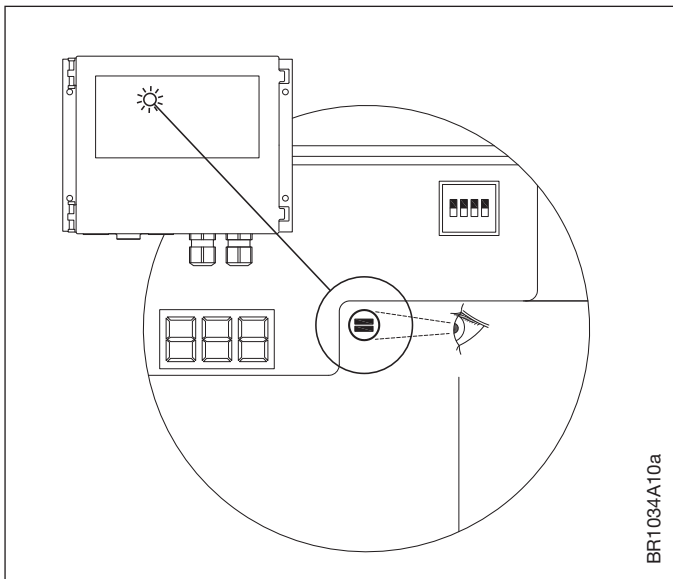


Fig. 6 / Fig. 6 / Abb. 6 / Fig. 6



OJ-DRHX-1055-MAD5, OJ-DRHX-1220-MAD5

Tabel 6.1 / DK	
LED	Tilstand
OFF	Ingen spænding
Grøn ON	Spænding på
Grøn blink	Valid Modbus kommunikation
Rød ON	Rotor stoppet pga. en kritisk alarm
Rød blink	I drift med Reduceret ydelse
Orange ON	Test-funktion aktiveret
Orange blink	Renblæsningssekvens aktiveret

NOTE: Blink betyder at LED er slukket i 100 ms og tændt i min.100 ms (ms=millisekunder)

Table 6.1 / GB	
LED	Condition
OFF	No power
Green ON	Power on
Green blink	Valid Modbus communication
Red ON	Rotor stopped due to a critical alarm
Red blink	Operation with reduced function
Orange ON	Test function activated
Orange blink	Pure blowing sequence activated

NOTE: Blink means that the LED is out for 100 ms and lit for 100 ms (ms = milliseconds)

Tabelle 6.1 / DE	
LED	Zustand
AUS	Keine Spannung
Grün EIN	Spannung vorhanden
Grün blinkend	Gültige Modbus-Kommunikation
Rot EIN	Rotor gestoppt wegen kritischem Alarm
Rot blinkend	Betrieb mit reduzierter Leistung
Orange EIN	Testfunktion aktiviert
Orange blinkend	Reinigungsfunktion aktiviert

HINWEIS: Blinken liegt vor, wenn die LED abwechselnd jeweils für 100 ms ausgeschaltet und eingeschaltet ist (ms = Millisekunden).

Tableau 6.1 / FR	
LED	État
ARRÊT	Aucune alimentation
Vert ON	Sous tension
Vert clignotant	Communication Modbus valide
Rouge ON	Rotor arrêté en raison d'une alarme critique
Rouge clignotant	Fonctionnement avec fonction réduite
Orange ON	Fonction de test activée
Orange clignotant	Séquence de purge activée

REMARQUE : clignotant signifie que la LED s'éteint pendant 100 ms et s'allume pendant 100 ms (ms = milliseconde)

Table 7			
	Setting zone	Unit	Factory settings
Address	1-247	n/a	79 dec.
Baud rate	9.6, 19.2, 38.4, 57.6, 115.2 kBaud		38.4
Parity	None, even, odd	n/a	None
Stop bit(s)	0, 1, 2	n/a	2
Communication time-out	0-240	Sec.	10

OJ ELECTRONICS A/S
Stenager 13B • DK-6400 Sønderborg
Tél. : +45 73 12 13 14 • Fax +45 73 12 13 13
oj@ojelectronics.com • www.ojelectronics.com

A.8 thermokon TFR anti-frost thermostat

Name	Data
Designation	Anti-frost thermostat
Type	TFR
Number	
Type of manual	Technical data sheet
Manufacturer	thermokon

Frostschutzthermostat TFR

Frostschutzthermostat
Antifreeze Thermostat

thermokon
Sensortechnik GmbH

DE - Datenblatt

Technische Änderungen vorbehalten
Stand 19.04.2010

EN - Data Sheet

Subject to technical alteration
Issue date 2010/04/19



Anwendung

Das Frostschutzthermostat TFR wird eingesetzt für die luftseitige Temperaturüberwachung von Wasser-Lufterwärmern in Lüftungs- und Klimaanlage zur Verhinderung von Frostschäden. Es besitzt eine kleine Schaltdifferenz und eine hohe Reproduzierbarkeit. Die Rückstellung erfolgt automatisch; bei TFR ...-R manuell mittels Taste.

Durch das Schalten des Frostschutzthermostats können beispielsweise folgende Frostschutzmaßnahmen ausgelöst werden:

- Ventilator AUS
- Außenluftklappe ZU
- Luftwärmeventil 100% AUF
- Lufterwärmepumpe EIN
- Kältemaschine (Verdichter) und Luftbefeuchter AUS
- Auslösung der Frostgefahrmeldung optisch und/oder akustisch

Typenübersicht

TFR 1,8	Frostschutzthermostat, Kapillarrohrlänge 1,8m, automatische Rückstellung
TFR 3	Frostschutzthermostat, Kapillarrohrlänge 3m, automatische Rückstellung
TFR 6	Frostschutzthermostat, Kapillarrohrlänge 6m, automatische Rückstellung
TFR 1,8-R	Frostschutzthermostat, Kapillarrohrlänge 1,8m, manuelle Rückstellung
TFR 3-R	Frostschutzthermostat, Kapillarrohrlänge 3m, manuelle Rückstellung
TFR 6-R	Frostschutzthermostat, Kapillarrohrlänge 6m, manuelle Rückstellung

Normen und Standards

CE-Konformität: 2004/108/EG Elektromagnetische Verträglichkeit
Produktsicherheit: 2001/95/EG Produktsicherheit

EMV: EN 60730-1: 2002
Produktsicherheit: EN 60730-1: 2002

Application

The antifreeze thermostat TFR is used for downstream temperature monitoring of water air heaters in ventilation and air-conditioning systems to prevent frost damages. It has a small differential gap and a good repeatability. The reset can be done automatically. For model TFR...-R reset is made manually by a button.

The antifreeze thermostat can be used to initiate the following frost protection functions:

- Stop fan
- Close outside air dampers
- Open heating coil valve 100%
- Start heating coil pump
- Switch-off chiller (condenser) and humidifier
- Trip visual and/or audible frost alarm

Types Available

TFR 1,8	Antifreeze thermostat, capillary tube length 1,8 m, automatic reset
TFR 3	Antifreeze thermostat, capillary tube length 3 m, automatic reset
TFR 6	Antifreeze thermostat, capillary tube length 6 m, automatic reset
TFR 1,8-R	Antifreeze thermostat, capillary tube length 1,8 m, manual reset
TFR 3-R	Antifreeze thermostat, capillary tube length 3 m, manual reset
TFR 6-R	Antifreeze thermostat, capillary tube length 6 m, manual reset

Norms and Standards

CE-Conformity: 2004/108/EG Electromagnetic compatibility
Product safety: 2001/95/EG Product safety

EMC: EN 60730-1: 2002
Product safety: EN 60730-1: 2002

Technische Daten

Sollwert-Einstellbereich Wh:	-10 ... +15°C (Werkseinstellung: 5°C)
Schaltdifferenz:	<= 2 +/- 1°C
Reproduzierbarkeit:	+/- 0,5°C
Fühler-Ansprechlänge:	ca. 60cm
Kapillarrohrlänge:	1,8m, 3m oder 6m (je nach Typ)
Schaltausgang:	Wechslerkontakt, max. 250VAC, max. 10A, Kontakmaterial: Ag/Ni(90%/10%) vergoldet (3µm)
Rückstellung:	TFR 1,8 ... 6: Automatisch TFR 1,8 ... 6-R: Manuell
Zulässiges Medium:	Luft
Einbaulänge:	Beliebig
Anschlußklemme:	Schraubklemme max. 2,5mm ²
Kabeleinführung:	Kabelverschraubung M16x1,5
Schutzart:	IP65 gemäß EN60529
Umgebungstemperatur:	w+mind. 2K ... 70°C
Transport:	-30...70°C / max. 85%rF, nicht kond.
Gehäuse:	Material Unterteil: PA GK30 Material Deckel: ABS transparent
Kapillarrohr:	Material: Kupfer Kapillarrohrfüllung: R 507

Gefahrenhinweis Achtung

Achtung: Einbau und Montage elektrischer Geräte dürfen nur durch eine Elektrofachkraft erfolgen. Vor Entfernen des Deckels Installation freischalten (Sicherung ausschalten) und gegen Wiedereinschalten sichern! Die Module dürfen nicht in Verbindung mit Geräten benutzt werden, die direkt oder indirekt menschlichen, gesundheits- oder lebenssichernden Zwecken dienen oder durch deren Betrieb Gefahren für Menschen, Tiere oder Sachwerte entstehen können.

Elektrischer Anschluss

Beim elektrischen Anschluss der Geräte gelten die techn. Daten der Geräte. Die Geräte müssen bei einer konstanten Betriebsspannung betrieben werden. Strom-/Spannungsspitzen beim Ein-/Ausschalten der Versorgungsspannung müssen bauseits vermieden werden.

Montagehinweis

Kanaleinschub

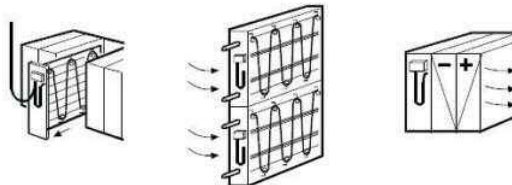
Es ist empfehlenswert, das Frostschutzthermostat auf eine dazu bestimmte Schublade (Kanaleinschub) unmittelbar nach dem Lufterwärmer zu montieren. Dabei ist auf ein genügend langes Anschlusskabel für ungehindertes Ein- und Ausfahren der Schublade zu achten. Bei Lufterwärmern mit sehr großem Querschnitt können mehrere Frostschutzschalter montiert und seriell verdrahtet werden. In solchen Fällen ist der Temperatursollwert bei jedem Frostschutzschalter individuell einzustellen.

Frostschutzthermostat

Die Umgebungstemperatur beim Frostschutzthermostatgehäuse (mit Testschlaufe) muss mindestens 2°C höher sein als der eingestellte Sollwert. Ist dies nicht gewährleistet, z.B. im Freien oder in ungeschützten Räumen, muß das Gehäuse mit der Testschlaufe im Innern des Zuluftgerätes montiert werden.

Kapillarrohr

Das Kapillarrohr wird auf der warmen Seite des zu schützenden Lufterwärmers (bei Luftkühlern vor dem Luftkühlen) im Abstand von ca. 5cm quer zu den Wärmetauscherrohren gleichmäßig über die ganze Fläche verlegt. Es wird empfohlen, für Testzwecke eine Schlaufe von ca. 60 cm direkt unter dem Gehäuse und vor dem Eintritt in den Luftkanal anzubringen. Damit das Kapillarrohr nicht beschädigt wird, ist ein minimaler Biegeradius von 20 mm einzuhalten. Die Montage wird durch Verwendung der im Zubehör erhältlichen Montageklammern vereinfacht.



Technical Data

Set point adjustment range:	-10...+15°C (factory setting: 5°C)
Differential gap:	<= 2 +/- 1°C
Repeatability:	+/- 0,5°C
Sensor operating length:	approx. 60 cm
Capillary tube length:	1,8m, 3m or 6m (depending on type)
Switching output:	Change-over contact, max. 250 VAC, max. 10A Contact material: Ag/Ni(90%/10%) gold plated (3µm)
Reset:	TFR 1,8...6: automatically TFR 1,8...6-R: manually
Admissible medium:	Air
Mounting length:	Any
Connecting terminal:	Screwing terminal max. 2,5 mm ²
Cable entry:	Cable connection M16x1,5
Protection class:	IP65 accord. To EN60529
Ambient temperature:	w+mind. 2K...70°C
Transport:	-30...70°C/ max. 85%rH, no condensate
Enclosure:	Material lower part: PA6 GK30 Material cover: ABS, transparent
Capillary tube:	Material: copper Capillary tube filling: R 507

Warning Advice Caution

Caution: The installation and assembly of electrical equipment may only be performed by a skilled electrician. Isolate installation before removal of cover (disconnect fuse) and protect against reconnection. The modules must not be used in any relation with equipment that supports, directly or indirectly, human health or life or with applications that can result in danger for people, animals or real value.

Electrical Connection

For the electrical connection, the technical data of the corresponding device are valid.

The devices must be operated at a constant supply voltage. When switching the supply voltage on/off, power surges must be avoided on site.

Mounting Advice

Withdrawable Tray

It is recommended to mount the antifreeze thermostat on a special withdrawable tray directly downstream of the heating coil. The connecting cable must be long enough to enable the tray to be inserted and removed smoothly. For heating coils with a large cross section several antifreeze thermostats can be fitted and connected in series. In such cases, the temperature set point is set individually for each antifreeze thermostat.

Antifreeze Thermostat

The ambient temperature of antifreeze thermostat housing (with the test loop) must be at least 2°C above the pre-adjusted set point. If this cannot be guaranteed (e.g. outdoors or in exposed spaces), housing and test loop must be installed inside the supply air unit.

Capillary Tube

The capillary tube must be mounted on the downstream side of the heating coil (and on the upstream side in case of cooling coils). It should be looped diagonally across the heat exchanger pipes at a distance of approx. 5 cm and should cover the entire area evenly.

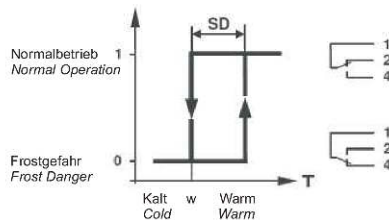
For test purposes, it is recommended to have a loop of approx. 60 cm directly beneath the housing outside the entry to the duct. To prevent damage to the capillary tube a minimum bending radius of 20 mm must be ensured. Mounting can be facilitated by using the capillary tube clamps (optional accessory).

Funktionsbeschreibung

Der Schalter im Frostschutzthermostat spricht an, wenn die Temperatur auf einer Kapillarrohrlänge von mindestens 60 cm den eingestellten Temperatursollwert unterschreitet (schließt Kontakt 1-4). Kontakt 1-2 öffnet gleichzeitig und kann als Signalkontakt verwendet werden. Die Rückstellung erfolgt automatisch (Kontakt schließt 1-2), wenn die Temperatur wieder über den eingestellten Sollwert ansteigt (beim Typ TFR...-R muß die Rückstellung manuell über die Reset-Taste erfolgen). Der TFR... ist „eigensicher“, d.h. bei Beschädigung des Kapillarrohr-Membransystems schaltet er automatisch in die Heizfunktion. Kontakt 1-4 schließt und kann deshalb als Arbeitskontakt verwendet werden. Die Lufttemperatur wird über die ganze Fühlerlänge (Kapillarrohr) erfasst. Das mit Gas (R 507) gefüllte Membransystem und das Kapillarrohr bilden eine Meßeinheit. Diese ist mechanisch mit dem Mikroschalter gekoppelt.

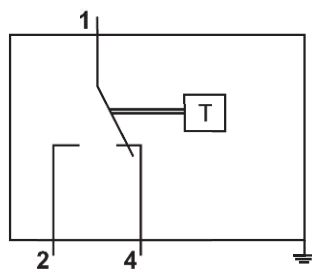
Function Description

The antifreeze thermostat trips when the temperature of drops below the selected set point over a capillary length of 60 cm (contact 1-4 closes). Simultaneously contact 1-2 breaks and can be used as a signal contact. An automatic reset is made when the temperature exceeds the the adjusted set point again (contact 1-2 closes). For model TFR...-R manual reset is required by means of the reset button. The TFR... is "self-secured", i.e. in case of a capillary tube diaphragm damage, it switches automatically to the heating function. Contact 1-4 closes and can thus be used as an operating contact. The air temperature is measured over the full length of the capillary tube. The gas filled diaphragm system and the capillary tube are forming a unit of measurement which is mechanically linked to the micro-switch.



Anschlussplan

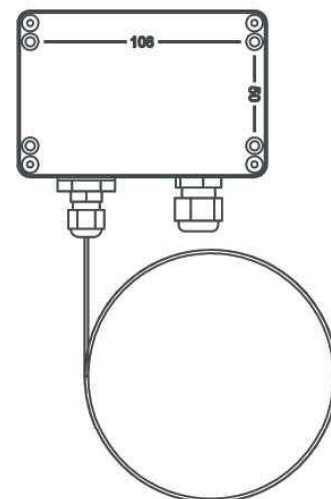
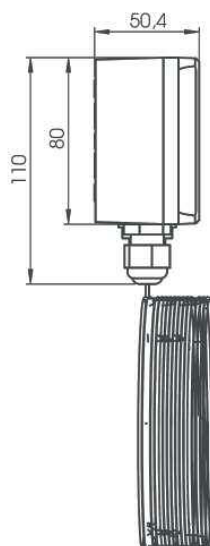
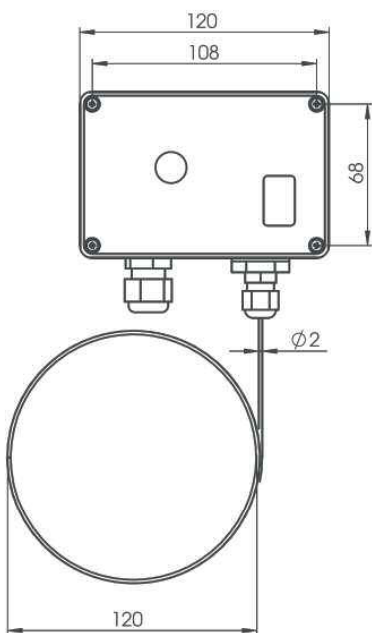
Terminal Connection Plan



1 - 2 Normalbetrieb / Normal Operation
 1 - 4 Frostgefahr / Frost Danger

Abmessungen (mm)

Dimensions (mm)



Zubehör (im Lieferumfang enthalten)

Accessories (Included in Delivery)

Montageklammern, 6 Stück bei 6m Kapillarrohrlänge.

Mounting clamps, 6 pcs. for 6m capillary tube length.

A.9 LED lamp TROX W850

Name	Data
Designation	LED lamp
Type	W850
Number	
Type of manual	Technical data sheet
Manufacturer	TROX GmbH

TROX GmbH

Heinrich-Trox-Platz
D-47504 Neukirchen-Vluyn
Phone +49(0)28 45/2 02-0
Fax +49(0)28 45/2 02-265
www.trox.de
Mail trox@trox.de

Product data sheet LED lamp

Status 02/2016

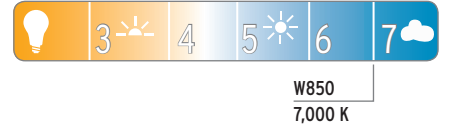


7.2 Watt/piece

238 lumen/piece

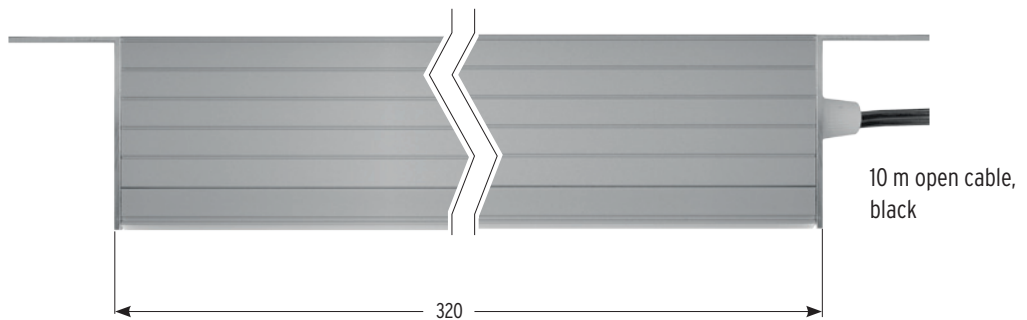
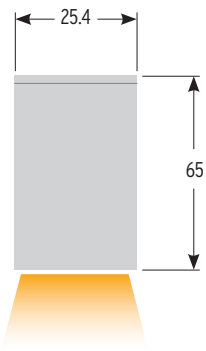
Integrated ballast (PSU)

Protection class



Construction & Dimensions

Surface: anodised aluminium
Length: 320 mm



Electrical & optical data

Dimensions	320 mm x 25.4 mm x 65 mm
Power	7.2 W/Piece
Voltage (V)	230 Volt (220 V _{min} , 240 V _{max})
Temperature	t _{cmin} = -25 °C, t _{cmax} = +50 °C
Storage temperature	t _{min} = -25 °C, t _{max} = +85 °C
Reverse voltage	-5 Volt
Ambient temperature	t _a min > -25 °C, t _a max = +45 °C



Service life



LM 79 compliant



LM 80 compliant

LED lamp	Lumen / piece	Color temperature (K)
W850	238	7,000 K

Order code: X00LUM ZEUS W850/0,320-CL-NA-FS

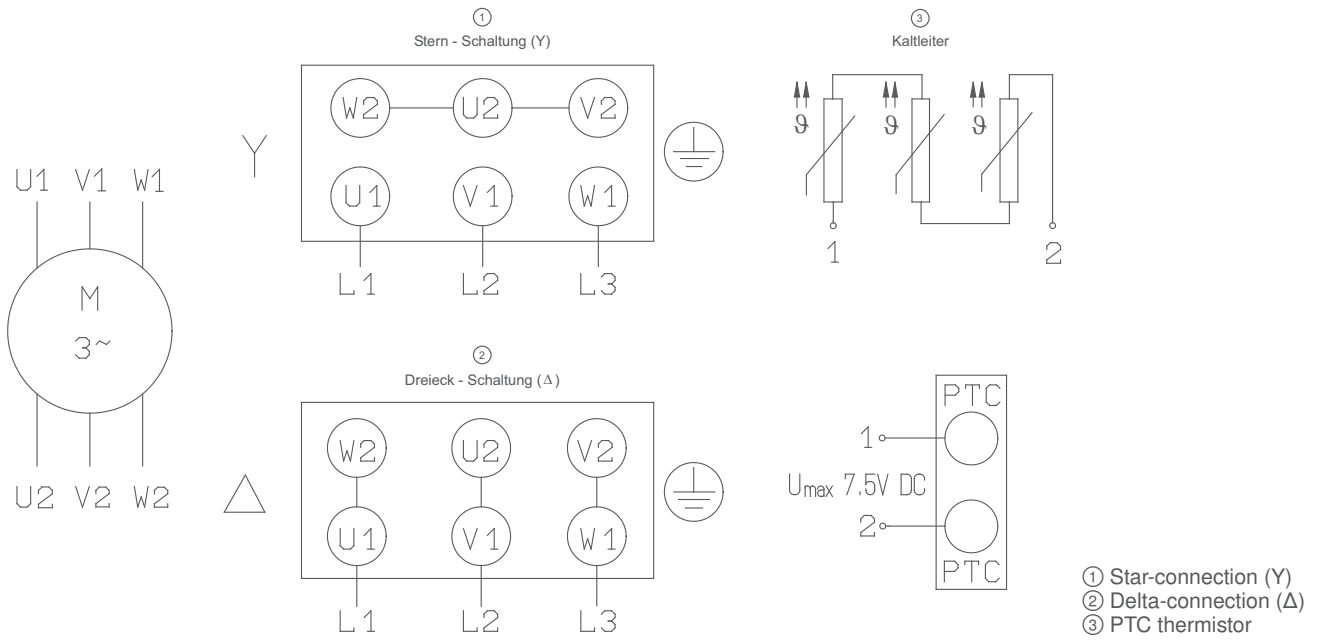


A.10 Fan electric motor Ziehl Abegg

Name	Data
Designation	Fan electric motor
Type	ER...Cpro/ER...C, GR...Cpro/GR...C
Number	
Type of manual	Connections
Manufacturer	Ziehl Abegg

Connection diagram for motors

Three-phase A.C. motor with PTC thermistor for one speed



Reversible rotation by interchanging phases

Rated voltage:

Motor size ≤ 90: 230 V Δ / 400 V Y

Motor size ≥ 100: 400 V Δ / 690 V Y

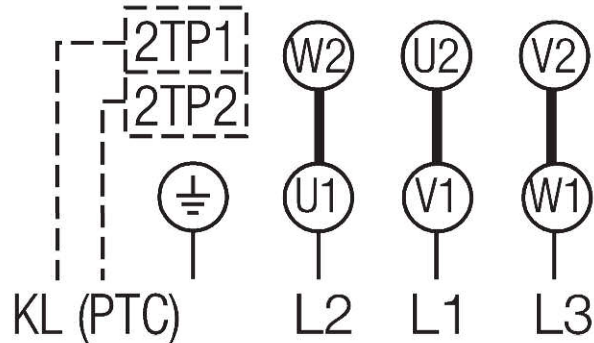
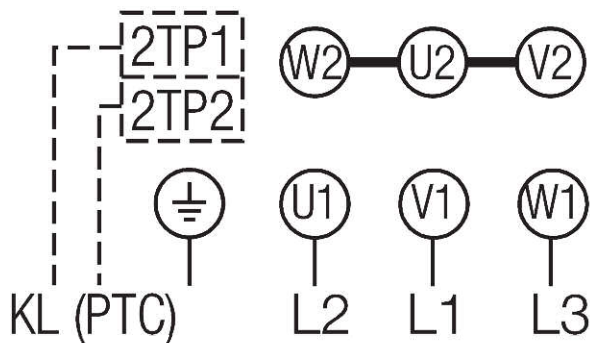
A.11 Nicotra Gebhardt fan electric motor

Name	Data
Designation	Fan electric motor
Type	
Number	
Type of manual	Connections
Manufacturer	Nicotra Gebhardt

Eintouriger Drehstrommotor, optional mit PTC
Three-phase A.C. motor, optional w/PTC Thermistor
Moteur triphasé à 1 vitesse, PTC Sonde en option

Stern - Schaltung (Y)
 Star - connection
 Branchement étoile

Dreieck - Schaltung (Δ)
 Delta - connection
 Branchement triangle



420 08-12-2005

Weitere Informationen finden Sie unter:

www.nicotra-gebhardt.com

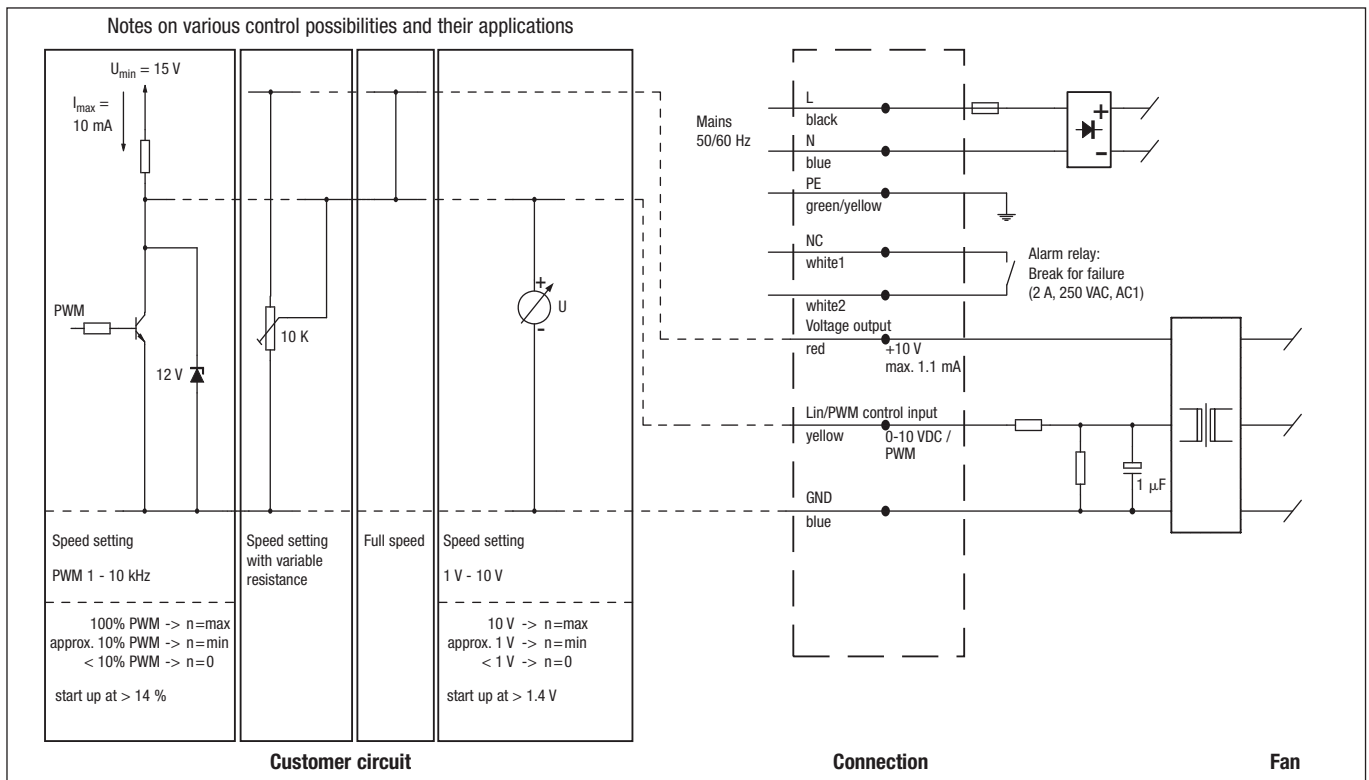
A.12 Fan electric motor ebm-pabst

Name	Data
Designation	Fan electric motor
Type	EC
Number	
Type of manual	Connections
Manufacturer	ebm-papst

Electrical connections EC K1)

Technical features:

- PFC (passive)
- Control input 0-10 VDC / PWM
- Output 10 VDC max. 1,1 mA
- Alarm relay
- Over-temperature protected electronics / motor



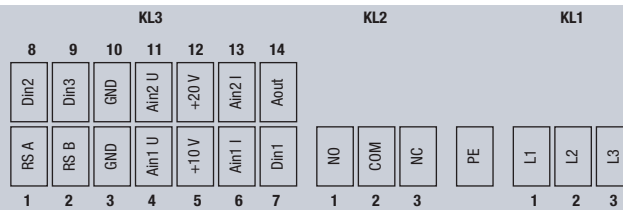
Line	Connection	Colour	Assignment / function
1	L	black	Mains 50/60 Hz, phase
	N	blue	Mains 50/60 Hz, neutral
	PE	green/yel	Protective earth
	NC	white1	Status relay, floating status contact, break with error
	COM	white2	Status relay, floating status contact, changeover contact, common connection (2 A, 250 V, min. 10 mA, AC1)

Line	Connection	Colour	Assignment / function
2	+10 V	red	Voltage output +10 V max. 1.1 mA
	0-10 V / PWM	yellow	Control input (Impedance 100 kΩ)
	GND	blue	GND

Electrical connections EC M3)

Technical features:

- PFC (passive)
- integrated PID controller
- Control input 0-10 VDC / PWM
- Input for sensor 0-10 V or 4-20 mA
- Slave output 0-10 V max. 5 mA
- Output 20 VDC ($\pm 20\%$) max. 50 mA
- Output 10 VDC ($+10\%$) max. 10 mA
- RS485 MODBUS-RTU
- Motor current limitation, Alarm relay
- Line undervoltage / phase failure detection
- Over-temperature protected electronics / motor
- Reverse polarity and locked-rotor protection, Soft start
- External 24 V input (programming)
- External release input
- Operation and alarm display
- Control interface with SELV potential safely disconnected from the mains



Connector	Pin	Connection	Assignment / function
KL1	1	L1	Mains supply connection, supply voltage 3~380-480 VAC; 50/60 Hz
	2	L2	Mains supply connection, supply voltage 3~380-480 VAC; 50/60 Hz
	3	L3	Mains supply connection, supply voltage 3~380-480 VAC; 50/60 Hz
PE		PE	Earth connection, PE connection
KL2	1	NO	Status relay, floating status contact, close with error
	2	COM	Status relay, floating status contact, changeover contact, common connection (2 A, 250 V, min. 10 mA, AC1)
	3	NC	Status relay, floating status contact, break with error
KL3	1	RSA	Bus connection RS485; RSA; MODBUS RTU
	2	RSB	Bus connection RS485; RSB; MODBUS RTU
	3/10	GND	Signal ground for control interface
	4	Ain1 U	Analogue input 1 (set value); 0-10 V; Ri= 100 k Ω ; parametrisable curves; only usable as alternative to input Ain1 I
	5	+10 V	Fixed voltage output 10 VDC; +10 V $\pm 3\%$; max. 10 mA; short circuit proof; power supply for ext. devices (e.g. potentiometer)
	6	Ain1 I	Analogue input 1 (set value); 4-20 mA; Ri= 100 Ω ; parametrisable curve; only usable as alternative to input Ain1 U
	7	Din1	Digital input 1: enabling of electronics; enabling: open pin or applied voltage 5 to 50 VDC; disabling: bridge to GND or applied voltage < 1 VDC; reset function: triggers software reset after a level change to < 1V
	8	Din2	Digital input 2: parameter set switch 1/2; according to EEPROM setting, the valid/used parameter set is selectable per BUS or per digital input Din2. Parameter set 1: open pin or applied voltage 5 to 50 VDC; parameter set 2: bridge to GND or applied voltage < 1 VDC
	9	Din3	Digital input 3: Control characteristic of the integrated controller; according to EEPROM setting, the control characteristic of the integrated controller is normally/inversely selectable per BUS or per digital input; normal: open pin or applied voltage 5 to 50 VDC (control deviation = actual sensor value - set value); inverse: bridge to GND or applied voltage < 1 VDC control deviation = set value - actual sensor value)
	11	Ain2 U	Analogue input 2; actual sensor value 0-10 V; Ri= 100 k Ω ; parametrisable curve; only usable as alternative to input Ain2 I
	12	+20 V	Fixed voltage output 20 VDC; +20 V $\pm 25\%$ / -10 %; max. 50 mA; short circuit proof; power supply for ext. devices (e.g. sensors)
	13	Ain2 I	Analogue input 2; actual sensor value 4-20 mA; Ri= 100 Ω ; parametrisable curve; only usable as alternative to input Ain2 U
	14	Aout	Analogue output 0-10 V; max. 5 mA; output of the actual motor control factor (output voltage of electronics)/of the actual motor speed; function selectable per BUS; parametrisable curve

Electrical connections EC L6)

Technical features:

- PFC (passive)
- Integrated PID controller
- Control input 0-10 VDC / PWM
- Input for sensor 0-10 V or 4-20 mA
- Slave output 0-10 V max. 3 mA
- Output 20 VDC ($\pm 20\%$) max. 50 mA
- Output 10 VDC ($+10\%$) max. 10 mA
- RS485 MODBUS
- Alarm relay
- Line undervoltage / phase failure detection
- Motor current limitation
- Over-temperature protected electronics / motor
- Locked-rotor protection
- Soft start



Connector	Connection	Assignment / function
PE	PE	Protective earth
KL1	L3	Mains; L3
	L2	Mains; L2
	L1	Mains; L1
KL2	NC	Status relay, floating status contact, break with error
	COM	Status relay, floating status contact, changeover contact, common connection (2 A, 250 V, min. 10 mA, AC1)
	NO	Status relay, floating status contact, close with error

Connector	Connection	Assignment / function
KL3	OUT	Master output 0-10 V max. 3 mA
	GND	GND
	0-10 V / PWM	Control / Actual value input (Impedance 100 k Ω)
	+10 V	Supply for external potentiometer, 10 VDC ($+10\%$) max. 10 mA
	+20 V	Supply for external sensor, 20 VDC ($\pm 20\%$) max. 50 mA
	4-20 mA	Control / Actual value input
	0-10 V / PWM	Control / Actual value input
	GND	GND
	RSB	RS485 interface for MODBUS RTU; RSB
	RSA	RS485 interface for MODBUS RTU; RSA
	RSB	RS485 interface for MODBUS RTU; RSB
	RSA	RS485 interface for MODBUS RTU; RSA

Electrical connections EC L7)

Technical features:

- PFC (active)
- Integrated PID controller
- Control input 0-10 VDC / PWM
- Input for sensor 0-10 V or 4-20 mA
- Slave output 0-10 V max. 3 mA
- Output 20 VDC ($\pm 20\%$) max. 50 mA
- Output 10 VDC (+10 %) max. 10 mA
- RS485 MODBUS
- Alarm relay
- Line undervoltage detection
- Motor current limitation
- Over-temperature protected electronics / motor
- Locked-rotor protection
- Soft start



Connector	Connection	Assignment / function
PE	PE	Protective earth
KL1	N	Mains 50/60 Hz. neutral
	L	Mains 50/60 Hz. phase
KL2	NC	Status relay, floating status contact, break with error
	COM	Status relay, floating status contact, changeover contact, common connection (2 A, 250 V, min. 10 mA, AC1)
	NO	Status relay, floating status contact, close with error

Connector	Connection	Assignment / function
KL3	OUT	Master output 0-10 V max. 3 mA
	GND	GND
	0-10 V / PWM	Control / Actual value input (Impedance 100 k Ω)
	+10 V	Supply for external potentiometer, 10 VDC (+10 %) max. 10 mA
	+20 V	Supply for external sensor, 20 VDC ($\pm 20\%$) max. 50 mA
	4-20 mA	Control / Actual value input
	0-10 V / PWM	Control / Actual value input
	GND	GND
	RSB	RS485 interface for MODBUS RTU; RSB
	RSA	RS485 interface for MODBUS RTU; RSA
	RSB	RS485 interface for MODBUS RTU; RSB
	RSA	RS485 interface for MODBUS RTU; RSA

Fan	Wiring diagram
K3G 250-AV29 -B2	L7)
K3G 280-AU11 -C2	L6)
K3G 310-BB49 -02	M3)
K3G 310-AZ88 -02	M3)
K3G 355-AY40 -02	M3)
K3G 400-AQ23 -01	M3)
K3G 450-AQ24 -01	M3)
K3G 450-AZ30 -01	M3)
K3G 500-AP25 -01	M3)
K3G 500-AQ33 -01	M3)
K3G 560-AP23 -01	M3)
K3G 560-AQ04 -01	M3)

B Safety data sheets

B.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

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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

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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.
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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.

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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.

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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:

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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.

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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

B.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

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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 %

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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.

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- 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.

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- 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



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- 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

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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.



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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.



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- 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.



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- 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


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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.



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TROX[®] TECHNIK

The art of handling air

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