



Hydraulic unit for RAC systems

RAC System



TROX[®] TECHNIK

The art of handling air

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CD10108, 1, GB/en
12/2024

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About this installation and operating manual

These instructions enable safe and efficient use of the hydraulic unit KVS.

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

Personnel must have read and understood these instructions carefully before starting any work. The basic prerequisite for safe working is to comply with all safety notes and instructions in this manual.

The local regulations for health and safety at work and general safety regulations also apply for the use of the device.

Illustrations in this manual are mainly for information and may differ from the actual design. In addition to this manual, the operating manuals for the individual components (which you receive separately) also apply. The instructions in the manuals – particularly safety notes – must be observed!

Other applicable documentation

In addition to this manual, the following documents apply:

- order-specific release drawing
- order-specific data sheets for the hydraulic unit and the air handling unit
- data sheets for components from other suppliers, if any
- Circuit diagram
- additional drawings, if any

TROX Technical Support

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

- Product designation
- TROX order number
- Delivery date
- Brief description of fault or issue

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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.troxtechnik.com.

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 – explosive atmosphere.
	Warning – danger of falling.
	Warning – hot surface.
	Warning – toxic substances.
	Warning – danger zone.

Additional markers

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

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

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1 Overview hydraulic unit

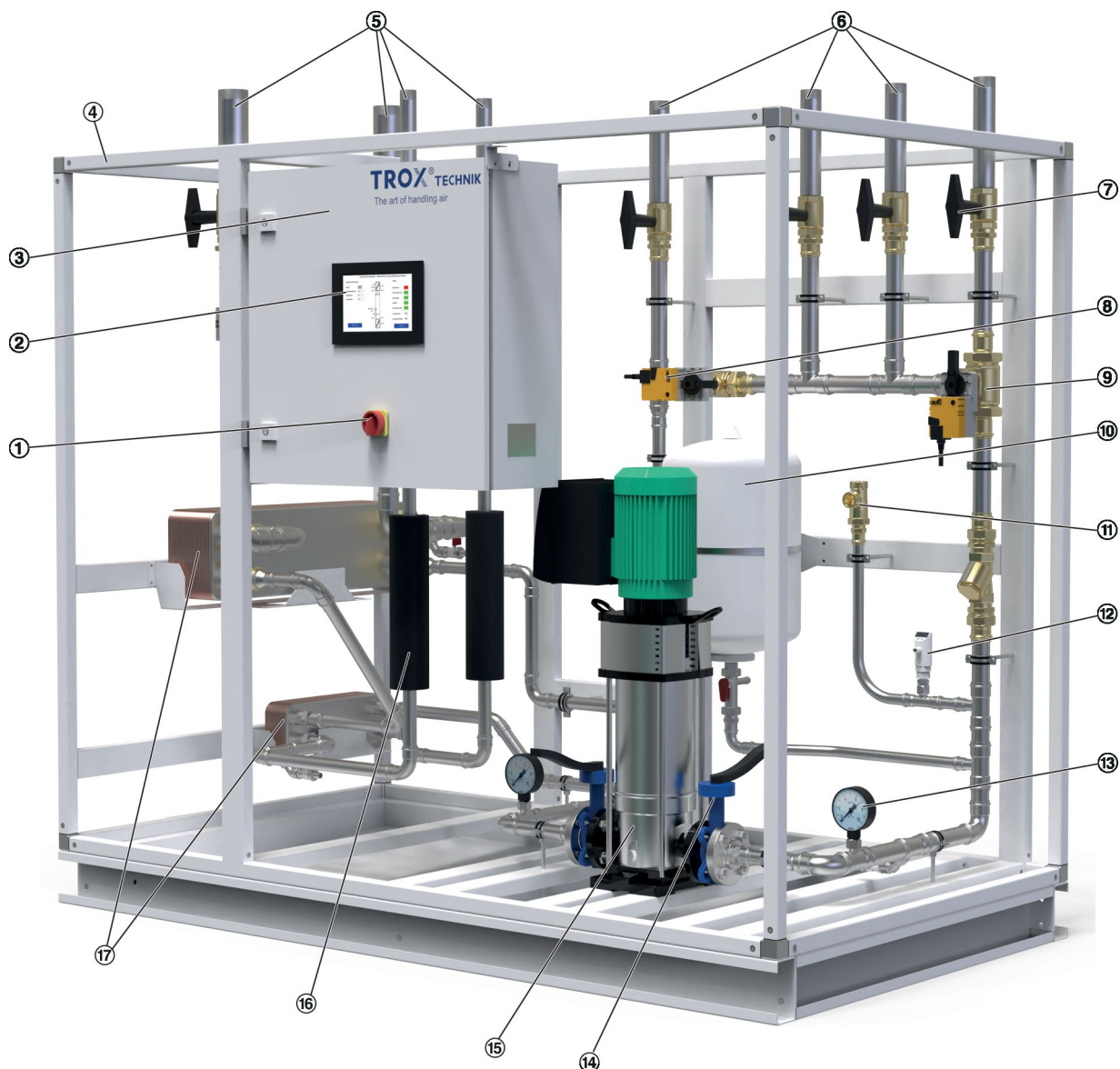


Fig. 1: Hydraulic unit (example)

- | | | | |
|---|--|---|---------------------------------------|
| ① | Mains isolator | ⑩ | Diaphragm expansion vessel |
| ② | Touch panel | ⑪ | Safety valve |
| ③ | Switch cabinet | ⑫ | Pressure sensor |
| ④ | Rack frame | ⑬ | Pressure gauge |
| ⑤ | Pipe connections external cold and heat feed | ⑭ | Shut-off damper |
| ⑥ | Pipe connections to the heat exchangers of the air handling unit (AHU) | ⑮ | Pump |
| ⑦ | Shut-off valves (manual) | ⑯ | Insulation (partially shown) |
| ⑧ | 2-way valve for frost protection | ⑰ | Heat exchanger for cold and heat feed |
| ⑨ | 3-way valve for output control | | |

Note

Depending on the configuration, the hydraulic unit may differ from the illustration shown above.

Pipe connections

The pipe connections of the hydraulic unit to the heat exchangers of the AHU are marked with stickers.

Connections to the AHU heat exchanger

Connection Hydraulic unit	Heat exchanger AHU	Designation
IN-ETA	IN	Flow – extract air
OUT-ETA	OUT	Return – extract air
IN-SUP	IN	Flow – supply air
OUT-SUP	OUT	Return – supply air

Connections for external feed

Connection Hydraulic unit	External feed
IN-CO	Flow – cooling
OUT-CO	Return – cooling
IN-HE	Flow – heating
OUT-HE	Return – heating

1.1 System description

The hydraulic unit and the heat exchangers in the unit (AHU) form the run-around coil system (RAC system). The RAC system transfers thermal energy from the extract air flow to the supply air flow, with the highest possible efficiency.

Mode of operation

- Cooling - Heat from the outdoor air (ODA) is transferred to the extract air (ETA), thereby cooling the supply air (SUP) (summer operation).
- Heating - Heat from the extract air (ETA) is transferred to the outdoor air (ODA), thereby heating the supply air (SUP) (winter operation).

The hydraulic unit contains all components as well as an integrated control system for efficient and coordinated operation of the RAC system.

Heat recovery system

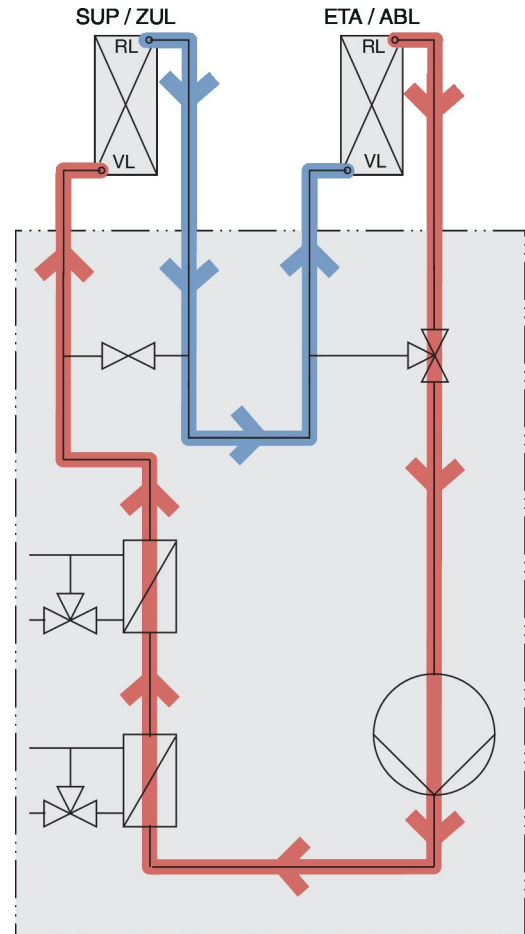


Fig. 2: Heat recovery system flow diagram

In pure heat recovery operation and 100% power requirement, the pump delivers a flow rate optimised to the air volume flow. This optimisation and the use of special RAC heat exchangers with a maximum counter flow proportion result in highly efficient heat recovery.

Performance adjustment

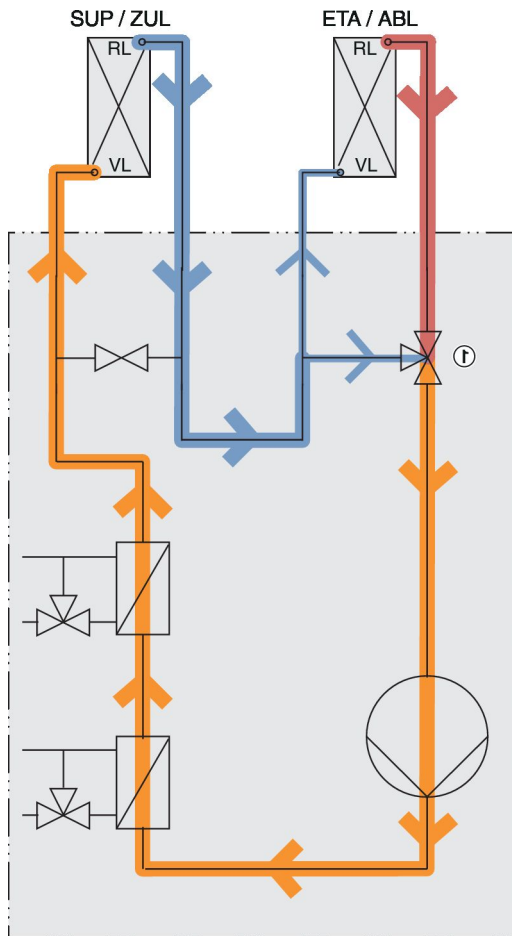


Fig. 3: Performance adjustment flow diagram

The 3-way control valve (1) in the return of the extract air heat exchanger is used to adjust the system output. In the first step, the output is regulated by the pump speed. If the output is still too high at minimum speed, the 3-way control valve opens the bypass, so that the extract air heat exchanger provides a lower thermal output.

Frost protection

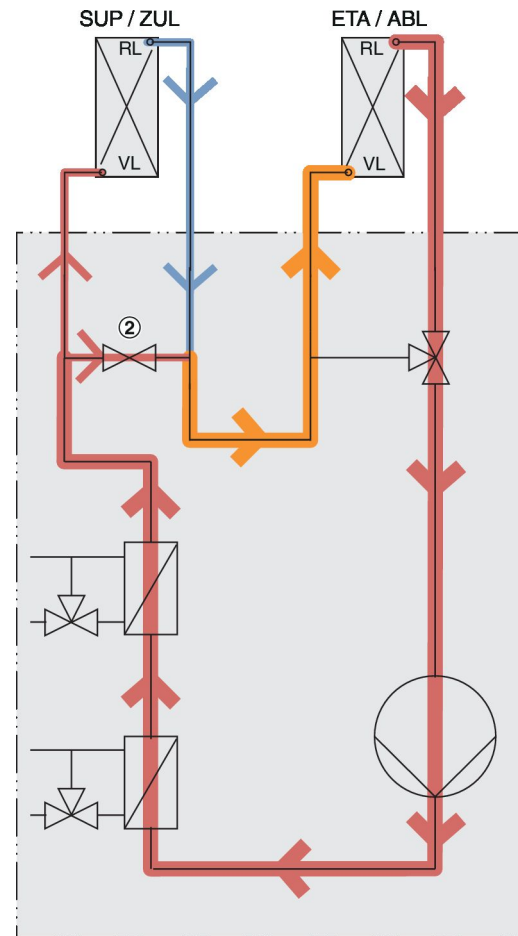


Fig. 4: Frost protection flow diagram

If required, the 2-way control valve (2) in the bypass between the flow and return of the supply air heat exchanger protects the extract air heat exchanger from freezing. If, in case of low outside temperatures, the flow temperature in the extract air heat exchanger falls below the setpoint value (adjustable), the pump speed is increased. This increases the return temperature of the supply air heat exchanger and consequently also the flow temperature of the extract air heat exchanger. If the temperature remains very low, the control valve gradually opens the bypass; this results in a mixing temperature, which prevents frost formation in the extract air heat exchanger.

Feed

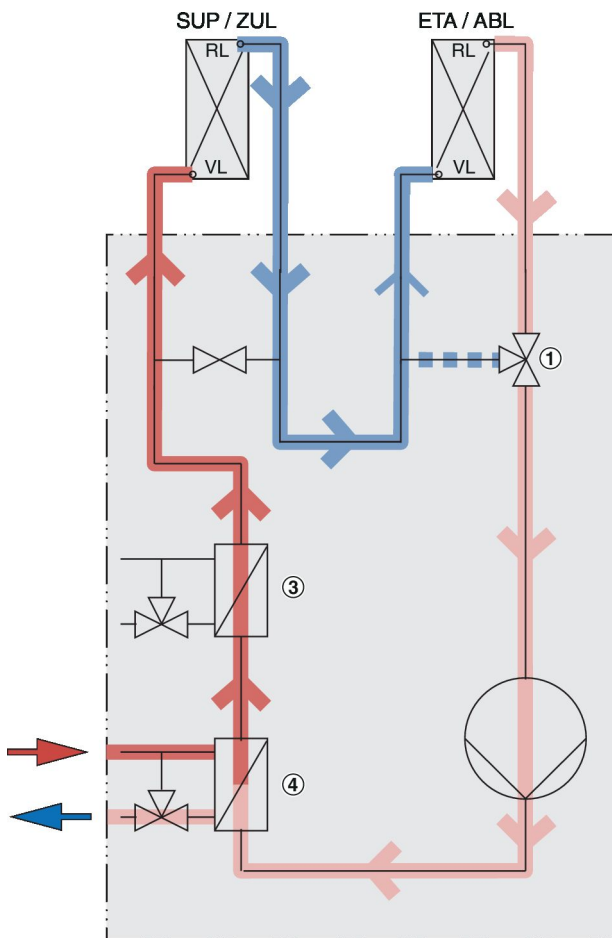


Fig. 5: Heat feed (100% feed)

The heat exchanger (4) feeds heat from an external source into the flow of the supply air heat exchanger.

In this operating mode, the temperature difference of the extract air heat exchanger is permanently monitored. If the temperature difference reaches a set limit value (adjustable), heat recovery from the extract air is no longer possible. The 3-way valve (1) then opens the bypass, and a warning is emitted.

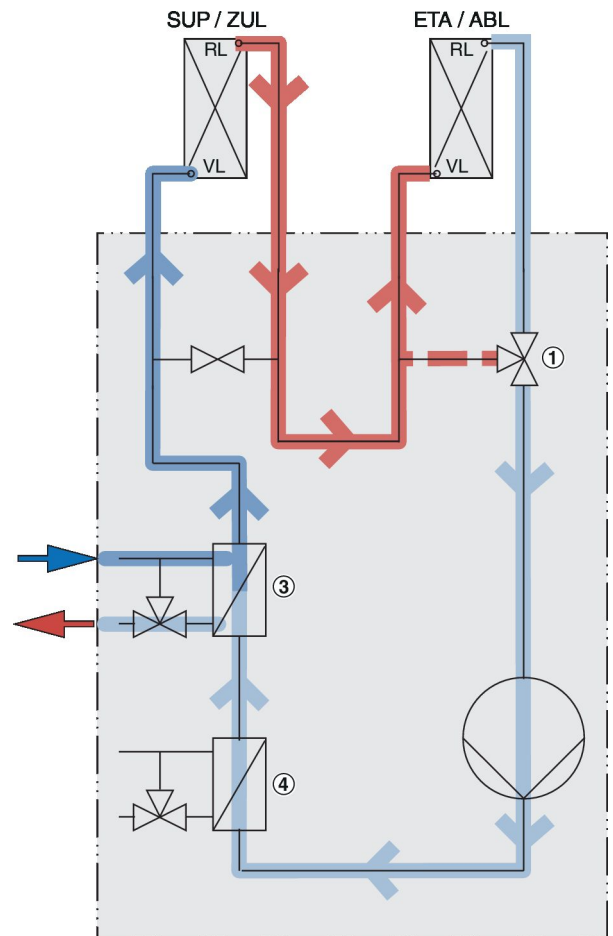


Fig. 6: Cooling feed (100% feed)

The heat exchanger (3) feeds cooling from an external source into the flow of the supply air heat exchanger.

In this operating mode, the temperature difference of the extract air heat exchanger is permanently monitored. If the temperature difference reaches a set limit value (adjustable), heat recovery from the extract air is no longer possible. The 3-way valve (1) then opens the bypass, and a warning is emitted.

2 Safety

2.1 Correct use

The TROX hydraulic unit is designed exclusively for heat recovery for air handling units. The hydraulic unit and the heat exchangers of the air handling unit form the run around coil system (RAC system). The hydraulic unit may only be used in conjunction with the AHU.

The hydraulic unit may only be operated indoors. Weatherproof versions can be installed outdoors, e.g. on the roof of a building.

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

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

Incorrect use

 **WARNING!**

Danger due to incorrect use!

Incorrect use of the hydraulic unit can lead to dangerous situations.

Never operate the hydraulic unit under the following conditions:

- In rooms with potentially explosive atmospheres (explosive gases or gas mixtures).
- Beyond the design specifications, see TROX data sheet.

2.2 Duty of care of the system owner

System owner

A system owner is the person who operates the unit for commercial or economic purposes or leaves it to a third party for use/operation and bears legal product responsibility for the protection of users, personnel or third parties during operation.

System owner's obligations

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

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

This applies in particular:

- The system owner must integrate the unit properly into the on-site lightning protection concept (provided by the client).
- The system owner must clearly regulate and define the responsibilities for transport, storage, assembly, installation, initial commissioning, final acceptance, and dismantling of the unit.
- The system owner must commission a qualified electrician to create equipotential bonding.
- The system owner has to ensure that all individuals who handle the unit have read and understood this manual.
- The system owner must provide the employees with the required personal protective equipment.
- The system owner must have all safeguards checked regularly for functionality and completeness.
- The system owner must ensure compliance with the national legal provisions.

2.3 Personnel requirements

 **WARNING!**

Danger if persons are insufficiently qualified!

Insufficiently qualified individuals are not aware of the risks involved in working with the hydraulic unit and expose themselves and others to the risk of serious or fatal injury.

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

Crane driver

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

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

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

Crane drivers have to be at least 18 years old.

Forklift driver

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

Forklift drivers are responsible for moving pallets.

HVAC technician

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

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

Instructed person

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

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

- Visually inspect the system
- clean the strainer
- clean the heat exchanger

Qualified electrician

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

Skilled qualified electrician

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

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

Hearing protection protects against hearing damage resulting from noise exposure.

Industrial safety helmet

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

Protective clothing

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

Protective gloves

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

Safety goggles

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

Safety harness

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

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

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

Safety shoes



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

2.5 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.

Mains isolator of hydraulic unit

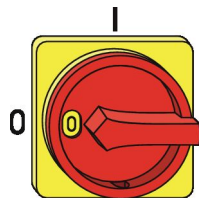


Fig. 7: Mains isolator

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

You can lock the isolator in the '0' position (with a pad-lock) to secure it against accidental restarting so that you can safely work on the hydraulic unit.

Equipotential bonding

During installation, a qualified electrician has to connect the hydraulic unit to the local earth bar. Equipotential bonding prevents ignition hazards due to electrostatic charging.

Inside door handle

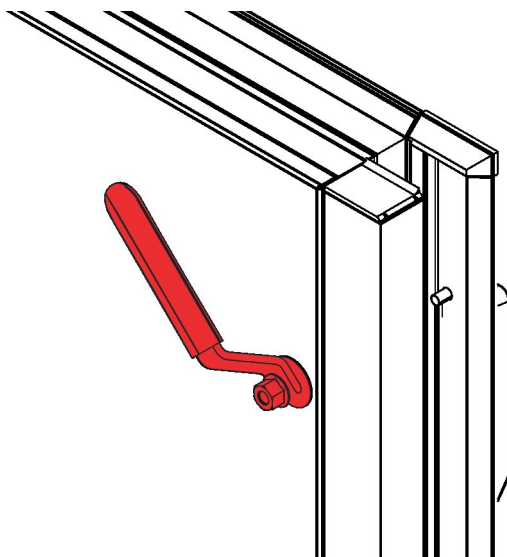


Fig. 8: Inside door handle on an inspection access door

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.

Hold open device

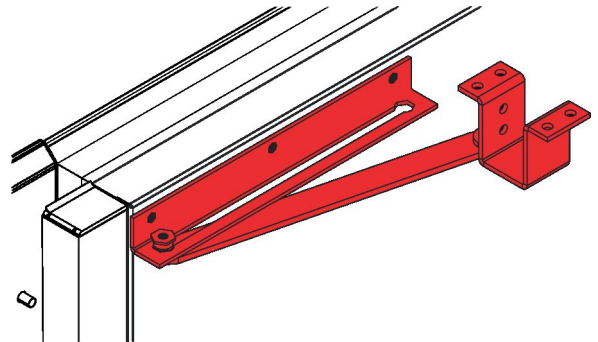


Fig. 9: Hold open device for outdoor air handling units

On devices designed for outdoor installations, each inspection access door is equipped with a hold open device (Fig. 9). 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.

2.6 Securing the unit against being switched on accidentally

Secure the hydraulic unit against accidental switch-on

CAUTION!

Danger due to unauthorised or uncontrolled restarting!

Unauthorised or uncontrolled restarting of the unit may cause serious injuries.

Switch off the hydraulic unit before you start working on the hydraulic unit or on any connected system, and secure it against accidental switch-on.

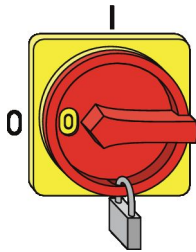


Fig. 10: Securing the main switch

1. ▶

WARNING!

Danger due to electric current!

The power cable which connects the hydraulic unit to the mains remains energised after switching off.

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

2. ▶ Secure the main switch with a padlock (Fig. 10).
3. ▶ Keep the key in a safe place.
4. ▶ Cover the main switch with a notice indicating that work is in progress.

2.7 Dangers when handling the AHU

The hydraulic 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. The following describes the residual risks that have been identified in a risk assessment.

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

2.7.1 General workplace hazards

Working at great heights

WARNING!

Danger of falling when working at great heights!

Working at great heights can cause people to fall and also tools and materials to fall. This can cause serious or even fatal injuries.

- Wear a safety harness.
- Only enter roof centres if ladders, handrails and safety harnesses are available and in perfect condition.
- Start working only if the components you have to work on are easily accessible.
- Secure all tool and materials against falling.
- Always wear protective 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.

2.7.2 Electric shock hazards

Electric current

 **DANGER!**

Danger to life due to electric current!

Contact with live parts poses an immediate danger to life due to electric shock. Damage to the insulation or individual components can be life-threatening.

- Work on the electrical system may only be carried out by qualified electricians.
- Work on the electrical system may only be carried out by 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:
 - Switch off the hydraulic unit mains isolator.
 - Secure it against being switched on accidentally.
 - Ensure that no voltage is present.
 - Connect to earth; and short circuit.
 - Cover or isolate neighbouring live parts.
- Never bypass or disable any fuses. Be sure to maintain the correct current rating when replacing a fuse.
- 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.

2.7.3 Danger from hydraulics

Liquid jet due to defective hydraulics

 **WARNING!**

Risk of injury due to liquid jet leaking under high pressure!

If pipes or components are defective, heat transfer media (coolant) can escape under high pressure.

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

2.7.4 Hazards from high 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.

2.7.5 Hazards due to hazardous substances and operating materials

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.

Inspection access doors slamming shut

WARNING!

Risk of crushing from doors slamming shut

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

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

2.7.6 Moving machinery hazards

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.

3 Transport, packaging and storage

3.1 Delivery condition

Depending on the size, the hydraulic unit is shipped either fully assembled or as components, either on square timber frames or on disposable pallets.

3.2 Transport inspection

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

Otherwise the manufacturer will not accept any liability.



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

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

The packaging has been damaged

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

No external damage to packaging, contents damaged.

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

3.3 Transport

3.3.1 Safety notes regarding transport

Improper transport



WARNING!

Danger to life during improper transport!

If packages/pallets are lifted without properly secured transport and safety equipment, they may fall off and lead to fatal injuries.

- Only transport the packages in the position of use (do not tilt)
- Never stand under suspended loads.
- Do not move additional loads on top of a package.
- Use only the provided 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.
- Never tie ropes and chains into knots, and do not 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 and safety equipment has been correctly assembled, fastened and secured before lifting the device.
- Secure all doors, dampers and panels.
- Transport the packages carefully without abrupt movements and lower them when leaving the workplace.
- Transport loops are designed for one-time use only and not for permanently suspending loads.
- Transportation tubes are designed for one-time use only and not for permanently suspending loads.

Warning: AHU casing units may tip over



WARNING!

Risk of injury from AHU casing units tipping over!

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

Be sure to take adequate precautions:

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

Unbalanced loads and centre of gravity

WARNING!

Risk of injury from falling or toppling loads!

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

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

Labelling the centre of gravity on the packaging

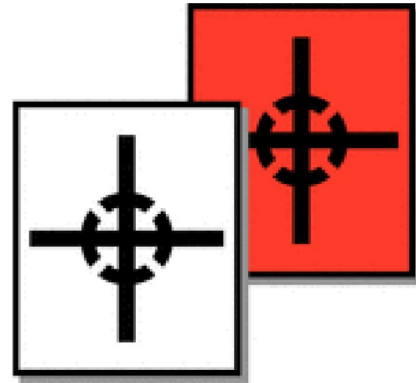


Fig. 11: Shipping labels

The centre of gravity is indicated on the shipping labels (Fig. 11).

Sharp edges, sharp corners and thin sheet metal parts

CAUTION!

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

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

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

Damage to goods being moved

NOTICE!

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

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

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

3.3.2 Forklift or pallet truck transport

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

Personnel:

- Forklift driver

Protective equipment:

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

! NOTICE!

Risk of damage to property from forklifts or pallet trucks!

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

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

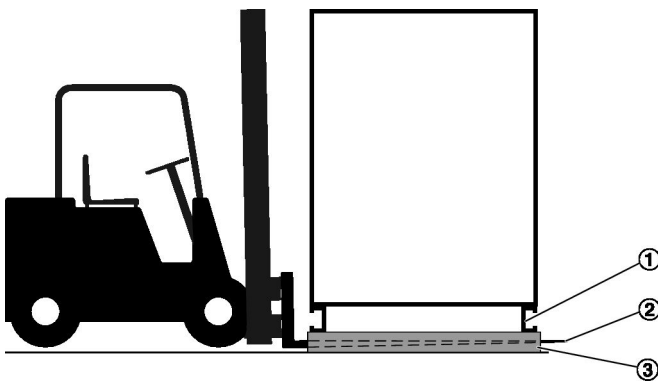


Fig. 12: Moving units with a forklift

1. ▶ Drive the forklift forward until the forks (Fig. 12 /3) are fully between the square edge timber sections (Fig. 12 /2) and protrude from underneath the base frame (Fig. 12 /1) on the opposite side.
2. ▶ Ensure that the load cannot tip.
3. ▶ Slowly lift the load and start moving.

3.3.3 Transport by crane

Using lifting eyes or eye nuts

Personnel:

- Crane driver

Protective equipment:

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

! WARNING!

Danger of death from the fall of units!

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

- Use lifting eyes or eye nuts only to move units up to a maximum weight of 1000 kg. Heavier units must be moved with transport tubes.
- Use all the lashing points provided.
- Use only adequate lifting gear and slings.
- Stand clear of suspended loads.

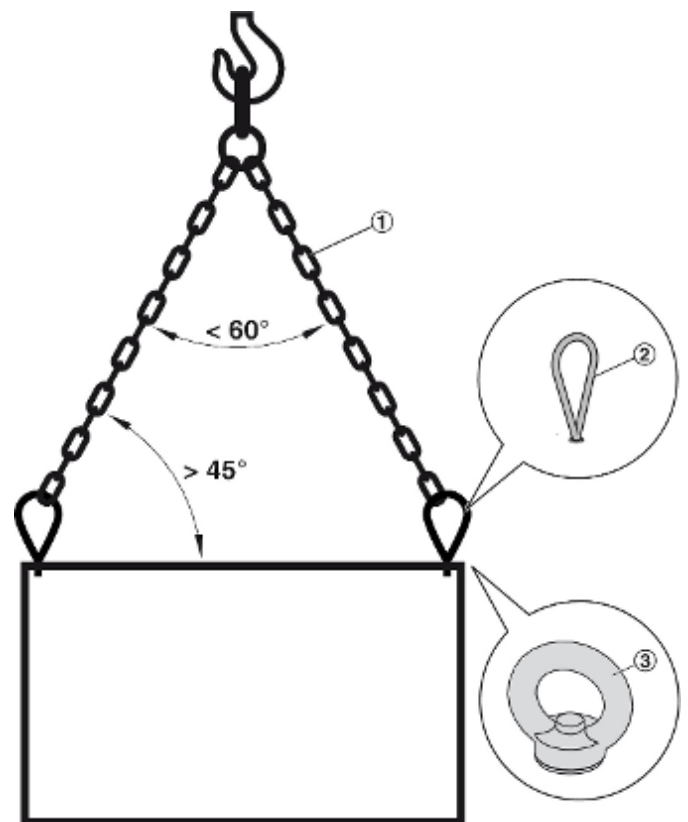


Fig. 13: Using lifting eyes for moving units with a crane

- ① Slings or chain
- ② Lifting eye (for units < 1000 kg)
- ③ Eye nut for units with a roof (units < 1000 kg)



Lifting eyes or eye nuts are part of the supply package.

If you have used the supplied lifting eyes for moving other units, you can reuse them.

Eye nuts are factory fitted to units for outdoor installation; they have to remain in place even after installation.

1. ▶ **Using lifting eyes:** Remove the covers from the threaded holes in the top corners of the units.
Insert all lifting eyes (Fig. 13 /2) into the threaded holes.

⚠ Important! Fully insert the thread!

2. ▶ Hook the slings (Fig. 13 /1) into the lifting eyes or eye nuts.

Note:

- Maintain an angle greater than 45° between the sling and the top of the unit.
- Do not spread slings by more than 60°.
- Ensure that the slings cannot damage the unit.
- Suspend (distribute) the load symmetrically, i.e. in such a way that its centre of gravity is beneath the crane hook.



We recommend using a chain hoist and spreader beam in the following cases:

- *If the correct angles for the slings cannot be maintained.*
- *If there are more than four lashing points on a package.*

3. ▶ Slowly lift the load and start moving.

3.4 Packaging

Packaging

The packaging depends on how the packages are being shipped. Only environmentally-friendly materials have been used for the packaging.

The packaging is intended to protect the components from damage, including transport damage, and corrosion. Do not destroy the packaging and do not remove it until you are ready to install the components.



ENVIRONMENT!

Note on disposing of single-use packaging

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

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

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

3.5 Storage and functional integrity

3.5.1 Storage

! NOTICE!

Risk of damage to property due to corrosion!

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

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

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

Please note the following storage conditions:

- Do not store outdoors.
- Store in a dry and dust-free place that is not exposed to sunlight.
- Storage temperature: -10 °C to +50 °C; avoid sudden/major fluctuations in temperature.
- Provide unpackaged units with protective packaging and ensure sufficient ventilation in order to prevent condensation.
- Seal openings in the units to ensure that no dust or vermin can get inside.
- Do not expose the units to aggressive operating fluids.
- The storage location must be level and have sufficient load-bearing capacity.
- If storing the units for more than 3 months, refer to the information on functional integrity.
↳ on page 21

Note!

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

3.5.2 Functional integrity of components

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

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

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

4 Installation

4.1 Safety notes

Sharp edges, sharp corners and thin sheet metal parts

CAUTION!

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

Sharp edges, sharp corners and thin-walled sheet metal parts of the heat exchanger and the hydraulic unit can cause abrasions and cuts to the skin.

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

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.

Incorrect installation

WARNING!

Risk to life from incorrect installation!

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

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

Hot surfaces

WARNING!

Risk of injury from hot surfaces!

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

- Professionally insulate all pipes.

Interconnecting units and systems

WARNING!

Risk of injury from interconnecting different units or systems!

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

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

4.2 Requirements for the installation location

Installation location (indoors)

The hydraulic unit may only be installed in a room that meets the following conditions:

- Do not use the hydraulic unit in areas with potentially explosive atmospheres.
- The room has been designed in compliance with the applicable building regulations and is suitable for the technical systems to be installed. National standards for engineering rooms may also apply.

- The installation room has to be
 - clean,
 - dry,
 - free from conductive dusts,
 - free from strong electromagnetic fields,
 - free from aggressive media,
 - free from frost.
- There must be sufficient clearance for installation, operation, maintenance and repair.
- The room must ensure a stable and level substructure in accordance with the on-site requirements.
- All operating fluid lines and the connected components must be frost-proof.
- Do not use the hydraulic unit as a structural element or as a roof for a building.

Escaping liquids

! NOTICE!

Risk of damage to property from escaping liquids!

If the RAC system leaks, glycol-containing liquid can escape and cause considerable damage to the building and the environment.

- Ensure that any leaking liquid is properly collected and disposed of.

Installation location (outdoors)

For outdoor installation of the hydraulic unit, please observe the following points:

- Do not use the hydraulic unit in areas with potentially explosive atmospheres.
- The installation location has to be
 - free from conductive dusts,
 - free from strong electromagnetic fields,
 - free from aggressive media.
- The installation site must ensure a stable and level substructure that meets the on-site requirements (see order-specific data sheet from TROX).
- There must be sufficient clearance for installation, operation, maintenance and repair. The maintenance walkway must be at least as deep as the device.
- The installation location must meet local regulations to prevent the falling of people, tools and materials.
- Suitable fall protection devices must be available.
- Prevent unauthorised individuals from accessing the hydraulic unit.
- Make sure that authorised individuals can access all unit parts safely.
- Observe the maximum permissible roof loads, the statics of the building, and external influences such as rain, snow, wind, direct sunlight, etc.
- The wiring of the hydraulic unit must be carried out professionally and in consideration of external influences such as rain, snow, wind, direct sunlight, etc.

4.3 Setting up the hydraulic unit

Setting up the hydraulic unit and connecting components

Personnel:

- HVAC technician

Protective equipment:

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



WARNING!

Risk of explosion!

The hydraulic unit is not explosion-proof. Using it in areas with potentially explosive atmospheres may lead to an explosion.

Do not install the hydraulic unit in areas with potentially explosive atmospheres.

Hydraulic unit (as one piece)

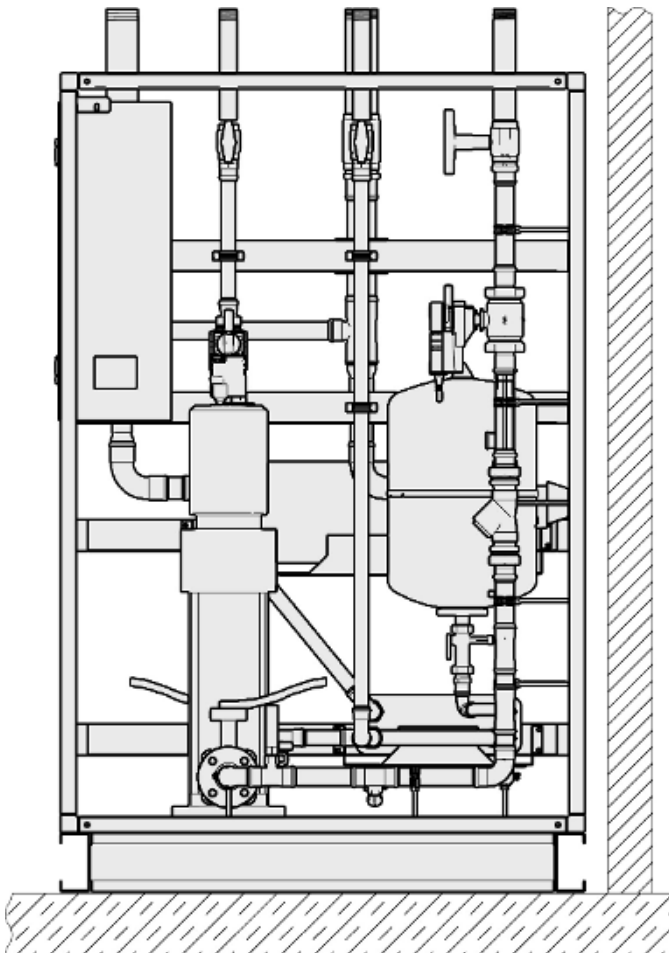


Fig. 14: Setting up the hydraulic unit

- ▶ Set up the hydraulic unit parallel to the wall and floor.

Position alignment:

with levelling - Adjust the levelling feet of the hydraulic unit accordingly.

without levelling feet - Use suitable material (provided by the client), e.g. rubber or elastomer sheets, to level out an uneven floor.

Hydraulic unit with several components



The arrangement of the components is given in the order-specific approval drawing.

The positioning of the components (Fig. 15 /1) on a surface with a high coefficient of friction (e.g. rubber or elastomer plates (Fig. 15 /4) is considerably simplified by sliding plates (Fig. 15 /3).

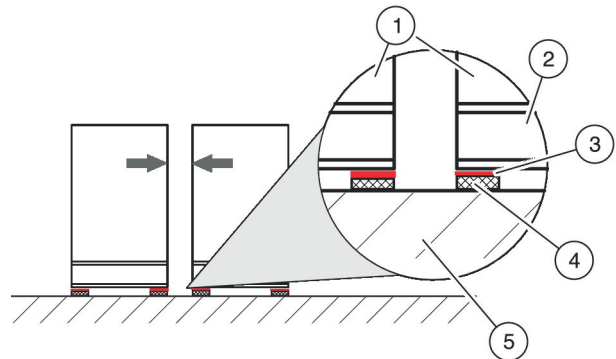


Fig. 15: Unit setup with anti-vibration elements

- ▶ Position the sliding plates (Fig. 15 /3, provided by the client) under the base frames (Fig. 15 /2) of the individual components (Fig. 15 /1).
- ▶ Bring the components as close together as possible.

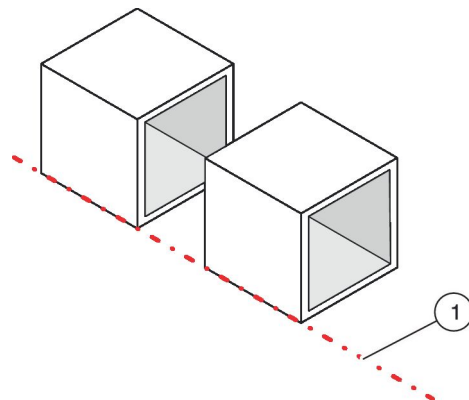


Fig. 16: Aligning components

- ▶ Align the components in a line (Fig. 16 /1).

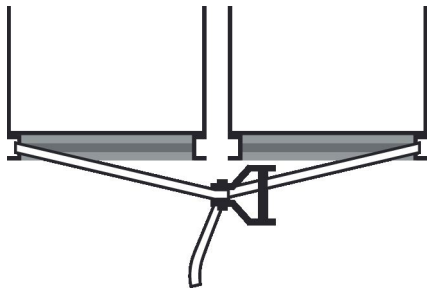


Fig. 17: Attaching a ratchet strap

4. ▶ Attach a ratchet strap to the base frames of two components (Fig. 17).
5. ▶ Tighten the ratchet strap.
 - ⇒ The components are pulled together over the unit base frame.

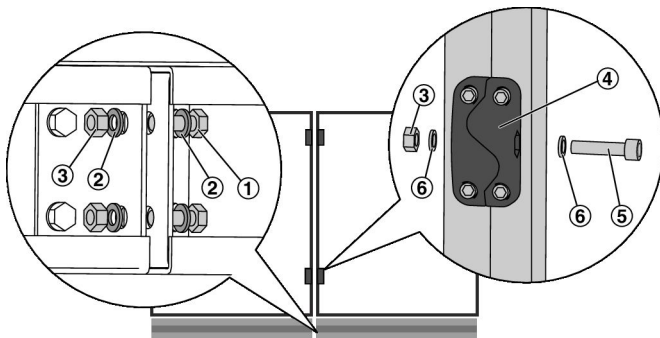


Fig. 18: Screwing the base frames together

- ① Hexagon head screws
 - ② Washers
 - ③ Nuts
 - ④ Module connectors
 - ⑤ Allen screws
 - ⑥ Schnorr® load washers
6. ▶ The components must be screwed evenly to the end faces of the base frames and to the module connectors.

Flange connection if several components

After the casing components are connected, the internal pipework of the hydraulic unit must be joined together using flange connections.

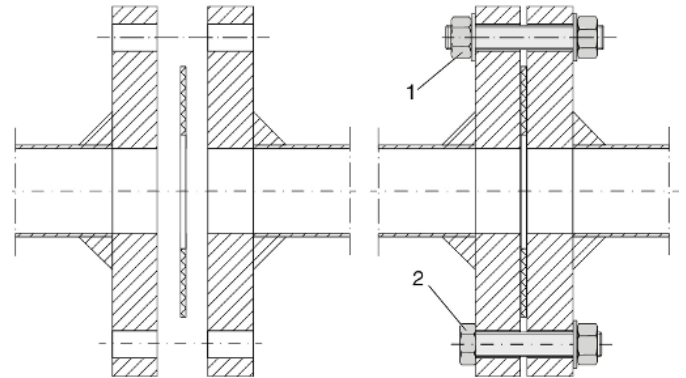


Fig. 19: Flange connection

- 1 Connection with threaded rod, 2 nuts with 2 washers
- 2 Connection with screw, nut and washer

! NOTICE!

Information on establishing a proper flange connection

Sheet metal-reinforced graphite gaskets must be used as sealing elements between the flange connections. (Scope of supply)

- Flanges and seal must be clean and undamaged.
- Use seals individually and only once.
- Do not use sealant.
- Lubricate screws and nut support.

Tightening procedure

The flange bolts must be tightened to the appropriate torque according to EN 1092-1 in order to guarantee the pressure level and tightness class.

Screw thread	Tightening torque [Nm]	Tightening procedure
M12	50	With a hand-operated wrench, with suitable extension if necessary
M16	125	

Connecting the run around coil system

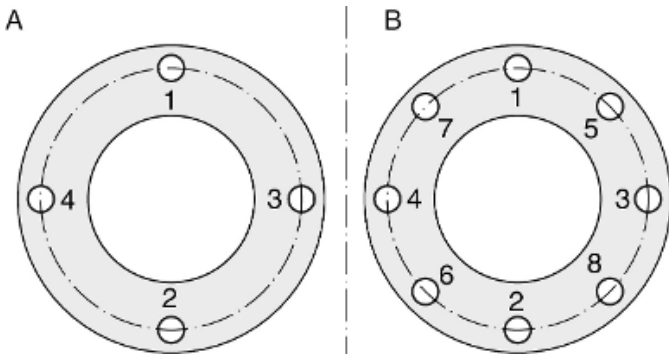


Fig. 20: Flange variants

- A Flange with 4 holes
- B Flange with 8 holes

1. ▶ Tighten the screws crosswise, according to Fig. 20, with 30% of the specified tightening torque.
2. ▶ Tighten the screws analogue to 1), with 60% of the specified tightening torque.
3. ▶ Tighten the screws analogue to 1), with 100% of the specified tightening torque.
4. ▶ Tighten all screws again with the full specified tightening torque. Repeat this procedure until the nuts can no longer be turned when the full tightening torque is applied.

4.4 Connecting the run around coil system

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

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



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

Personnel:

- HVAC technician

Protective equipment:

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

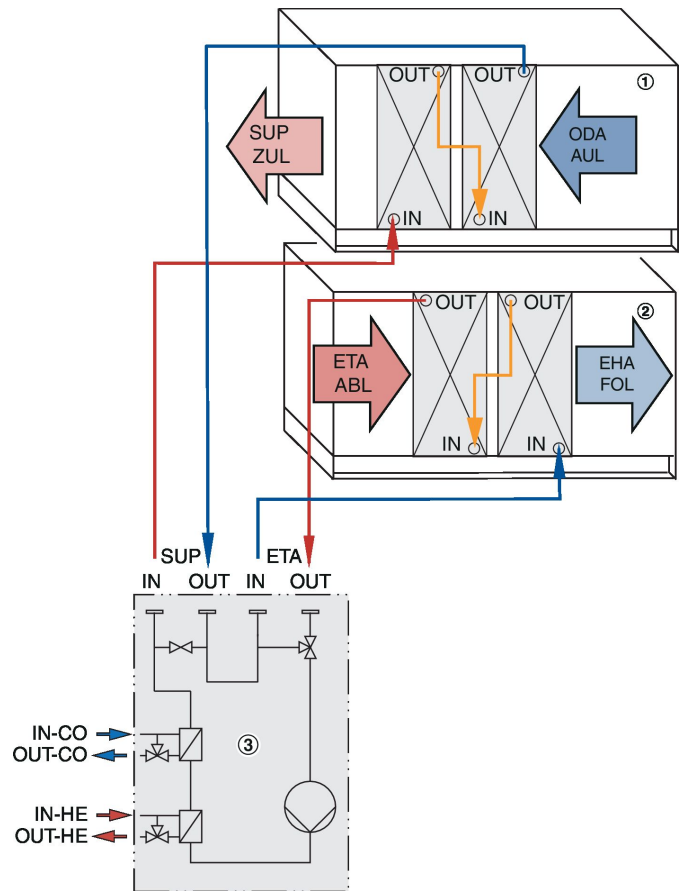


Fig. 21: Hydraulic system connection (example)

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

1. ▶ Connect the heat exchanger with the hydraulic unit (Fig. 21).

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

The precise positions of the connection points are given in the order-specific approval drawing.

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

Heat exchanger connection

Connection on hydraulic unit	Heat exchanger AHU	Description
IN-ETA	IN	Flow – extract air
OUT-ETA	OUT	Return – extract air

Connection on hydraulic unit	Heat exchanger AHU	Description
IN-SUP	IN	Flow – supply air
OUT-SUP	OUT	Return – supply air

2. ▶ Run-around coil systems with external feeding:
Make the required connections (Fig. 21).

Connections for external feeding

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

Ventilation device

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

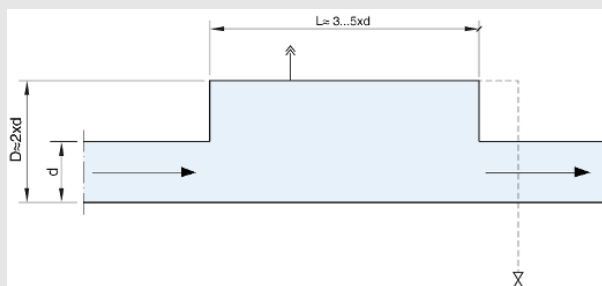


Fig. 22: Air separator with cross section enlargement

4.5 Filling and venting the hydraulic unit

Personnel:

- HVAC technician

Protective equipment:

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



CAUTION!

Risk of poisoning from glycol-water mixture

There is a risk of poisoning when filling or venting with a glycol-water mixture! (Observe the manufacturer's safety data sheet!)



CAUTION!

Risk of injury from hot media fluids and hot surfaces

Do not fill or vent with hot media, risk of scalding. Do not touch any hot surfaces. (Risk of burns)

Notes on the filling media

Fill the system with the glycol-water mixture of the concentration given in the technical data sheets. The information in the data sheets is based on the specialist consultants' design guidelines and have to be checked as part of commissioning. The specialist consultant calculates the concentration based on the expected minimum outdoor air temperature.

! NOTICE!

Risk of damage to property due to incorrect glycol concentration

The components within the hydraulic unit are designed for a maximum glycol concentration of 50%. If the glycol content is too high, this will result in reduced performance and the destruction of sealing materials.

Too little glycol can lead to frost damage and corrosion. Therefore, always observe the minimum concentration specified by the glycol manufacturer.

The RAC system is filled with a glycol-water mixture, water quality according to VDI 2035.

Suitable types of glycol:

- Monoethylene glycol (MEG)
- Propylene glycol

! NOTICE!

Risk of damage due to insufficiently mixed heat transfer fluid

Fill the RAC system with a ready-to-use mixture. Filling the system with water first, then adding glycol will not result in quick and sufficient mixing. Particularly with outdoor units, there will still be a risk of freezing. Never top up the RAC system with pure water, as there is no proper mixing which can lead to frost damage.

! NOTICE!

Risk of damage to property due to incorrect heat transfer fluid

Using water only as a heat transfer fluid is only permissible the fluid temperature in the system will not, in any circumstances, fall below 0 °C. Note that there is no function in the RAC system to prevent this state.

! NOTICE!

Risk of damage to materials due to long downtimes

Long downtimes of the filled system can lead to damage to seals due to clogging.

The system should be checked for leaks - no more than 4 weeks before commissioning - and then filled with the operating medium.

Leakage test of the system

Before you fill in the heat transfer fluid, check the system for leakage, either with air or with a glycol-water mixture.

Important: Do not use water for the leakage test, unless you fill the system with a water glycol mixture immediately after the test. Otherwise, residual water in the system may lead to corrosion or freeze up at low temperatures and damage the system.

Rinsing the system

Before you fill the system, rinse it to remove any oil and contamination (from assembly work) from the pipe system.

Filling and venting the system

After the successful leakage test and rinsing of the system, you can fill it.

Note: Before filling the system, set the pre-charge pressure on the diaphragm expansion vessel (see the technical data sheet for values). If changes are made to the pipe system, the values for pre-charge pressure have to be recalculated, .

Filling quantity: The required filling quantity or volume is given in the technical documentation for the system. It is also advisable to plan and keep a suitable reserve quantity.



Keep rinsing the system until no more air bubbles can be seen at the open outlet. Rinsing can be optimised with suitably placed hose connections.

Due to the complexity of the heat exchangers, air deposits are difficult to remove using conventional methods. The use of a glycol-water mixture makes proper venting difficult because the swirling fluid tends to become foamy so that air gets trapped in the foam.

We recommend dividing the pipe network into three sections:

- Supply air heat exchanger
- Extract air heat exchanger
- external pipework

For dividing the pipe network into sections, install shut-off valves (1-4) and filling cocks (a-d) on the heat exchangers so that each pipe section can be rinsed separately so that entrapped air can be effectively removed.

Note: Switch off the pump of the RAC system before you start rinsing the system!

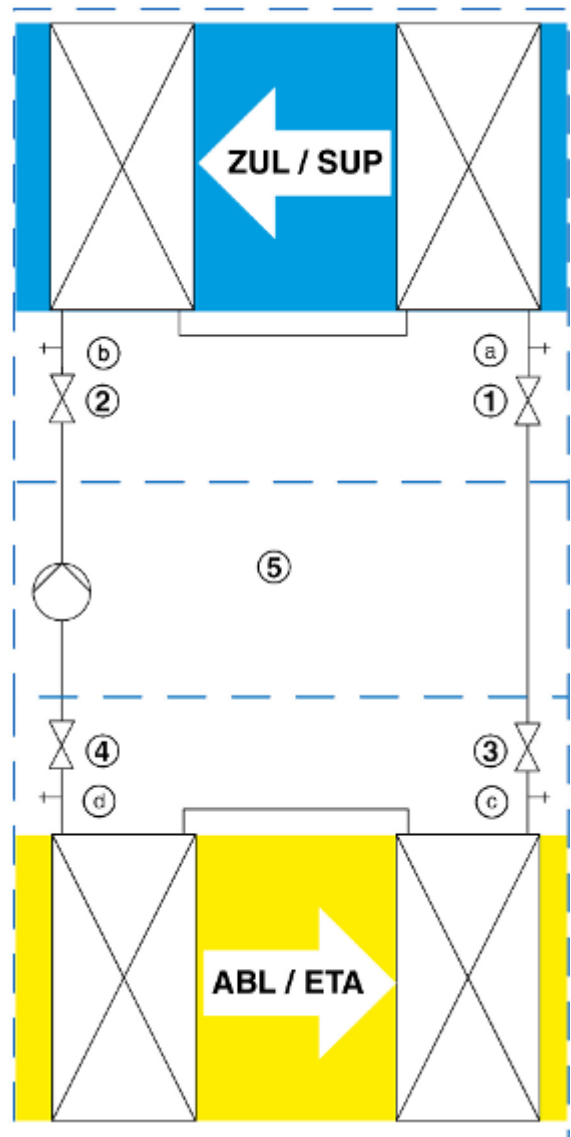


Fig. 23: Venting the RAC system

Rinsing the supply air heat exchanger section

Fitting	Status / connection
Shut-off (1)	Closed
Shut-off (2)	Closed
Cock (a)	Flush hose inlet
Cock (b)	Flush hose outlet

Rinsing the extract air heat exchanger section

Fitting	Status / connection
Shut-off (3)	Closed
Shut-off (4)	Closed
Cock (c)	Flush hose inlet
Cock (d)	Flush hose outlet

Connecting the unit to the power supply

Rinsing the external pipe section (5)

Fitting	Status / connection
Shut-off (2)	Closed
Shut-off (4)	Closed
Cock (a)	Flush hose inlet
Cock (c)	Flush hose outlet

Rinsing the external pipe section (5)

Fitting	Status / connection
Shut-off (1)	Closed
Shut-off (3)	Closed
Cock (b)	Flush hose inlet
Cock (d)	Flush hose outlet

The required rinsing time depends on the size of the different sections.

Recommendation: If no more air can be detected at the flush hose outlet, continue rinsing for another 5 to 10 minutes.

Optional venting device

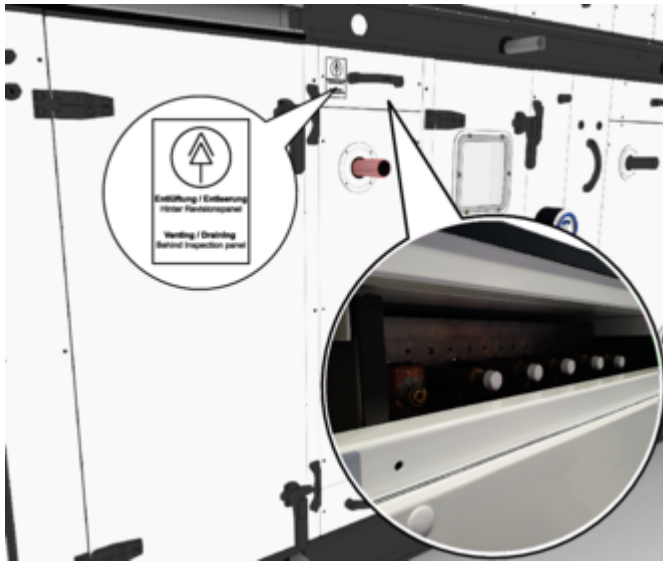



Fig. 24: Example of venting devices behind a small inspection access panel on the X-CUBE

If the RAC heat exchangers are fitted with optional venting devices, the inspection access panel is marked accordingly. The vents can be accessed after opening the inspection panel on the connection side.

Optimum venting

To vent the system as effectively as possible, we recommend that you install suitable vents (provided by the client) at the highest points of the system, see  'Ventilation device' on page 27.

Setting the operating pressure

After venting the system, set the operating pressure. The operating pressure is determined as part of the design of the diaphragm expansion vessel design and can be found in the technical data sheets for the RAC system.

Pressure fluctuations

The system pressure should remain virtually constant, no matter whether the pump is running (nominal speed approx. 80 - 90%, see pump display) or idle. Large pressure fluctuations indicate air pockets in the system that will reduce performance. Therefore, if pressure fluctuations occur, vent the system (again).

4.6 Connecting the unit to the power supply

Electrical connection of hydraulic unit

DANGER!

Danger to life due to electric current!

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

- Only a skilled qualified electrician must connect the power supply.
- Lay power supply lines in such a way that mechanical or thermal damage is excluded.
- Earth the hydraulic unit according to the state of the art.
- When connecting the electrical components, observe the manufacturer's instructions, the local electrical regulations (DIN/VDE) and the general recommendations for avoiding electromagnetic interference.

1. ▶

Circuit diagram

The wiring diagrams and terminal connection plans can be found in the wiring diagram included in the scope of delivery. The wiring diagram can be found in the switch cabinet of the hydraulic unit.

Connect the hydraulic unit according to the circuit diagram to the power supply.

2. ▶ Connect the hydraulic station to the on-site equipotential bonding system.
3. ▶ Test protective conductors and insulation resistance according to EN 60204 (VDE 0113). Take the appropriate safety precautions!

4.7 Wiring bus sensors

For RAC systems with air-side sensors, the sensors have to be connected on site to the hydraulic unit control system.

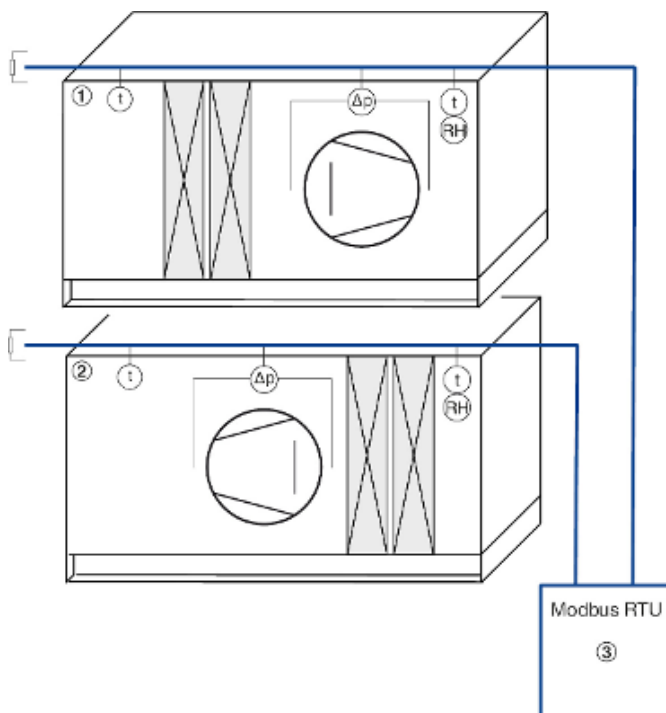


Fig. 25: Connecting bus sensors

- 1 X-CUBE (supply air)
- 2 X-CUBE (extract air)
- 3 Switch cabinet of the hydraulic unit

When connecting the sensors, please note:

- Sensors have to be connected by others, and before commissioning
- Wiring: Daisy chain, Modbus EIA-485 standard, data transmission with Modbus RTU
- Connection according to the wiring diagram (see switch cabinet of the hydraulic unit).
- For sensor data sheets, see Appendix.
- To avoid line reflections, network segments must be terminated at both ends with 120 Ω bus terminal resistors.
- Recommended data cable:
 - Cable used must be twisted in pairs and shielded, and comply with Modbus specifications., e.g. HELUKABEL PAAR-TRONIC-CY-2x2x1 mm²
 - Do not exceed the maximum cable length (EIA-485 standard).
- Commissioning is carried out by TROX Service.

4.8 Installing components for dehumidification cooling recovery

For RAC systems with dehumidification cooling recovery, the components (sensors, valve actuators) have to be connected by others to the control system of the hydraulic unit.

The components to be connected are shown in the schematic illustration of the system (see order documents).

When connecting the components, observe the following:

- Components have to be connected on site, by others (before commissioning)
- Analogue wiring according to the manufacturers' documentation
- Connection according to the wiring diagram (see switch cabinet of the hydraulic unit).
- Commissioning is carried out by TROX Service.

4.9 Installing the adiabatic humidifier

For RAC systems with control of the adiabatic humidifier, the components (sensors, valve actuators) have to be connected by others to the control system of the hydraulic unit.

The components to be connected are shown in the schematic illustration of the system (see order documents).

When connecting the components, observe the following:

- Components have to be connected on site, by others (before commissioning)
- Analogue wiring according to the manufacturers' documentation (see Appendix)
- Connection according to the wiring diagram (see switch cabinet of the hydraulic unit).
- Commissioning is carried out by TROX Service.

5 Initial commissioning

5.1 Safety notes regarding initial commissioning

Incorrect initial commissioning

WARNING!

Risk to life from incorrect initial commissioning!
Incorrect initial commissioning can lead to potentially fatal situations and cause considerable damage to property.

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

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.

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.

5.2 Before initial commissioning

Before initial commissioning:

- Remove protective film, if any
- Install pipework between the hydraulic station and the air handling unit. ↪ *on page 26*.
- Fill the system and vent it. ↪ *Chapter 4.5 'Filling and venting the hydraulic unit' on page 28*.
- Vent the pump of the hydraulic unit.
- Establish equipotential bonding and earth connection.
- Connect the supply voltage ↪ *4.6 'Connecting the unit to the power supply' on page 30*.
- Check pre-charge pressure p₀ on the diaphragm expansion vessel, and adjust if necessary. ↪ *5.3 'Checking the diaphragm expansion vessel' on page 33*
- Check the system filling pressure, and adjust if necessary. ↪ *5.3 'Checking the diaphragm expansion vessel' on page 33*
- Check and document system tightness.
- Fill the RAC system with the specified operating medium and the corresponding concentration.

NOTICE!

Damage to the pump in case of dry operation!

Dry operation will damage the mechanical seal of the pump or considerably reduce its service life. A defective mechanical seal results in the leakage of fluid.

It is mandatory to vent the pump before initial commissioning.

For details on venting the pump, see the pump manufacturer's documentation (attached).

5.3 Checking the diaphragm expansion vessel



Note on volume sizing:

The volume of the diaphragm expansion vessel was designed based on the specified project planning data. This calculation must be checked for correctness.

If the basis of the calculation has changed, e.g. the installation location or the length of a pipe, a new calculation is required.

For data, see the project-specific technical data sheets of the hydraulic unit.

The calculation shown is based on DIN EN 12828 and DIN 4807 T2 for glycol-filled cooling systems.

Type diaphragm expansion vessel	Available Vn [l]
S100	88.00
S140	126.00
S200	180.00

Helpful calculation tables:

Expansion coefficient n when glycols are added as antifreeze agents

Concentration	ϵ_{max} [°C]						
	20	30	40	50	60	70	80
0%	0.13	0.37	0.72	1.15	1.66	2.24	2.88
25%	0.82	1.22	1.70	2.26	2.90	3.62	4.42
34%	1.17	1.62	2.13	2.70	3.33	4.02	4.77
40%	1.35	1.80	2.31	2.88	3.51	4.20	4.95
50%	2.12	2.67	3.28	3.95	4.68	5.47	6.32

The values correspond to the values of ethylene glycol. A concentration between 25 and 50% is recommended. Concentrations below 25% can lead to corrosion damage, concentrations above 50% can affect seals.

Specific water content of pipework

DN	25	32	40	50	65	80	100
l/m	0.51	0.80	1.20	2.04	4.08	5.66	8.50

Data based on a press-fit piping system

Volume diaphragm expansion vessel

Type diaphragm expansion vessel	Available Vn [l]
S25	19.00
S33	23.00
S50	45.00
S80	68.00

Checking the diaphragm expansion vessel

Calculation steps:

1. Determine system data:

Values	Description	Input
Lowest system temperature t_{SysMin} [°C]	<p>For indoor installation of the RAC system: Return temperature outdoor air heat exchanger in winter</p> <p>For outdoor installation of the RAC system: Standstill temperature in winter (e.g. lowest outside air temperature)</p>	_____ °C
Highest system temperature t_{SysMax} [°C]	<p>For indoor installation of the RAC system: No heating supply: Return temperature extract air heat exchanger With heating supply: Supply temperature heating supply</p> <p>For outdoor installation of the RAC system: Standstill temperature in summer (e.g. 60 °C due to solar radiation)</p>	_____ °C
Glycol concentration [%]	<p>According to the sizing of the RAC system See data sheet</p>	_____ %
Percentage expansion n [%]	<p>According to the glycol manufacturer's instructions For a first approximation, values can be taken from the auxiliary table ↻ 'Expansion coefficient n when glycols are added as antifreeze agents' on page 33</p>	$n =$ _____ %
Static pressure P_{St} [bar]	<p>System height $h_A =$ _____ m 10 m = 1.0 bar</p>	$P_{\text{St}} =$ _____ bar
Volume of heat exchanger and RAC system [l]	<p>According to the sizing of the RAC system See data sheet ("Volume without pipe-work")</p>	$V_{\text{RAC system}} =$ _____ l
Pipework volume [litres]	<p>Length of all pipework * specific water content [DN] ↻ 'Specific water content of pipework' on page 33</p>	$V_{\text{Pipe}} =$ _____ l
System volume V_A [l]	$V_{\text{RAC system}} + V_{\text{Pipe}}$	$V_A =$ _____ l

2. Pressure determination:

Values	Description	Input
Pre-charge pressure P_0 [bar]	<p>Minimum operating pressure to prevent underpressurisation</p> <p>$P_0 = P_{St} + 0.2 \text{ bar}$</p> <p>$P_0 \geq 1.0 \text{ bar}$</p> <p>Check and adjust before filling the system!</p>	$P_0 = \underline{\hspace{2cm}}$ bar
Trigger pressure safety valve P_{SV}	$P_{SV} = 8 \text{ bar}$	$P_{SV} = 8 \text{ bar}$
Final pressure P_e [bar]	<p>Pressure in the system at maximum temperature</p> <p>$P_e \leq P_{SV}$</p> <p>if $h_A \leq 10 \text{ m} \Rightarrow P_e = 4.00 \text{ bar}$</p> <p>if $h_A \geq 10 \text{ m and } \leq 20 \text{ m} \Rightarrow P_e = 5.00 \text{ bar}$</p> <p>if $h_A \geq 20 \text{ m} \Rightarrow P_e = P_{SV} - 0.1 \times P_{SV}$</p>	$P_e = \underline{\hspace{2cm}}$ bar

3. Calculation of diaphragm expansion vessel and filling pressure:

Values	Description	Input
Expansion volume V_e [l]	<p>$V_e = \frac{n}{100} \times V_A$</p> <p>enter n as %</p>	$V_e = \underline{\hspace{2cm}}$ l
Water seal V_v [l]	<p>$V_v = 0,005 \times V_A$</p> <p>V_v at least 3 litres</p>	$V_v = \underline{\hspace{2cm}}$ l
Nominal volume diaphragm expansion vessel V_n [l]	<p>$V_n = (V_e + V_v) \times \frac{P_e + 1}{P_e - P_0}$</p>	$V_n = \underline{\hspace{2cm}}$ l
Existing $V_{n,IST}$ [l]	see table ↗ 'Volume diaphragm expansion vessel' on page 33	$V_{n,IST} = \underline{\hspace{2cm}}$ l

Values	Description	Input
Initial pressure test P_a [bar]	$P_a = \frac{P_e + 1}{1 + \frac{V_e \times (P_e + 1)}{V_{n,IST} \times (P_0 + 1)}} - 1 \text{ bar}$ <p>Test: $P_e \geq P_a + 0.25 \dots 0.3 \text{ bar}$</p> <p>otherwise the vessel is too small and an additional or larger diaphragm expansion vessel is required.</p> <p>Then perform calculation with new V_n, ACTUAL-</p>	$P_a = \underline{\hspace{2cm}} \text{ bar}$
Filling pressure calculation P_F [bar]	$P_F = V_{n,IST} \times \frac{(P_0 + 1)}{V_{n,IST} - VA \times n - V_v} - 1 \text{ bar}$ <p>Filling pressure corresponds to the filling pressure with a medium temperature of 10 °C, when filling the system at a stand-still.</p>	$P_F = \underline{\hspace{2cm}} \text{ bar}$

5.3.1 Commissioning the diaphragm expansion vessel

Pressure setting

Either set the diaphragm expansion vessel pressure before filling the RAC system, or shut-off the water connections to the expansion vessel, drain it, and set the pressure once you have filled the RAC system.

Tool:

- Test and refill set for expansion vessels

CAUTION!

Do not exceed the permitted operating pressure (→ diaphragm expansion vessel rating plate). Otherwise the vessel might burst.

A wrong pre-charge pressure or filling pressure for the system will impair the function of the diaphragm expansion vessel.

Setting the pre-charge pressure p_0

- ▶ Use the gas charging valve on the diaphragm expansion vessel to set the pre-charge pressure for the system – at least 1.0 bar. Fill up with nitrogen only!
- ▶ Carefully open the water-side shut-off.
- ▶ Set the filling pressure p_F of the RAC system

5.4 Parameter setting of the pressure sensor

To enable operation, the digital pressure sensor must then be parameterised to the desired switching points.

The parameterisation is carried out directly on the pressure sensor, further information ↗ *Appendix B 'Supplier documents' on page 76*.

The following parameters have to be set:

Parameters	Displayed name	Setting default
Switching point 1: System switch-off	SP1	1 bar below SP2; Minimum 1.0 bar
Switching point 1: Reset point	rP1	0.3 bar below SP1
Switching point 2: Warning for system filling pressure test	SP2	0.3 to 0.5 bar below the operating pressure
Switching point 2: Reset point	rP2	0.3 bar below SP2
Characteristic for switching point 1	OU1	Hno (normally open; hysteresis)
Characteristic for switching point 2	OU2	Hno (normally open; hysteresis)
Displayed unit	Uni	bar

5.5 Venting

Requirements:

- All operating media lines are professionally connected.
- Pipework connected according to the suppliers' instructions.
- Hydraulic system filled with operating fluid
- Hydraulic system is pre-vented
- Diaphragm expansion vessel has been checked
 - Volume of diaphragm expansion vessel is sufficient for the system
 - Pre-charge pressure has been calculated and set based on the on-site conditions.
- Filling pressure for the system has been set.
- Supply voltage has been established.

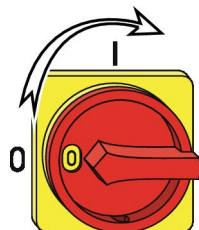


Fig. 26: Switch on the main switch

1. ▶ Turn on the mains isolator to switch on the hydraulic unit

2. ▶ Login to X-CUBE Control on the user interface. Either use the touch panel of the hydraulic unit or the AHU, or via the computer of the MCE ↗ *'Login users' on page 42*.
3. ▶ Switch on the hydraulic unit in manual mode, Fig. 36 .
Set a low pump capacity (50% max.) for venting.
4. ▶ Vent the system. Repeat several times, if necessary.

Note:

When starting the pump, the filling pressure in the system has to remain nearly constant. Strong fluctuations in the filling pressure indicate that air is still trapped in the system.

5.6 Switching on

Switch-on prerequisites:

- The RAC system has been vented,
↳ 5.5 'Venting' on page 37
- Signal cables are in place and have been connected
 - Release signal (digital)
 - Power requirement (analogue 0 – 10 V)
 - Optional: Proportional signal for the air volume flow (analogue 0 – 10 V)
 - Optional: Status signals are available (fault, warning, operating status; 'heat recovery not possible' message, risk of frost damage during feed process).
 - Alternatively: Modbus TCP/IP or BACnet IP communication is available
Depending on system construction, see wiring diagram
- The unit is easily accessible. For outdoor units, the occupational health and safety regulations are met. No danger of falling off.
- Pre-charge pressure p₀ on the MAG was checked and corrected if necessary (cf. ↳ 5.3 'Checking the diaphragm expansion vessel' on page 33)
- Filling pressure of the system was checked and adjusted if necessary ↳ 5.3 'Checking the diaphragm expansion vessel' on page 33
- System tightness was tested and documented
- RAC system is filled with the intended operating medium and the corresponding concentration

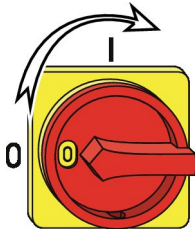


Fig. 27: Switch on the main switch

1. ▶ Turn on the mains isolator to switch on the hydraulic unit
2. ▶ Login to X-CUBE Control on the user interface. Either on the touch panel of the hydraulic station or AHU or via the computer of the MCE, ↳ 'Login users' on page 42 .
3. ▶ Set the automatic mode, Fig. 36

6 Using X-CUBE Control

6.1 General

X-CUBE Control is the control system of the hydraulic unit. Use the X-CUBE Control user interface to configure the hydraulic unit and to set parameters.

Open the user interface as follows:

- Touch panel on the hydraulic unit
- Touch panel on the X-CUBE (optional)
- Browser on the on-site PC (provided by the client)

Using the touch panel

The touch panel is sensitive to the pressure of your fingers; no keyboard or mouse is required. A virtual keyboard is displayed on the panel for you to enter data.

Alternatively, you can use a PC with keyboard and mouse to navigate X-CUBE Control. In this case you have to establish a connection between the unit and a PC (by others) or a network (by others).

6.2 System overview

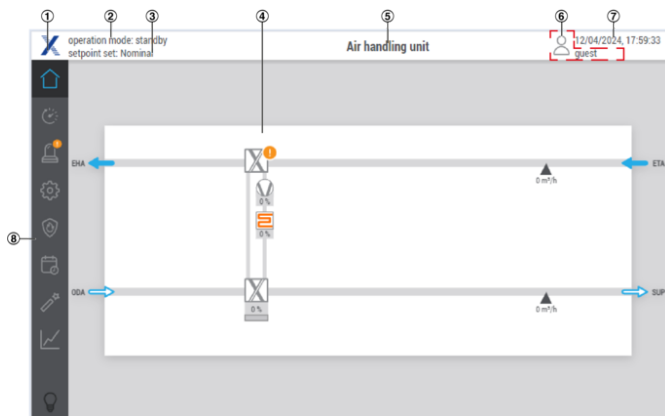


Fig. 28: System overview (example)

The system overview is a schematic illustration of the run-around coil system. Symbols can be selected, which may open further pages for parameterisation.

Pos.	Description
1	Select to display the software version information. Refer to these when contacting TROX Service.

Pos.	Description
2	Shows current operating mode: <ul style="list-style-type: none"> ■ Off: Manual control not possible, timer programme not active. ■ Standby: Manual control possible, timer programme active. ■ Start-up ■ Control: All relevant control circuits (fans, temperature, humidity and air quality) are enabled. ■ Fault: At least one critical fault is present. The system is switched off. ■ Frost protection: The frost protection thermostat has been triggered. The heating coil is activated at full power. ■ Standby + MCE: Standby required by the management and control equipment. ■ Control + MCE: Control required by the management and control equipment.
3	Display of the active setpoint value.
4	System diagram
5	Displays the name of the system.
6	Displays the user status and the user currently logged in. <ul style="list-style-type: none"> ■ No user logged in (guest) ■ User logged in (staff, service, or admin) Select this symbol to open the log-in screen.
7	Shows date and time of the X-CUBE controller, Setting: 'Settings → Basic settings'.
8	Main menu

Main menu

Icon	Menu item	Description
	Start	Select to call up the start page and display the system diagram.
	Status control	When selected, the control status is displayed: This contains a brief overview <ul style="list-style-type: none"> ■ Control strategy ■ Setpoint and actual values for: <ul style="list-style-type: none"> – Temperature control – Fan – Humidity control (optional)

System overview

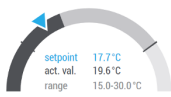

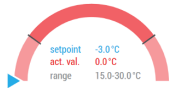
Icon	Menu item	Description
	Status alarms	Shows list of alarms. Displayed when there is at least one warning. Displayed when there is at least one critical alarm. In case of a critical alarm, the X-CUBE is switched off!
	Settings	Opens the 'Settings' menu, for general settings.
	Wizard	The commissioning wizard guides through the first steps of commissioning.
	History	Opens the 'Trend' menu where trends for various parameters (e.g. temperature, humidity or pressure) can be read and downloaded*. *not possible via touch panel!
	Maintenance lighting	Switches the maintenance lighting (if available) ON or OFF. Maintenance lighting is OFF; select to switch ON Maintenance lighting is ON; select to switch OFF

System diagram symbols

Icon	Description
	Airflow direction left
	Airflow direction left
	Airflow direction right
	Airflow direction right


Icon	Description
	Run-around coil system, Chapter 6.4 'Run-around coil system' on page 45
	44 %
	42 %
	0 %
	100 %
	pump,
	Orange: Heat feed Blue: Cooling feed
	Sensors, Chapter 6.5 'Supply/extract air measured values' on page 56
	OFF
	ON
	Function disabled
	Function enabled
	Status OK
	Status Note
	Status Warning
	Status Error
	manual control Status OK
	manual control Status Error

Tachometer explanation

Colour	Display	Description
Neutral/grey		Control loop is OK. Actual value is within defined range.
Orange		Actual value deviates from setpoint value
Red		<p>Actual value is outside of displayed range.</p> <ul style="list-style-type: none"> ■ Check whether the affected sensor is transmitting the measured values without errors. ■ Please check whether the control system is running.

6.3 User management

Login users

Select the  in the header to open the 'Login' screen.

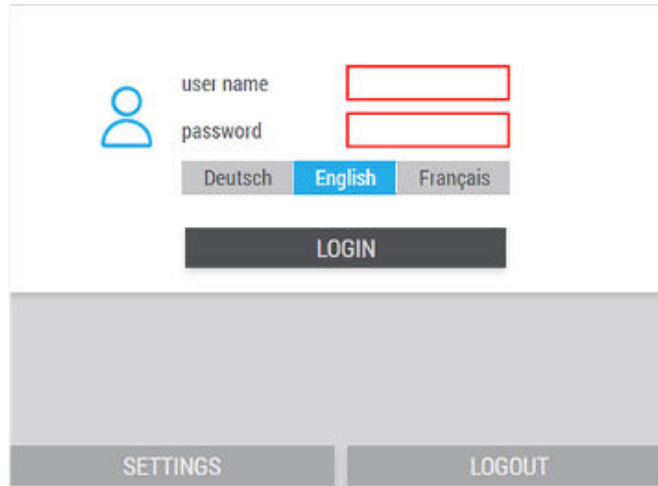


Fig. 29: Login users

To log in, enter the 'user name' and the corresponding 'password', then [LOGIN].

To customise the interface language, select the appropriate language [Deutsch], [English] or [Français], the language setting is only adopted after successful login.

If another user wants to log in, the current active user has to log out first. To do this, open the user login and select [LOGOUT] to log out the active user.

Factory settings

User name	Default password	Rights	Automatic logout after ...	Typical functions
Guest	-	Guest	-	Read only access
userStaff	userStaff	Staff	15 minutes	Change of setpoints and schedules
userService	userService	Service	1 hour	Changes to controller settings, external devices and MCE interface






During commissioning, replace the standard login data with individual login data. This prevents unauthorised persons from gaining change access to the visualisation.

As long as the default user name and default password are used to log in, the following warning will be shown.



To create new users or edit existing users in the user login, select *[EINSTELLUNGEN]*.


Please note: Rights management allows you to change your own user or to create or change users with the same or fewer access rights.

user name	rights	edit	delete
userAdmin	Admin		
userService	Service		
userStaff	Staff		

+ NEW USER
DELETE
CLOSE

Fig. 30: User log-in settings

Edit users

Go to the 'edit' column and select  to edit user data.


USER

old username:

new username:

password:

confirm password:


rights: 

APPLY
CLOSE

Fig. 31: Edit users

In the window, you may edit the 'user name' and the 'password' for a user. Accept data input by clicking on *[APPLY]*.

Creating a new user

 The following steps require **Administrator** rights.


To create a new user, click on *[+ NEW USER]*.

USER

user name:

password:

confirm password:

rights: 


APPLY
CLOSE






Fig. 32: Creating a new user

Enter the user name, password and rights* in the window and click on *[APPLY]*.

Please note: Rights management allows you to create users with the same or fewer access rights.


Delete users

 The following steps require **Administrator** rights.

user name	rights	edit	delete
userAdmin	Admin		
userService	Service		
userStaff	Staff		

+ NEW USER DELETE CLOSE

Fig. 33: User log-in settings

In the column 'delete', select the symbol  to remove the user data.

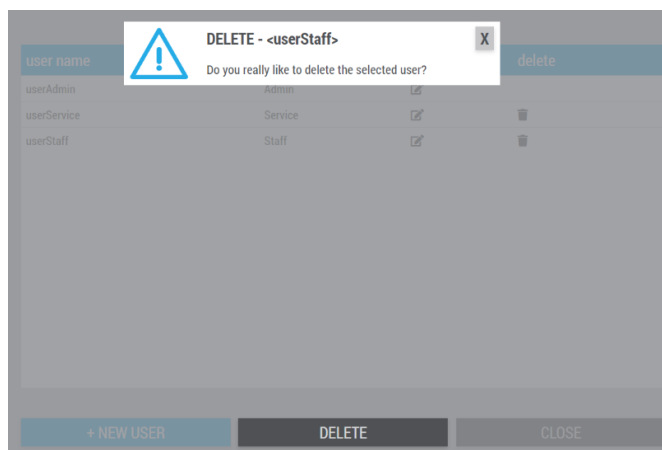




Fig. 34: Confirmation prompt

For the confirmation prompt, click [DELETE] to remove the user.

Click [CLOSE] to exit the menu without deleting the user.

6.4 Run-around coil system

Component status

Go to the system diagram  and select the run-around coil system .

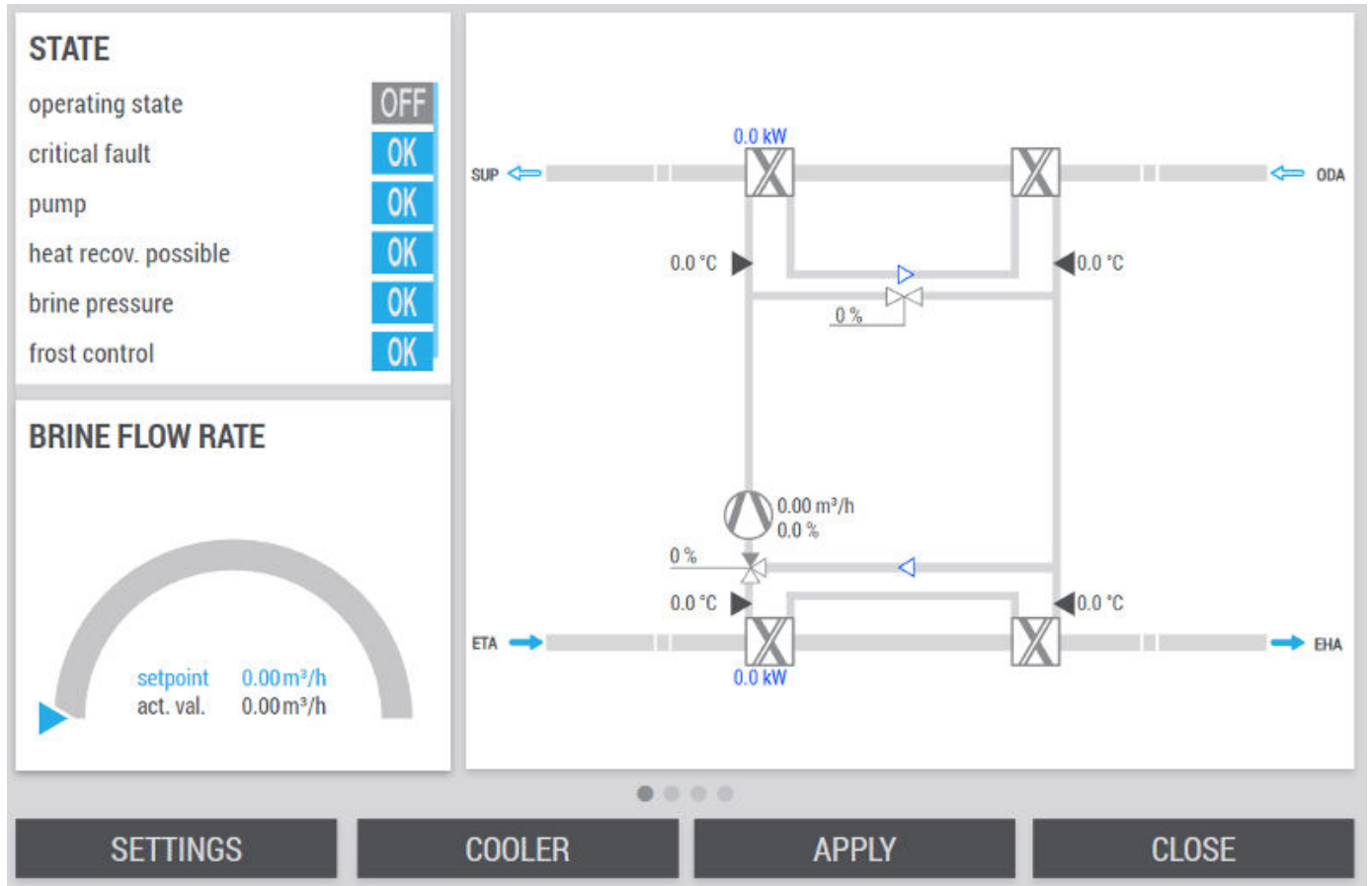


Fig. 35: Status page (1) run-around coil system

Designation	Description
STATUS	Operating status: <ul style="list-style-type: none"> OFF Run-around coil system turned off ON Run-around coil system switched on
	Critical fault <ul style="list-style-type: none"> ! At least one fault is present OK no fault
	Pump <ul style="list-style-type: none"> ! At least one fault is present OK no fault
	Heat recovery possible <ul style="list-style-type: none"> ! No OK Indicates that heat recovery is possible.
	Brine pressure <ul style="list-style-type: none"> ! Brine pressure outside specifications OK Brine pressure OK
	Anti-icing protection <ul style="list-style-type: none"> ! Fault anti-icing protection OK Anti-icing protection OK
	Brine flow rate	Tachometer for displaying the setpoint and actual value of the brine flow rate 'Tachometer explanation' on page 41 .

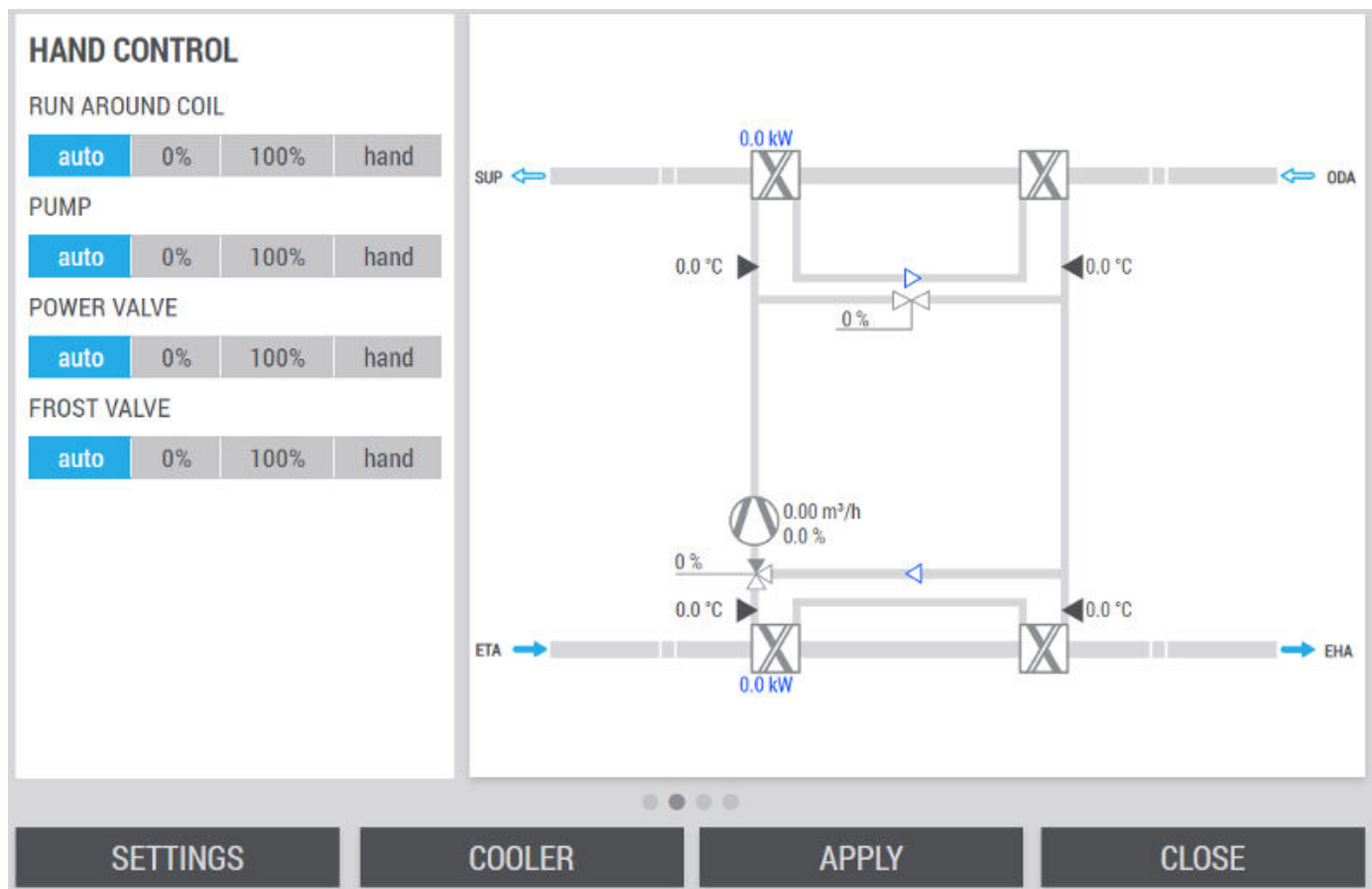


Fig. 36: Status page (2) run-around coil system

Designation	Description
MANUAL CONTROL	<ul style="list-style-type: none"> Run-around coil system Pump Power valve Anti-freeze valve Heat feed Cooling feed <p>Manual control of the component is achieved by selecting one of the following options:</p> <p>auto 0% 100% hand</p> <p>If you select the option <i>[Manual]</i>, the field 'actuating value' appears, in which you can enter values between 0% and 100%</p> <p>auto 0% 100% hand</p> <p>actuating value <input type="text" value="30"/> %</p>

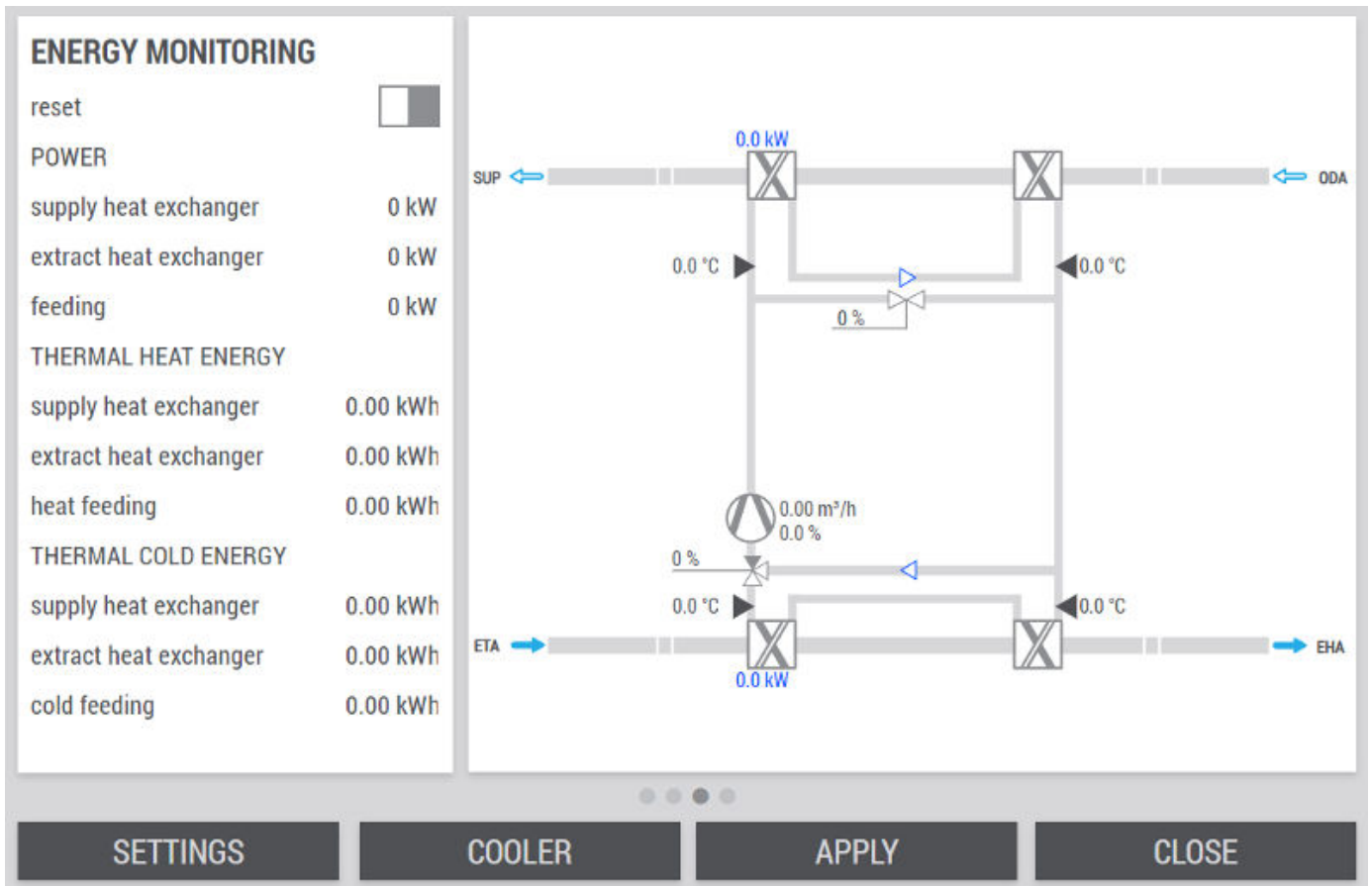


Fig. 37: Status page (3) run-around coil system

Designation	Description
ENERGY MONITORING	reset <input type="checkbox"/> keep values <input checked="" type="checkbox"/> reset accumulated energy values
	Output Display of the output in kW via the supply/extract air heat exchanger and via heat feed.
	Heating and cooling energy Display of the cumulative energy in kWh via the supply/extract air heat exchanger and via heat feed.

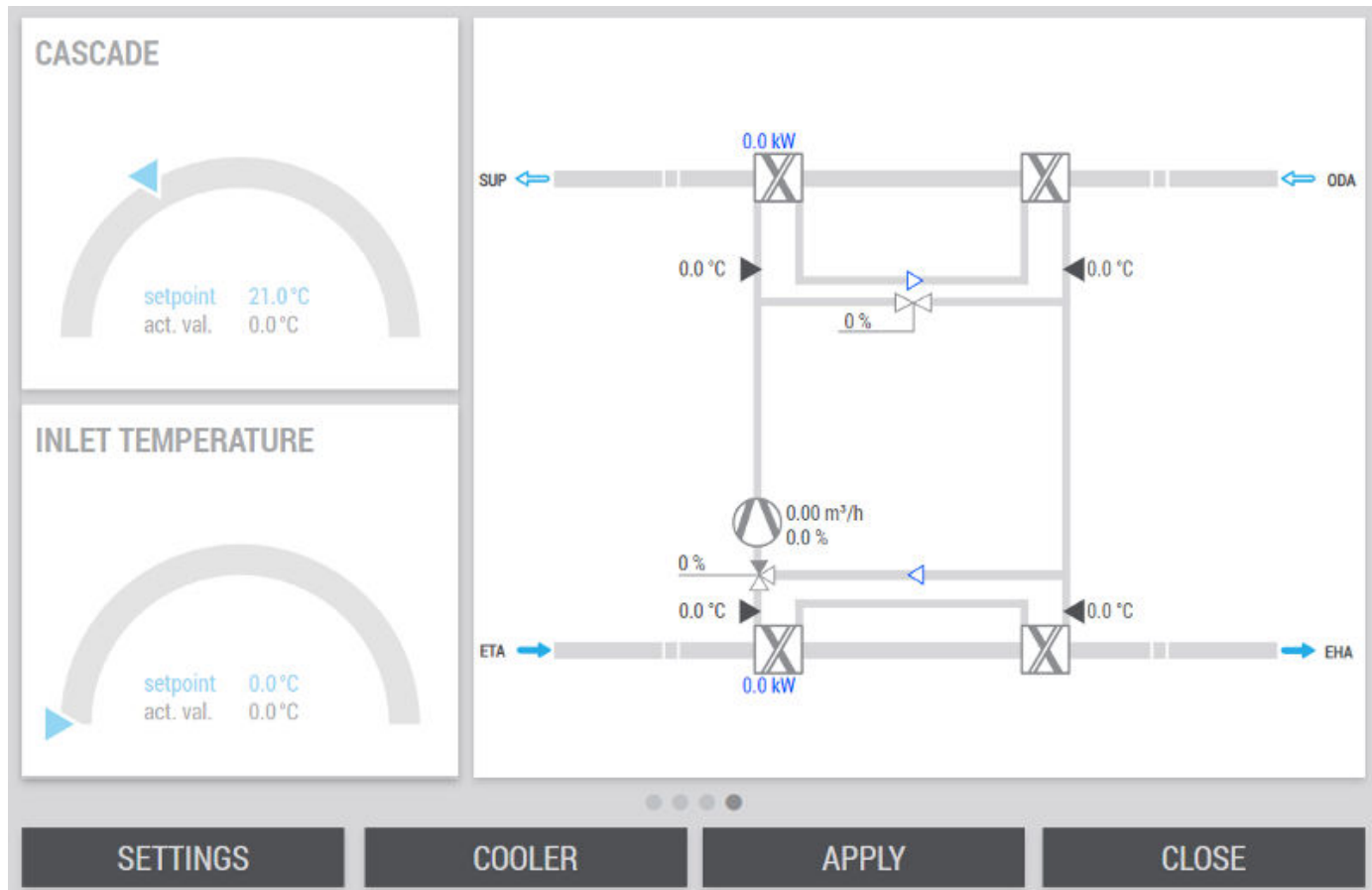


Fig. 38: Status page (4) run-around coil system

Designation	Description
CASCADE FLOW TEMPERATURE	If a heat or cooling feed is available, the flow temperature of the supply air heat exchanger is controlled in cascade with the supply air temperature. The auxiliary controller determines the setpoint for the slave controller, using the supply air temperature as the control variable. The slave controller has the flow temperature of the supply air heat exchanger as a control variable, tachometer: Tachometer explanation on page 41 .

Click **[EINSTELLUNGEN]** to open the settings page.

Click **[APPLY]** to save the values. Click **[CLOSE]** to leave the page without saving.

Settings

Service user rights are required to make changes to the settings.

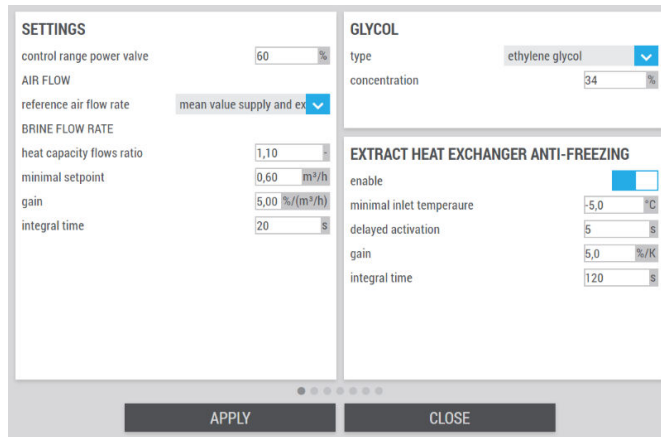


Fig. 39: Settings run-around coil system (1)

Designation	Description	
SETTINGS	Control range power valve	Share of the power requirement that is taken over by the valve
	Air volume flow rate	Reference air volume flow <ul style="list-style-type: none"> ▪ Mean value for supply and extract air: The mean value of the incoming air volume flow measurement values is selected to calculate the optimum pump flow rate ▪ Supply air volume flow rate: Only the SUP volume flow rate is selected to calculate the optimum pump flow rate ▪ Extract air volume flow rate: Only the ETA volume flow rate is selected to calculate the optimum pump flow rate
	BRINE FLOW RATE Ratio of heat capacity flows	Is used to calculate the optimum brine flow rate and describes the ratio of the air heat capacity flow to the brine heat capacity flow. > 1 = Higher setpoint value (value range: 0.85 - 1.15)
	minimum setpoint value	Corresponds to the minimum volume flow rate. Must be determined during commissioning (manual operation: pump speed = 30%; open power valve in 10% steps from 0% - 100% and note measured value, min. measured value minus 0.3 - 0.5m³/h corresponds to min. setpoint value). Does not generate the error "Minimum volume flow not reached"
	Gain Integral action time	Input fields for the PI controller of the brine volume flow controller
GLYCOL	Type	Corresponds to the glycol type used. The planning specifications are given on the device data sheet.
	Concentration	Corresponds to the glycol concentration used. The planning specifications are given on the device data sheet.

Designation	Description	
ANTI-ICING PROTECTION FOR EXTRACT AIR HEAT EXCHANGER	enable	<input type="checkbox"/> no release, here the anti-icing protection can be switched off if required. <input checked="" type="checkbox"/> Releases the anti-icing protection.
	Minimum flow temperature	Minimum flow temperature of the extract air heat exchanger
	delayed activation	Delayed activation of the anti-icing controller
	Gain Integral action time	Input fields for the PI controller of the anti-icing controller

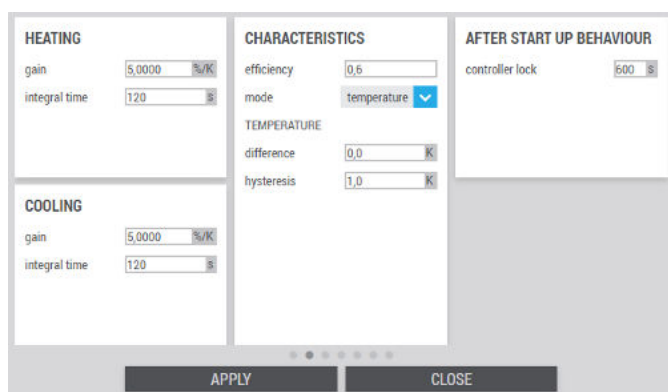


Fig. 40: Settings run-around coil system (2)

Designation	Description	
HEATING	Gain	Input fields for PI controller in heating mode.
	Integral action time	
COOLING	Gain	Input fields for PI controller in cooling mode.
	Integral action time	
OPERATING BEHAVIOUR	Heat recovery coefficient	To determine the air outlet temperature of the heat recovery system. If the calculated value cannot reach the target value, the controller is synchronised to 100% (boost in the start-up process).
	Mode	Determines which values are used to evaluate whether heat recovery is possible. You can choose between temperature, enthalpy or both.
	TEMPERATURE	
		<ul style="list-style-type: none"> Difference: Describes the minimum temperature difference between extract air and outdoor air for enabling heat recovery Hysteresis: Minimum difference after switching off the heat recovery to enable it again.
	Actuating value	minimum and maximum actuating value
POST START UP BEHAVIOUR	Controller lock	After the priming, the heat recovery runs at full power for the duration of the controller lock. PI control is disabled during this time. In winter, the function can be used to prevent the heat recovery from being switched off prematurely by the control system

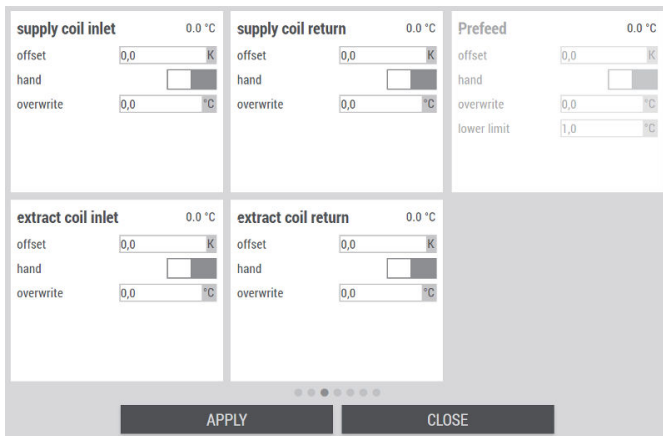


Fig. 41: Settings run-around coil system (3)

Designation	Description	
Supply air coil inlet	Offset	Allows the measured value to be corrected by adding the value entered in the input field 'Offset' to the displayed value.
Extract air coil inlet	Manual	<input type="checkbox"/> The current measured value is adopted.
Supply air coil outlet		<input checked="" type="checkbox"/> The value from the input field 'overwrite' is adopted.
Extract air coil outlet	overwrite	Allows the sensor value to be overwritten manually for any tests.
Feeding inlet		Lower limit

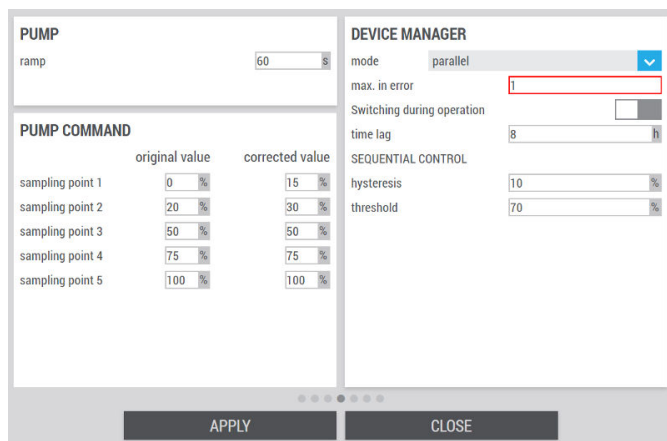


Fig. 42: Settings run-around coil system (4)

Designation	Description	
PUMP	Ramp	Start-up and switch-off ramp (in seconds) of the pump to prevent abrupt switching on and off.
PUMP CONTROL SIGNAL	The original value of the pump control signal is adjusted linearly with the aid of 5 adjustable grid points. This allows the effect on the change in volume flow to be distributed more evenly.	
DEVICE MANAGER	Mode	<ul style="list-style-type: none"> ■ parallel: All pumps start up and shut down simultaneously ■ sequential: Pumps start up one after the other. If total demand \leq threshold value, the threshold value is divided by the number of operating pumps and each individual pump is run up to the threshold value. When all pumps have reached the threshold value, then parallel operation.
	max. in error	Number of pumps that must show errors before the station is switched off.
	Switchover in operation	<input type="checkbox"/> Prevents the pump from switching off during operation. <input checked="" type="checkbox"/> Allows the pump to be switched off during operation.
	Time difference	Specifies the time at which the switchover between operating pump and reserve pump takes place. The pump with the highest number of operating hours is always switched off.
	Hysteresis	Specifies the value - below the threshold value - at which a pump is switched off again. (Shut down).
	Threshold value	Total demand signal of the pumps. Is divided by the number of operating pumps in the case of sequential control. Pumps then start up one after the other until the speed of the individual pump has reached the threshold value.



The settings in the following window are only relevant if the RAC system is equipped with a dehumidification cold recovery system.


The screenshot shows a control interface with three main sections:

- REHEATER VALVE:** Includes a toggle for 'enable sequence' (checked), a 'gain' input field set to 1,0000 %/K, and an 'integral time' input field set to 180 s.
- COOLER FROST TEMPERATURE:** Includes a 'frost limit' input field set to 7,0 °C, an 'offset' input field set to 0,0 K, a 'hand' toggle (unchecked), and an 'overwrite' input field set to 0,0 °C.
- RETURN TEMPERATURE reheater:** Includes an 'offset' input field set to 0,0 K, a 'hand' toggle (unchecked), and an 'overwrite' input field set to 0,0 °C.

At the bottom, there are 'APPLY' and 'CLOSE' buttons.

Fig. 43: Settings run-around coil system (5)

Designation	Description	
REHEATER VALVE	Sequence release	<input type="checkbox"/> Removes the reheater valve from the heating sequence. <input checked="" type="checkbox"/> Integrates the reheater valve into the heating sequence.
	Gain Integral action time	Input fields for the PI controller in heating mode.
Reheater RETURN TEMPERATURE	Offset	Allows the measured value to be corrected by adding the value entered in the input field 'Offset' to the displayed value.
	Manual	<input type="checkbox"/> The current measured value is adopted. <input checked="" type="checkbox"/> The value from the input field 'overwrite' is adopted.
	overwrite	Allows the sensor value to be overwritten manually for any tests.
COOLING COIL FROST TEMPERATURE	Frost limit value	Limit value of the air inlet temperature at the dehumidifying cooling coil.
	Offset	Allows the measured value to be corrected by adding the value entered in the input field 'Offset' to the displayed value.
	Manual	<input type="checkbox"/> The current measured value is adopted. <input checked="" type="checkbox"/> The value from the input field 'overwrite' is adopted.
	overwrite	Allows the sensor value to be overwritten manually for any tests.

 The settings in the following window are only relevant if the RAC system is equipped with a cooling feed.

The screenshot shows two main configuration panels. The left panel, titled 'SUPPLY COIL INLET TEMP.', includes a 'cascade control' toggle (checked), and input fields for 'minimum' (14,0 °C), 'maximum' (35,0 °C), 'gain' (5,0 K/K), and 'integral time' (120 s). The right panel, titled 'COLD FEEDING', includes an 'enable sequence' toggle (checked), and input fields for 'gain' (5,0000 %/K), 'integral time' (120 s), and 'outdoor limit' (16 °C). Below these is an 'inlet temperature' section with 'offset' (0,0 K), a 'hand' toggle (unchecked), and 'overwrite' (0,0 °C). At the bottom are 'APPLY' and 'CLOSE' buttons.

Fig. 44: Settings run-around coil system (6)

Designation	Description	
SUPPLY TEMPERATURE SUPPLY AIR COIL	Cascade control	<input type="checkbox"/> cascade control not active <input checked="" type="checkbox"/> cascade control active
	Minimum	Minimum brine temperature after feed.
	Maximum	Maximum brine temperature after feed
	Gain	Input fields for the PI controller of the auxiliary controller.
	Integral action time	
COOLING FEED	Sequence release	<input type="checkbox"/> Removes the cooling feed from the cooling sequence. <input checked="" type="checkbox"/> Integrates the cooling feed into the cooling sequence.
	Gain	Input fields for the PI controller of the cooling feed.
	Integral action time	
	Outdoor limit	Limit temperature below which the cooling feed is blocked for cooling.
Flow temperature	Offset	Allows the measured value to be corrected by adding the value entered in the input field 'Offset' to the displayed value.
	Manual	<input type="checkbox"/> The current measured value is adopted. <input checked="" type="checkbox"/> The value from the input field 'overwrite' is adopted.
	overwrite	Allows the sensor value to be overwritten manually for any tests.

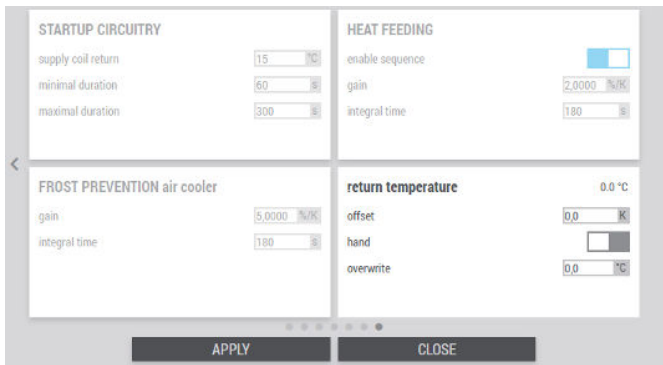


Fig. 45: Settings run-around coil system (7)

Designation	Description	
START-UP CIRCUIT	Outlet supply air coil	Input field for the limit value from which the start-up circuit is deactivated after the minimum duration has elapsed.
	Minimum duration	Minimum duration of the start-up circuit
	Maximum duration	Maximum duration of the start-up circuit
HEAT FEED <i>(only if heat feed is available)</i>	Sequence release	<input type="checkbox"/> Removes the heat feed from the heating sequence. <input checked="" type="checkbox"/> Integrates the heat feed into the heating sequence.
	Gain Integral action time	Input fields for the PI controller of the heat feed.
FROST PREVENTION cooling coil <i>(only if dehumidification cold recovery is available)</i>	Gain Integral action time	Input fields for the PI controller for frost protection of the dehumidifying cooling coil.
Return temperature	Offset	Allows the measured value to be corrected by adding the value entered in the input field 'Offset' to the displayed value.
	Manual	<input type="checkbox"/> The current measured value is adopted. <input checked="" type="checkbox"/> The value from the input field 'overwrite' is adopted.
	overwrite	Allows the sensor value to be overwritten manually for any tests.

6.5 Supply/extract air measured values

Component status


In the system diagram , select the corresponding sensor (SUP / ETA).

Fig. 46: Status page sensors



























Designation	Description	
Temperature Humidity Air quality Air volume flow rate	Offset	Allows the measured value to be corrected by adding the value entered in the input field 'Offset' to the displayed value. Example: The display shows 19.9 °C, but the actual value captured by the reference sensor is 20.5 °C. Enter 0.6 °C to correct the sensor value. Enter negative corrections with a minus sign.
	Hand	<input type="checkbox"/> The current measured value is adopted. <input checked="" type="checkbox"/> The value from the input field 'overwrite' is adopted.
	overwrite	Allows the sensor value to be overwritten manually for any tests.
	K factor	The K factor is required to calculate the air volume flow. It is provided by the fan manufacturer.
Duct pressure Fan pressure	Zeroing	Important: Only carry out zero-point adjustment while fans are stopped, as otherwise the measured values will not be correct. Carry out a zero-point adjustment of the differential pressure sensor by setting the slide switch. <input type="checkbox"/> inactive <input checked="" type="checkbox"/> Start zeroing
	Hand	<input type="checkbox"/> The current measured value is adopted. <input checked="" type="checkbox"/> The value from the input field 'overwrite' is adopted.
	overwrite	Allows the sensor value to be overwritten manually for any tests.

Click [APPLY] to save the values. Click [CLOSE] to leave the page without saving.

6.6 List of alarms

Select  in the main menu to open the page 'Alarm list'.

All alarms are displayed and processed in an overview on this page.

			raised	cleared
		Outdoor Air.Temp - MODBERR_HighGapOf:61.09972.	12/03/2024, 04:10:25	-
		Telegrame-> Previous: 1794.61.3.2.3.48.232.165.0.0. - current: 1793.61.3.2.4.32.235.89.0.0..	12/03/2024, 04:10:25	-
		DevId: 2 - Addr: 61 - getTemp - MODBERR_HighGapOf:61.09972.	12/03/2024, 04:10:25	-
		Outdoor Air.Temp - MODBERR_HighGapOf:61.09972.	12/03/2024, 04:10:22	-
		Telegrame-> Previous: 1793.61.3.2.4.32.235.89.0.0. - current: 1794.61.3.2.3.48.232.165.0.0..	12/03/2024, 04:10:22	-
		DevId: 2 - Addr: 61 - getTemp - MODBERR_HighGapOf:61.09972.	12/03/2024, 04:10:22	-
		Outdoor Air.Temp - MODBERR_HighGapOf:63.15589.	03/03/2024, 22:33:18	-
		Telegrame-> Previous: 1794.61.3.2.3.48.232.165.0.0. - current: 1793.61.3.2.4.40.234.159.0.0..	03/03/2024, 22:33:18	-
		DevId: 2 - Addr: 61 - getTemp - MODBERR_HighGapOf:63.15589.	03/03/2024, 22:33:18	-
		Outdoor Air.Temp - MODBERR_HighGapOf:63.15589.	03/03/2024, 22:33:15	-
		Telegrame-> Previous: 1793.61.3.2.4.40.234.159.0.0. - current: 1794.61.3.2.3.48.232.165.0.0..	03/03/2024, 22:33:15	-
		DevId: 2 - Addr: 61 - getTemp - MODBERR_HighGapOf:63.15589.	03/03/2024, 22:33:15	-
		TxAhuApp_PlcTask -> task time exceeded.	01/03/2024, 18:34:19	-
		X-CUBE started.	01/03/2024, 18:34:19	-









HISTORY




CLOSE

Fig. 47: Alarm overview







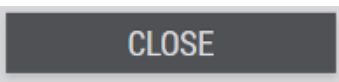


- You can sort the alarms by selecting column headers.
- The blue scroll bar above the control elements can be used to display the invisible column 6.

Explanations

Column	Icon/description
1	Alarm status
	 The alarm is active.
	 The alarm is waiting to be acknowledged.
	 The alarm is no longer active
	 Message

List of alarms

Column	Icon/description	
2	Alarm priority	
		Information
		Warning
		Critical alarm. In case of a critical alarm, the X-CUBE is switched off.
3	Alarm description	
4	Time stamp at which the alarm occurred.	
5	Time stamp at which the alarm became inactive after the cause was rectified.	
6	Alarm identification number	
		Call up the 'Alarm history' window where you can download the alarm histories as .csv files.
		Select the respective alarm priority to filter the list.
		Acknowledge/delete all alarms. Alarms that are waiting to be acknowledged are removed from the list and transferred to the alarm history. Alarms for unsolved errors will be displayed again after a short while. This function requires at least 'Staff' user rights.
		Close window



*It is **not** possible to download the alarm lists via the touch panel.*

History

On the page 'Alarm list', select [HISTORY] to go to the page 'Alarm history'. Navigate through up to 10 pages using the arrows '<' and '>'.





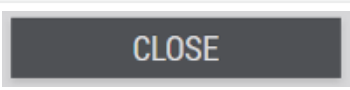
The historical alarms are displayed on these pages.

			date	ID
		X-CUBE started.	13/07/2023, 21:06:55	1.9.0
		X-CUBE.24V control voltage.Warning.	13/07/2023, 21:07:25	122.10.0
		X-CUBE.ExtAb/Ven.Warning.	13/07/2023, 21:07:25	131.10.0
		X-CUBE.ExtAb/Ven.Warning.	13/07/2023, 22:02:16	131.10.0
		Alarms acknowledged by userAdmin.	13/07/2023, 22:02:32	1.9.1
		X-CUBE.ExtAb/Ven.Warning.	13/07/2023, 22:02:32	131.10.0
		X-CUBE.BMA Kueche Warning.	13/07/2023, 22:03:58	135.10.0
		X-CUBE started.	13/07/2023, 22:15:58	1.9.0
		X-CUBE.BMA Kueche Warning.	13/07/2023, 22:16:28	135.10.0
		X-CUBE.BMA Kueche Warning.	13/07/2023, 22:21:16	135.10.0
		X-CUBE started.	13/07/2023, 22:35:41	1.9.0
		X-CUBE started.	13/07/2023, 22:48:36	1.9.0
		Supply Air Combined sensor.Temperature out of order..	13/07/2023, 23:16:01	10208.10.5
		Supply Air Combined sensor.Temperature out of order..	13/07/2023, 23:32:49	10208.10.5
		Supply Air Combined sensor.Temperature out of order..	13/07/2023, 23:48:06	10208.10.5
		Supply Air Combined sensor.Temperature out of order..	14/07/2023, 00:15:29	10208.10.5
		X-CUBE started.	14/07/2023, 00:24:13	1.9.0
		X-CUBE.BMA Kueche Warning.	14/07/2023, 01:00:20	135.10.0
		X-CUBE.BMA WC.Error.	14/07/2023, 01:00:20	137.10.0
		X-CUBE.Weather sensor.Temperature.communication error..	14/07/2023, 01:00:41	201.10.3
		X-CUBE.LeakageSensor.communication error..	14/07/2023, 01:00:41	139.10.3

Fig. 48: Window alarm history

Explanations

Column	Icon/description
1	Alarm status
	The alarm is active.
	The alarm is waiting to be acknowledged.
	The alarm is no longer active
2	Alarm priority
	Information
	Warning
	Critical alarm. In case of a critical alarm, the X-CUBE is switched off.
3	Alarm description

Column	Icon/description
4	Time stamp at which the alarm occurred.
5	Alarm identification number
	   Select the respective alarm priority to filter the list.
	 Download alarm history as .csv files. The alarm history comprises up to 600 entries with time stamp, error text and priority. Acknowledgements are saved with the additional information of the logged-in user name. It is not possible to download the alarm lists via the touch panel!
	 Close window

6.7 Data history

In the main menu, open  → 'Temperature' 'Air volume flow' or 'Humidity'.

The data for the selected day are visualised in these displays. The selection goes back up to one year.

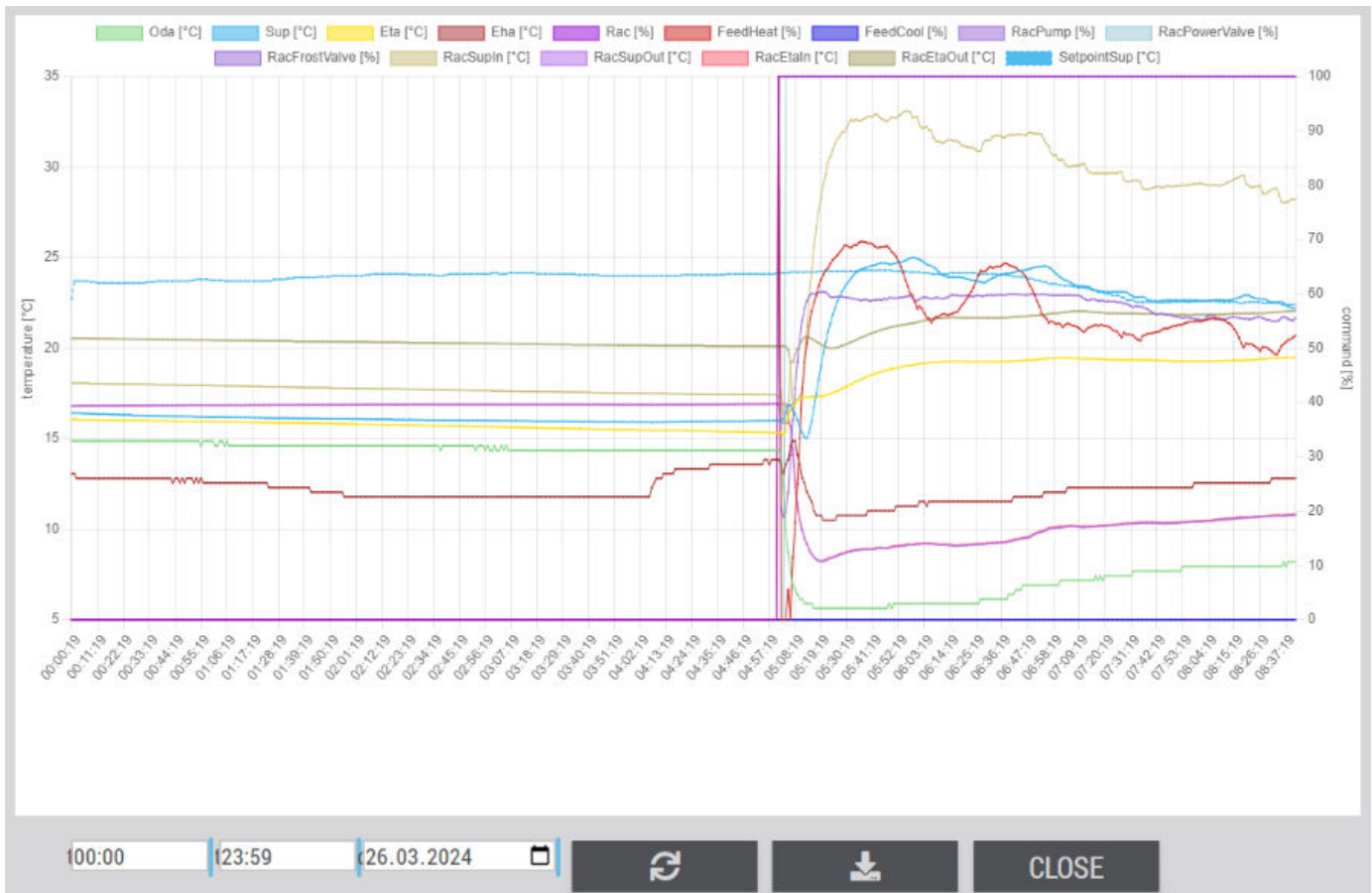



Fig. 49: Temperatures

By selecting , the recorded values of the respective day can be downloaded as a CSV file.



Downloading trends is not possible via the touch panel.

7 Maintenance

7.1 Safety instructions regarding maintenance

Improperly executed maintenance work

WARNING!

Risk of injury due to improperly executed maintenance work!

Improper maintenance can lead to serious injuries and considerable material damage.

- Before starting maintenance work, switch off the hydraulic unit and AHU, and secure it against being restarted accidentally.
- Never allow unauthorised persons to carry out maintenance work.
- Before starting, 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 in accordance with this manual.
 - all inspection access doors and covers are closed,
 - all safeguards have been installed and function correctly.

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.

Hot surfaces

WARNING!

Risk of injury from hot surfaces!

The parts of the hydraulic unit 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 the ambient temperature.

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.

7.2 Maintenance plan

The hydraulic unit requires regular maintenance. Regular care and maintenance ensure operational readiness, functional reliability and long service life of the unit. The following chapters describe the maintenance jobs required to ensure efficient and faultless operation of the unit.

If increased wear is detected during regular inspections, shorten the required maintenance intervals according to the actual wear and tear.



All maintenance work can also be carried out by TROX Technical Service. For questions about maintenance and maintenance intervals, contact the TROX Technical Service, ☎ 'TROX Technical Support' on page 3.

Hydraulic unit general, pipework

Interval	Maintenance work	Personnel
every 6 months	Visually check casing parts for contamination, damage and corrosion. Clean if necessary.	Instructed person
annually	Check joints and pipework for leakage.	Instructed person
	Check casing for condensation buildup.	Instructed person
	Check equipotential bonding.	Instructed person
	Check the water quality of the hydraulic unit. The system has to meet the heating and cooling circuit requirements (EN 14868, VDI2035-1/-2).	HVAC technician

☒ 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
annually	Check function of flow and return pipes.	HVAC technician

☑ Heating coil

Interval	Maintenance work	Personnel
every 6 months	Check heat exchanger for contamination, damage, corrosion and leakage.	HVAC technician
annually	Check function of flow and return pipes.	HVAC technician

Electric motors

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

Pumps

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

Diaphragm expansion vessel

Interval	Maintenance work	Personnel
every 6 months	Visually check for contamination, damage and corrosion. Remove contamination. In case of damage or corrosion, replace the vessel.	HVAC technician
	Visually check connections for leakage. If there are any leaks, seal the affected connections.	HVAC technician
	Diaphragm check: Briefly actuate the nitrogen valve, if water escapes, replace the MAG.	HVAC technician
	Pressure setting, ↪ Chapter 5.3 'Checking the diaphragm expansion vessel' on page 33	HVAC technician

Volume flow meter and control valve

Interval	Maintenance work	Personnel
annually	Visually check for contamination, damage and corrosion. Remove contamination. In case of damage or corrosion, replace the components.	Instructed person
	Visually check connections for leakage. If there are any leaks, seal the affected connections.	Instructed person
	Carry out a functional test by measuring.	Instructed person

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
annually	Check function of control valves.	HVAC technician

Electrical components and devices

Interval	Maintenance work	Personnel
every 6 months	Visually check sensors for contamination, damage and corrosion. Clean if necessary.	Instructed person
annually	Check the connections of the sensors.	Skilled qualified electrician
	Check sensor function.	Skilled qualified electrician
	Check actuators for contamination, damage and corrosion.	Instructed person
	Check actuator for input signals, and check operating and setting range.	Skilled qualified electrician
	Check anti-frost thermostat.	Instructed person
	Check local isolator.	Skilled qualified electrician

Control system

Interval	Maintenance work	Personnel
annually	Check the controller for correct installation and ambient conditions.	Skilled qualified electrician
	Check the internal power supply (backup batteries).	Skilled qualified electrician
	Check functional elements, and operating and display devices.	Instructed person
	Check input signals.	Skilled qualified electrician
	Check control loops and control signals.	Skilled qualified electrician
	Check parameters.	Instructed person

7.3 Maintenance

7.3.1 Decommissioning for maintenance

WARNING!

Danger due to electric current!

The power and voltage supply cable from the building connection to the device is still energised after switching off.

Please note that switching off the hydraulic unit can also have an effect on other devices (e.g. the AHU) or systems in your environment. Therefore, before switching off the hydraulic unit, check whether other devices or systems could be affected by the shut-off.

To switch off the hydraulic unit, first switch off the main switch. This is normally located in the switch cabinet of the AHU.

Observe the following steps when switching off the hydraulic unit:

- ▶ Switch off all operating modes and functions of the AHU before switching off the main switch.

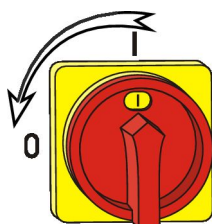


Fig. 50: Switching off the main switch

- ▶ Use the main switch to turn off the AHU.

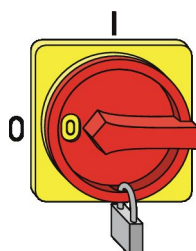


Fig. 51: Securing the main switch

- ▶ Switch off the power and voltage supply to the device by turning the main switch to the '0' position.
- ▶
 - Secure the main switch with a padlock (Fig. 51).
 - Keep the key in a safe place.
 - Cover the main switch with a notice indicating that work is in progress.

7.3.2 Opening inspection access doors

Opening standard inspection access doors

Personnel:

- Instructed person

Protective equipment:

- Safety harness
- Industrial safety helmet
- Protective gloves

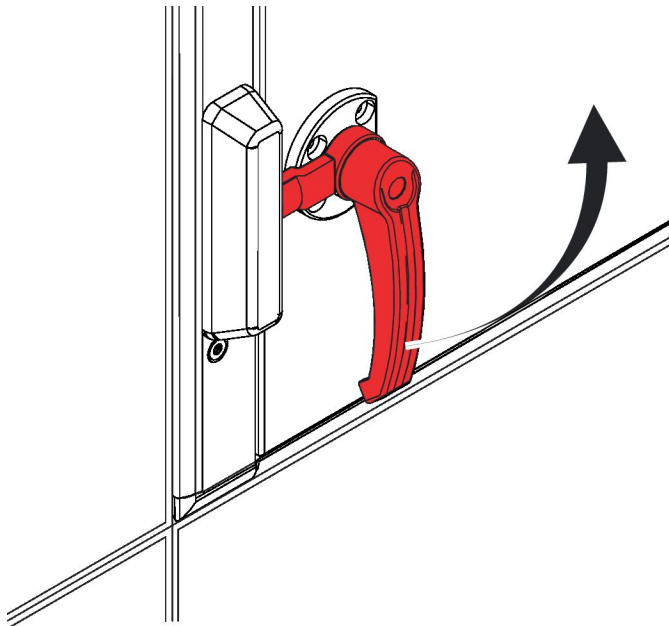


Fig. 52: Opening a door lock

- ▶ Turn the door handle anti-clockwise by 90° (Fig. 52).
- ⇒ This unlocks the door; it can now be opened.

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.

7.3.3 Clean hydraulic unit

Clean hydraulic unit

The hydraulic unit (external and internal surfaces) is cleaned manually using cleaning equipment (dry/wet method). First, dust deposits are vacuumed or blown off in a dry process. If necessary, the surfaces and components are subsequently cleaned with a damp cloth.

Cleaning equipment and cleaning aids:

- Vacuum cleaner, compressed air
- Damp, lint-free cloths
- Non-corrosive and silicone-free cleaning agents
Information on resistance to cleaning agents and disinfectants can be requested from TROX.

During cleaning, please note:

- Remove dirt and dirty water carefully and dispose of them correctly.

7.3.4 Clean dirt traps

Personnel:

- HVAC technician

Protective equipment:

- Safety goggles

Material:

- Drip tray for glycol-containing media

Clean the strainer of the dirt trap regularly. The cleaning intervals should be adapted to the degree of contamination of the operating fluid.

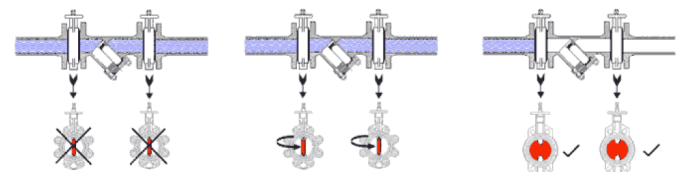


Fig. 53: Dirt traps

- ▶ Close the shut-off valves upstream and downstream of the dirt trap so that no more medium can flow in, and the dirt trap is depressurised.
- ▶ Carefully remove the strainer, use the drip tray to collect the operating fluid and professionally dispose of the fluid.
- ▶ Clean the strainer.
- ▶ Put the strainers back in and open the valves. Check for leakage!

7.3.5 Diaphragm expansion vessel

Diaphragm check

Personnel:

- HVAC technician
 - ▶ Briefly actuate the gas charging valve; some filling gas should escape.
If no filling gas escapes, adjust the pre-charge pressure of the vessel with filling gas.
If liquid escapes, replace the diaphragm expansion vessel.

Pressure setting

Personnel:

- HVAC technician

Do not exceed the permitted operating pressure (→ rating plate). Otherwise the vessel might burst.

A wrong pre-charge pressure or filling pressure for the system will impair the function of the diaphragm expansion vessel.

Operate and monitor the system at a constant temperature.

1. ▶ If the pressure in the diaphragm expansion vessel rises to > 4 bar, shut off the water side connections to the vessel, then reduce the pressure on the gas charging valve to 4 bar.
2. ▶ Drain the water side.

Setting the pre-charge pressure p_0

3. ▶ Check the gas charging valve for leakage. Important: For any maintenance work on the gas charging valve, be sure to vent (depressurise) the vessel beforehand.

Set the filling pressure for the system p_e

- ⇒ The diaphragm expansion vessel is again ready for use

7.3.6 Centrifugal pump

Replacement intervals

Part or component subject to wear and tear		Mechanical seal	Pump and motor bearings	Frequency inverter	Winding of the motor
Service life		10,000 h up to 20,000 h	12,000 h up to 15,000 h	≥15,000 h Max. ambient temperature 40 °C	25,000 h Max. ambient temperature 40 °C
Replacement interval	Continuous operation	1 to 2 years	1.5 to 5 years	1 to 3 years	3 years
	15 hours of operation / day 9 months per year	2 to 4 years	3 to 10 years	–	6 years

7.3.7 Completion of the maintenance work

Personnel:

- Instructed person

Prepare restart

- ▶ Ensure the following points before switching on:
 - There are no persons or objects, such as tools, in the hydraulic unit.
 - All media connections are intact and open.
 - If necessary, switch on other system components first.
- ▶ Remove the padlock from the main switch.

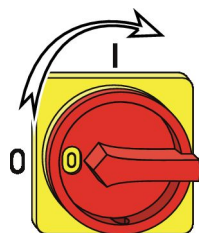


Fig. 54: Switch on the main switch

- ▶ Switch the hydraulic unit back on at the main switch.
- ▶ If fault messages occur on the control system, it may be necessary to acknowledge them.

8 Decommissioning

If the unit is no longer used, it has to be removed and disposed of in an environmentally friendly manner.

8.1 Safety

Personnel

- Disassembly must only be carried out by specialist personnel.
- Only skilled qualified electricians must work on the electrical system.

Electrical system

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

Danger of electric shock! Do not touch any live components! Live electrical components may suddenly move uncontrollably and seriously injure people.

Therefore:

- Switch off the power supply and disconnect the product permanently before you begin to disassemble it.

 **WARNING!****Risk of injury due to incorrect disassembly**

Stored residual energy, pointed parts and parts with sharp edges or corners on the unit or on tools can cause injuries. Therefore:

Therefore:

- Before you start, make sure that there is sufficient clearance for the work you have to complete.
- Be careful when you touch parts that have sharp edges or corners.
- Disassemble components professionally. Be aware that some components are very heavy. Use lifting gear if necessary.
- Secure components to prevent them from falling or toppling.
- When in doubt, contact the manufacturer.

8.2 Disassembly

Before you start disassembly:

- Switch off the unit and secure it against being switched on accidentally.
- Physically disconnect the unit from the power supply and discharge any residual energy.
- Remove and dispose of any operating fluids, auxiliary materials and leftover processing materials in an environmentally sound manner.

Then professionally clean subassemblies and components and disassemble them in compliance with local occupational safety and environmental protection regulations.

8.3 Disposal

If no take back (disposal) agreement is in place, the various parts should be recycled:

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

 **ENVIRONMENT!****Risk of harm to the environment due to improper disposal!**

Electronic waste, electronic components, lubricating and other auxiliary materials are hazardous waste and must be disposed of by a specialist company.

If you are not sure how to dispose of anything in an environmentally friendly manner, contact your local authorities or a specialist disposal company.

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Appendix

A Schematic illustrations of the system (examples)

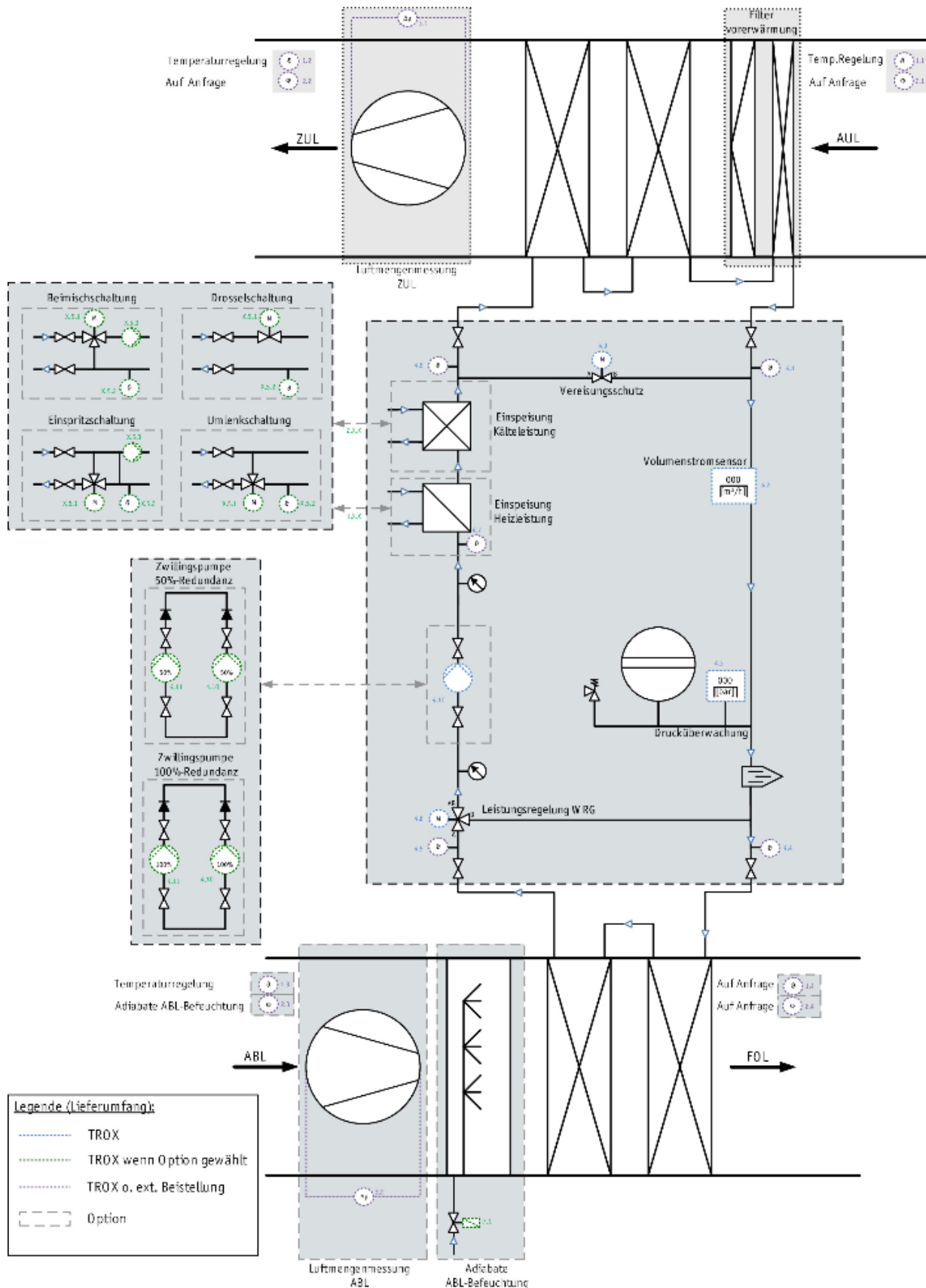


Fig. 55: RAC system with cooling feed

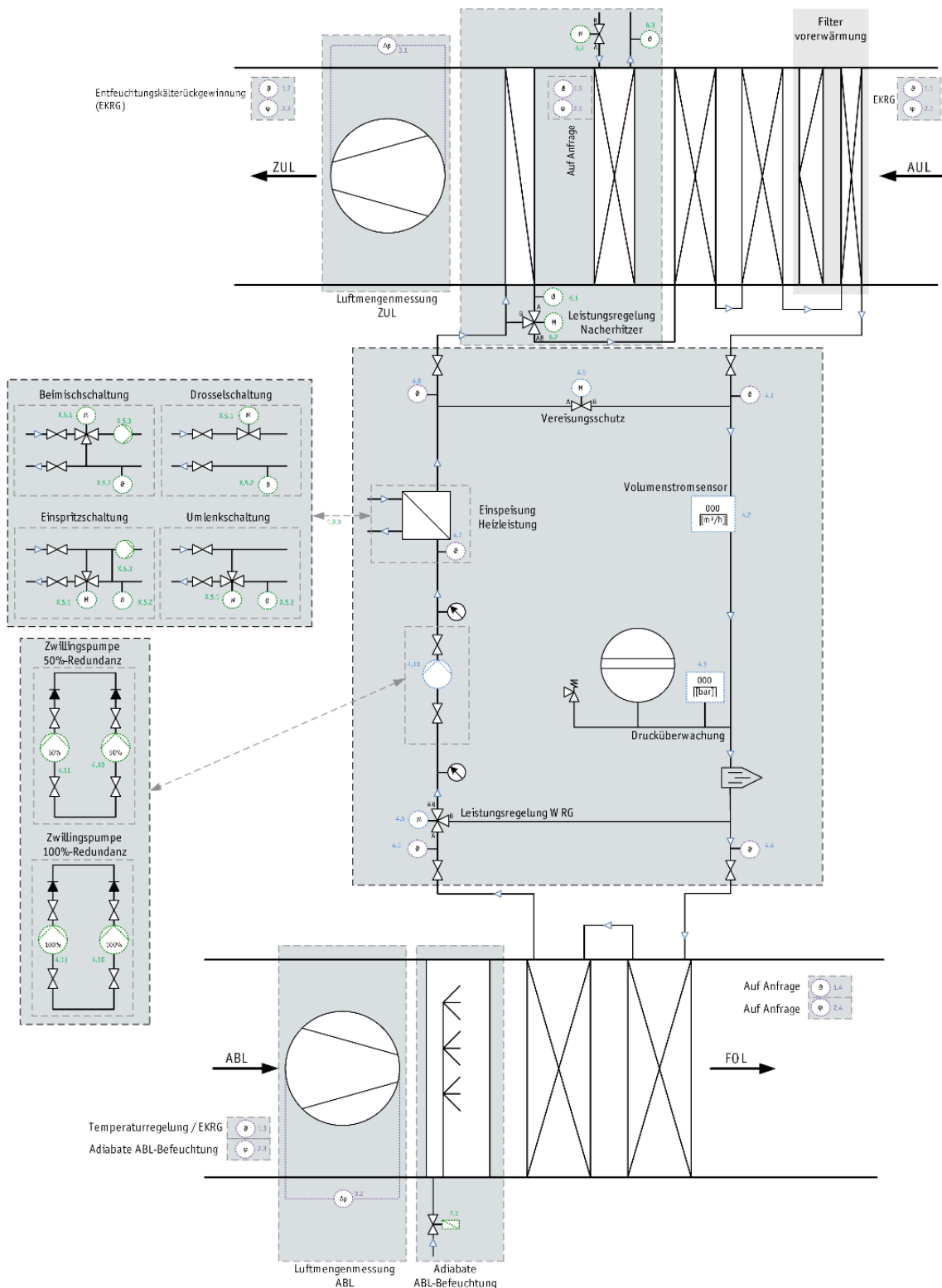


Fig. 56: RAC system with dehumidification cooling recovery

B Supplier documents

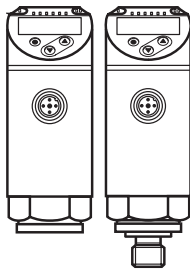
B.1 Pressure sensor



Operating instructions
Electronic pressure sensor
PN7xxx

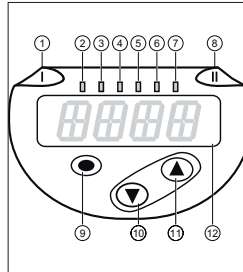


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7 Operating and display elements

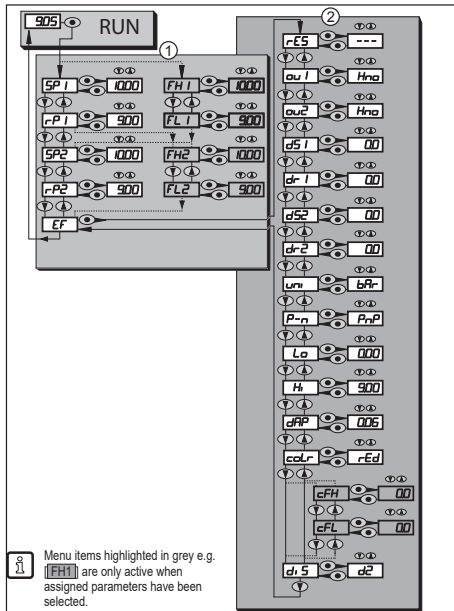


1 to 8: Indicator LEDs	
LED 1	Switching status OUT1 (lights when output 1 is switched).
LED 8	Switching status OUT2 (lights when output 2 is switched).
LEDs 2 - 7	System pressure in the indicated unit of measurement.
9: [Enter] button [•]	
- Selection of the parameters and acknowledgement of the parameter values.	
10 to 11: Arrow keys up [▲] and down [▼]	
- Setting of the parameter values (scrolling by holding pressed; incremental by pressing once).	
12: Alphanumeric display, 4 digits	
- Display of the current system pressure.	
- Indication of the parameters and parameter values.	

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8 Menu

8.1 Menu structure: Main menu



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8.2 Explanation of the menu

8.2.1 Explanation of the menu level 1

SPx/rPx	Upper / lower limit value for system pressure at which OUT1 switches with hysteresis setting. SPx/rPx is displayed if the parameter [Hno] or [Hnc] for OUTx was set in the extended functions "EF" menu.
FHx/FLx	Upper / lower limit value for system pressure at which OUT1 switches with window setting. FHx/FLx is displayed if the parameter [Fno] or [Fnc] for OUTx was set in the extended functions "EF" menu.
EF	Extended functions / opening of menu level 2.

8.2.2 Explanation of the menu level 2

rES	Restore factory setting.
ou1	Output function for OUT1: • Switching signal for the pressure limit values: hysteresis function [H . .] or window function [F . .], either normally open [. no] or normally closed [. nc].
ou2	Output function for OUT2: • Switching signal for the pressure limit values: hysteresis function [H . .] or window function [F . .] as normally open (. no) or normally closed (. nc) each.
dS1 / dS2	Switching delays for OUT1 / OUT2.
dr1 / dr2	Switch-off delay for OUT1 / OUT2.
uni	Standard unit of measurement for system pressure (display): [bAr] / [mbar] / [MPa] / [kPa] / [PSI] / [inHG]
P-n	Output logic: pnp / npn.
Lo	Minimum value memory for system pressure.
Hi	Maximum value memory for system pressure.
dAP	Damping of the measured signal.
colr	Assignment of the display colours "red" and "green" within the measuring range.
cFL / cFH	Lower / upper value for colour change. Parameter only active after selection of a freely definable colour window in the colr parameter: [r-cF] or [G-cF].
dS	Update rate and orientation of the display.

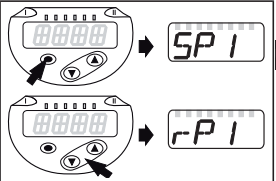
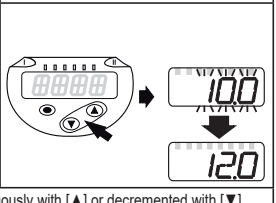
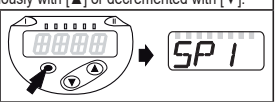
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9 Parameter setting

During parameter setting the unit remains in the operating mode. It continues to monitor with the existing parameters until the parameter setting has been completed.

9.1 Parameter setting in general


3 steps must be taken for each parameter setting:


1	Select parameter ▶ Press [●] to get to the menu. ▶ Press [▲] or [▼] until the requested parameter is displayed.	
2	Set parameter value ▶ Press [●] to edit the selected parameter. ▶ Press [▲] or [▼] for min. 2 s. > After 2 s: setting value is changed: incrementally by pressing the button once or continuously by keeping the button pressed. Numerical values are incremented continuously with [▲] or decremented with [▼].	
3	Acknowledge parameter value ▶ Briefly press [●]. > The parameter is displayed again. The new setting value is saved.	

Set other parameters
▶ Press [▲] or [▼] until the requested parameter is displayed.


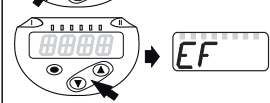
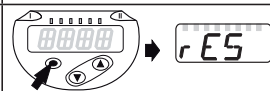
Finish parameter setting
▶ Press [▲] or [▼] several times until the current measured value is displayed or wait for 30 s.
> The unit returns to the process value display.


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 If [C.Loc] is displayed when an attempt is made to modify a parameter value, an IO-Link communication is active (temporary locking).

 If [S.Loc] is displayed, the sensor is permanently locked via software. This locking can only be removed using a parameter setting software.

• Change from menu level 1 to menu level 2:

▶ Press [●] to get to the menu.	
▶ Press [▲] or [▼] until [EF] is displayed.	
▶ Press [●]. > The first parameter of the submenu is displayed (here: [rES]).	

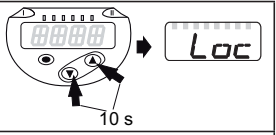
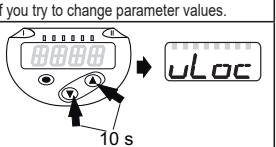
 Change from menu level 1 to menu level 2 when a parameter setting software is used:

▶ Activate the [EF] button.

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• Locking / unlocking

The unit can be locked electronically to prevent unintentional settings.

▶ Make sure that the unit is in the normal operating mode. ▶ Press [▲] + [▼] simultaneously for 10 s. > [Loc] is displayed.	
During operation: [Loc] is briefly displayed if you try to change parameter values.	
For unlocking: ▶ Press [▲] + [▼] simultaneously for 10 s. > [uLoc] is displayed.	



On delivery: not locked.

• Timeout:

If no button is pressed for 30 s during parameter setting, the unit returns to the operating mode with unchanged values.

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9.2 Configure display (optional)

▶ Select [Uni] and set the unit of measurement: - [bAr], [mbar], - [MPa], [kPa], - [PSI], - [inHG]	uni
 The selectable units of measurement depend on the respective unit.	
▶ Select [diS] and set the update rate and orientation of the display: - [d1]: update of the measured values every 50 ms. - [d2]: update of the measured values every 200 ms. - [d3]: update of the measured values every 600 ms. - [rd1], [rd2], [rd3]: display as for d1, d2, d3; rotated by 180°. - [OFF] = The measured value display is deactivated in the Run mode. The LEDs remain active even if the display is deactivated. Error messages are displayed even if the display is deactivated.	diS
 Even with unsteady pressure characteristics [d1] provides optimum readability; the corresponding algorithms are stored.	

9.3 Set output signals

9.3.1 Set output functions ▶ Select [ou1] and set the switching function: - [Hno] = hysteresis function/NO, - [Hnc] = hysteresis function/NC, - [Fno] = window function/NO, - [Fnc] = window function/NC.	ou1
▶ Select [OU2] and set the function: - [Hno] = hysteresis function/NO, - [Hnc] = hysteresis function/NC, - [Fno] = window function/NO, - [Fnc] = window function/NC.	ou2
9.3.2 Define switching limits for the hysteresis function ▶ [ou1] / [ou2] must be set as [Hno] or [Hnc]. ▶ Select [SP1] / [SP2] and set the value at which the output is set.	SP1 SP2
▶ Select [rP1] / [rP2] and set the value at which the output is reset. rPx is always smaller than SPx. The unit only accepts values which are lower than the value for SPx.	rP1 rP2


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9.3.3 Define switching limits for the window function

<ul style="list-style-type: none"> ▶ [ou1] / [ou2] must be set as [Fno] or [Fnc]. ▶ Select [FH1] / [FH2] and set the upper limit value. 	FH1 FH2
<ul style="list-style-type: none"> ▶ Select [FL1] / [FL2] and set the lower limit value. FLx is always lower than FHx. The unit only accepts values which are lower than the value for FHx. 	FL1 FL2

9.4 User settings (optional)

9.4.1 Set delay for the switching outputs

<p>[dS1] / [dS2] = switching delay for OUT1 / OUT2. [dr1] / [dr2] = reset delay for OUT1 / OUT2.</p> <ul style="list-style-type: none"> ▶ Select [dS1], [dS2], [dr1] or [dr2] and set a value between 0 and 50 s (at 0 the delay time is not active). 	dS1 dr1 dS2 dr2
 For this unit the parameters [dSx] und [drx] for the set and reset points are designed strictly to the VDMA guideline.	UK

9.4.2 Set output logic for the switching outputs

<ul style="list-style-type: none"> ▶ Select [P-n] and set [PnP] or [nPn]. 	P-n
--	------------

9.4.3 Set damping for the switching signal

<ul style="list-style-type: none"> ▶ Select [dAP], set the value in seconds; setting range 0.000...4.000 s (τ value: 63 %). At 0.00 [dAP] is not active. 	dAP
---	------------

9.4.4 Read min/max values for the system pressure

<ul style="list-style-type: none"> ▶ Select [Hi] or [Lo] and briefly press [•]. [Hi] = maximum value, [Lo] = minimum value. Delete memory: ▶ Select [Hi] or [Lo]. ▶ Press and hold [▲] or [▼] until [---] is displayed. ▶ Briefly press [•]. 	Hi Lo
--	------------------------

9.4.5 Reset all parameters to factory setting

<ul style="list-style-type: none"> ▶ Select [rES]. ▶ Press [•]. ▶ Press and hold [▲] or [▼] until [---] is displayed. ▶ Briefly press [•]. <p>We recommend noting down your own settings before carrying out a reset (→ 12 Factory setting).</p>	rES
--	------------

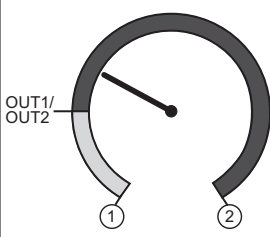
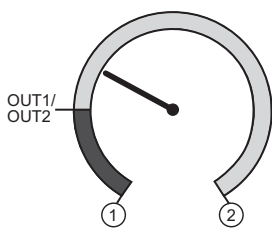
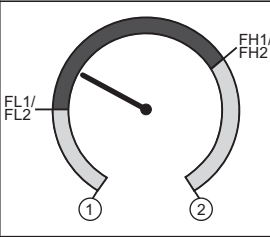
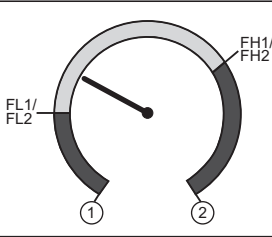






9.4.6 Set colour change of the display

<ul style="list-style-type: none"> ▶ Select [colr] and set the function: <ul style="list-style-type: none"> - [rEd] = display colour red (independent of the measured value). - [GrEn] = display colour green (independent of the measured value). - [r1ou] = display colour red when OUT1 switches. - [G1ou] = display colour green when OUT1 switches. - [r2ou] = display colour red when OUT2 switches. - [G2ou] = display colour green when OUT2 switches. - [r-12] = Display colour red when the measured value is between the limit values of OUT1 and OUT2. - [G-12] = Display colour green when the measured value is between the limit values of OUT1 and OUT2. - [r-cF] = Display colour red when the measured value is between the freely definable limit values [cFL]* and [cFH]*. - [G-cF] = Display colour green when the measured value is between the freely definable limit values [cFL]* and [cFH]*. <p>* The parameters [cFL] and [cFH] can only be selected in the menu tree when [r-cF] or [G-cF] were activated.</p>	colr
<ul style="list-style-type: none"> ▶ Select [cFL] and set the lower limit value (only possible when [r-cF] or [G-cF] were activated). > The setting range corresponds to the measuring range and its maximum limit is [cFH]. 	cFL
<ul style="list-style-type: none"> ▶ Select [cFH] and set the upper limit value (only possible when [r-cF] or [G-cF] were activated). > The setting range corresponds to the measuring range and its minimum limit is [cFL]. 	cFH

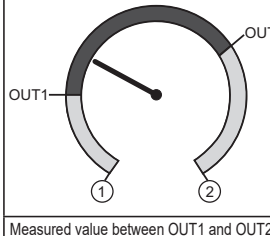
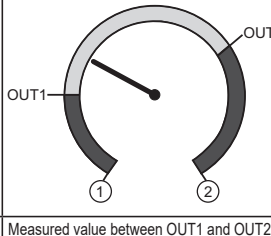
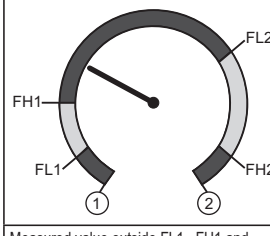
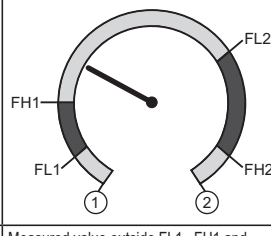






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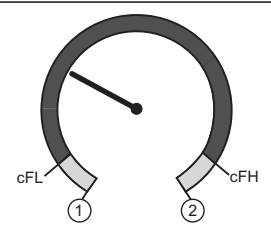
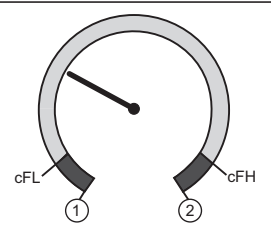
9.4.7 Graphical depiction of the colour change of the display



<p>Display colour change for the parameters [r1ou] / [r2ou], mode hysteresis function</p> 	<p>Display colour change for the parameters [G1ou] / [G2ou], mode hysteresis function</p> 								
<p>Measured value > switch point OUT1/OUT2; Display = red</p>	<p>Measured value > switch point OUT1/OUT2; Display = green</p>								
<p>Display colour change for the parameters [r1ou] / [r2ou], mode window function</p> 	<p>Display colour change for the parameters [G1ou] / [G2ou], mode window function</p> 								
<p>Measured value between FL1/FL2 and FH1/FH2; Display = red</p>	<p>Measured value between FL1/FL2 and FH1/FH2; Display = green</p>								
<table border="1"> <tr><td></td><td>Colour change display green</td></tr> <tr><td></td><td>Colour change display red</td></tr> <tr><td>1</td><td>Initial value of the measuring range</td></tr> <tr><td>2</td><td>Final value of the measuring range</td></tr> </table>		Colour change display green		Colour change display red	1	Initial value of the measuring range	2	Final value of the measuring range	UK
	Colour change display green								
	Colour change display red								
1	Initial value of the measuring range								
2	Final value of the measuring range								

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<p>Display colour change for the parameters [r-12], mode hysteresis function</p> 	<p>Display colour change for the parameters [G-12], mode hysteresis function</p> 												
<p>Measured value between OUT1 and OUT2; Display = red</p>	<p>Measured value between OUT1 and OUT2; Display = green</p>												
<p>Display colour change for the parameters [r-12], mode window function</p> 	<p>Display colour change for the parameters [G-12], mode window function</p> 												
<p>Measured value outside FL1...FH1 and FL2...FH2; Display = red</p>	<p>Measured value outside FL1...FH1 and FL2...FH2; Display = green</p>												
<table border="1"> <tr><td></td><td>Colour change display green</td></tr> <tr><td></td><td>Colour change display red</td></tr> <tr><td>1</td><td>Initial value of the measuring range</td></tr> <tr><td>2</td><td>Final value of the measuring range</td></tr> <tr><td>FL1/FL2</td><td>Lower limit value window function outputs OUT1 / OUT2</td></tr> <tr><td>FH1/FH2</td><td>Upper limit value window function outputs OUT1 / OUT2</td></tr> </table>		Colour change display green		Colour change display red	1	Initial value of the measuring range	2	Final value of the measuring range	FL1/FL2	Lower limit value window function outputs OUT1 / OUT2	FH1/FH2	Upper limit value window function outputs OUT1 / OUT2	
	Colour change display green												
	Colour change display red												
1	Initial value of the measuring range												
2	Final value of the measuring range												
FL1/FL2	Lower limit value window function outputs OUT1 / OUT2												
FH1/FH2	Upper limit value window function outputs OUT1 / OUT2												

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Display colour change with parameter [r-cF] independent of OUT1 / OUT2.	Display colour change with parameter [G-cF] independent of OUT1 / OUT2
	
Measured value between cFL and cFH; Display = red	Measured value between cFL and cFH; Display = green

	Colour change display green
	Colour change display red
1	Initial value of the measuring range
2	Final value of the measuring range
cFL	Lower limit value (independent of the output function)
cFH	Upper limit value (independent of the output function)

10 Operation

After power on, the unit is in the Run mode (= normal operating mode). It carries out its measurement and evaluation functions and provides output signals according to the set parameters.

Operating indicators → 7 Operating and display elements.

10.1 Read set parameters

- ▶ Press [●].
- ▶ Press [▲] or [▼] until the requested parameter is displayed.
- ▶ Briefly press [●].
- > The unit displays the corresponding parameter value for approx. 30 s; then it changes to the process value display.

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11 Technical data and scale drawing

11.1 Setting ranges

		SP1 / SP2		rP1 / rP2		ΔP
		min	max	min	max	
PN7160 PN7560	bar	4	600	2	598	2
	PSI	40	8700	20	8680	20
	MPa	0.4	60	0.2	59.8	0.2
PN7070 PN7570	bar	4	400	2	398	2
	PSI	40	5800	20	5780	20
	MPa	0.4	40	0.2	39.8	0.2
PN7071 PN7571	bar	2	250	1	249	1
	PSI	40	3620	20	3600	20
	MPa	0.2	25	0.1	24.9	0.1
PN7092 PN7592	bar	1	100	0.5	99.5	0.5
	PSI	10	1450	5	1445	5
	MPa	0.1	10	0.05	9.95	0.05
PN7093 PN7593	bar	0.2	25	0.1	24.9	0.1
	PSI	4	362	2	360	2
	MPa	0.02	2.5	0.01	2.49	0.01
PN7094 PN7594	bar	-0.9	10	-0.95	9.95	0.05
	PSI	-13.5	145	-14	144.5	0.5
	MPa	-0.09	1	0.095	0.995	0.005
PN7096 PN7596	bar	0.02	2.5	0.01	2.49	0.01
	PSI	0.4	36.2	0.2	36	0.2
	kPa	2	250	1	249	1
PN7097 PN7597	mbar	10	1000	5	995	5
	PSI	0.1	14.5	0.05	14.45	0.05
	kPa	1	100	0.5	99.5	0.5
	inHG	0.2	29.5	0.1	29.4	0.1

ΔP = step increment

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10.2 Self-diagnosis / error indications

The unit has many self-diagnostic options.

- It monitors itself automatically during operation.
- Warnings and faults are displayed (even if the display is deactivated), in addition they are available via IO-Link.

Display	Status LED OUT1	Status LED OUT2	Type of fault	Corrective measures
none			Supply voltage too low.	▶ Check / correct the supply voltage.
SC	flashes	flashes	Excessive current at switching outputs OUT1 + OUT2 *).	▶ Check switching outputs for short-circuit or excessive current; remove the fault.
SC1	flashes		Excessive current at switching output OUT1 *).	▶ Check switching output OUT1 for short-circuit or excessive current; remove the fault.
SC2		flashes	Excessive current at switching output OUT2 *).	▶ Check switching output OU2 for short-circuit or excessive current; remove the fault.
C.Loc			Parameter setting locked via pushbuttons, parameter setting is active via IO-Link communication (→ 9.1)	▶ Wait until parameter setting via IO-Link is finished.
S.Loc			Setting buttons locked via parameter software. Parameter change is rejected (→ 9.1).	▶ Unlocking only possible via IO-Link interface / parameter software.
OL			Process value too high. (measuring range exceeded)	▶ Check / reduce system pressure / select unit with corresponding measuring range.
UL			Process value too low (value below measuring range).	▶ Check / increase system pressure / select unit with corresponding measuring range.


*) The respective output remains deactivated as long as the excessive current / short circuit continues.

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		SP1 / SP2		rP1 / rP2		ΔP
		min	max	min	max	
PN7099 PN7599	mbar	-980	1000	-990	990	10
	PSI	-14.3	14.5	-14.4	14.4	0.1
	kPa	-98	100	-99	99	1
	inHG	-29	29.6	-29.2	29.4	0.2

ΔP = step increment

11.2 Further technical data

 Further technical data and scale drawing at www.ifm.com → Data sheet search → Enter the article number.

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12 Factory setting

	Factory setting	User setting
SP1	25% VMR *	
rP1	23% VMR *	
OU1	Hno	
OU2	Hno	
SP2	75% VMR *	
rP2	73% VMR *	
dS1	0.0	
dr1	0.0	
dS2	0.0	
dr2	0.0	
P-n	PnP	
dAP	0,06	
Uni	bAr / mbAr	
colr	rEd	
diS	d2	

UK

* = The indicated percentage of the final value of the measuring range (VMR) of the respective sensor (for PN7xx9 the percentage of the measuring span) is set.

More information at www.ifm.com

B.2 Thermokon sensor

PR25

Contact temperature sensor

thermokon[®]
Sensortechnik GmbH

Datasheet

Subject to technical alteration
Issue date: 12.02.2016



Application

Contact temperature sensor for measuring temperature on pipes and arched surfaces.
Designed for control and monitoring systems.

Types Available

PR25	Sensor	passive, with Sensor according to customer's need*
PR25	TRA	active, 4..20 mA
PR25	TRV	active, 0..10 V

* eg: PT100/PT1000/Ni1000/Ni1000TK5000/LM235Z/NTC.../PTC... and other sensors on request.

** Measuring range (TRA/TRV) 1: -50..+50 °C, 2: -10..+120 °C, 3: 0..+50 °C, 4: 0..+150 °C, 8: -15..+35 °C

Security Advice – Caution



The installation and assembly of electrical equipment should only be performed by authorized personnel.

The product should only be used for the intended application. Unauthorised modifications are prohibited! The product must not be used in relation with any equipment that in case of a failure may threaten, directly or indirectly, human health or life or result in danger to human beings, animals or assets. Ensure all power is disconnected before installing. Do not connect to live/operating equipment.

Please comply with

- Local laws, health & safety regulations, technical standards and regulations
- Condition of the device at the time of installation, to ensure safe installation
- This data sheet and installation manual

Thermokon Sensortechnik GmbH - Platanenweg 1 - 35756 Mittenaar - tel.: 02778/6960-0 - fax: -400 - www.thermokon.de - email@thermokon.de

PR25_Datasheet_en.docx © 2016

Notes on Disposal



As a component of a large-scale fixed installation, Thermokon products are intended to be used permanently as part of a building or a structure at a pre-defined and dedicated location, hence the Waste Electrical and Electronic Act (WEEE) is not applicable. However, most of the products may contain valuable materials that should be recycled and not disposed of as domestic waste. Please note the relevant regulations for local disposal.

General remarks concerning sensors

Especially with regard to passive sensors in 2-wire conductor versions, the wire resistance of the supply wire has to be considered. If necessary the wire resistance has to be compensated by the follow-up electronics. Due to self-heating, the wire current affects the measurement accuracy, so it should not exceed 1 mA.

When using lengthy connection wires (depending on the cross section used) the measuring result might be falsified due to a voltage drop at the common GND-wire (caused by the voltage current and the line resistance). In this case, 2 GND-wires must be wired to the sensor - one for supply voltage and one for the measuring current.

Sensing devices with a transducer should always be operated in the middle of the measuring range to avoid deviations at the measuring end points. The ambient temperature of the transducer electronics should be kept constant. The transducers must be operated at a constant supply voltage ($\pm 0,2$ V). When switching the supply voltage on/off, onsite power surges must be avoided.

Build-up of Self-Heating by Electrical Dissipative Power

Temperature sensors with electronic components always have a dissipative power, which affects the temperature measurement of the ambient air. The dissipation in active temperature sensors shows a linear increase with rising operating voltage. This dissipative power has to be considered when measuring temperature. In case of a fixed operating voltage ($\pm 0,2$ V) this is normally done by adding or reducing a constant offset value. As Thermokon transducers work with a variable operating voltage, only one operating voltage can be taken into consideration, for reasons of production engineering. Transducers 0..10 V / 4..20 mA have a standard setting at an operating voltage of 24 V =. That means, that at this voltage, the expected measuring error of the output signal will be the least. For other operating voltages, the offset error will be increased by a changing power loss of the sensor electronics. If a re-calibration should become necessary later directly on the sensor, this can be done by means of a trimming potentiometer on the sensor board.

Remark: Occurring draft leads to a better carrying-off of dissipative power at the sensor. Thus temporally limited fluctuations might occur upon temperature measurement.

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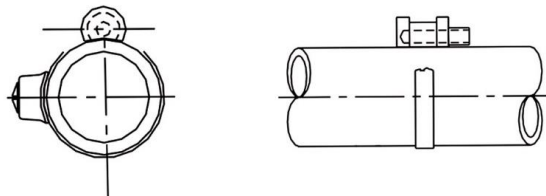
Technical Data

Measuring values		temperature
Output voltage	passive TRV	depending on used sensor 0..10 V, min. load 5 k Ω
Output Amp	TRA	4..20 mA, max. load 500 Ω
Power supply	TRV TRA	15..24 V = (\pm 10%) or 24 V ~ (\pm 10%), 15..24 V = (\pm 10%)
Power consumption	TRV TRA	typ. 0,4 W (24 V =) | 0,8 VA (24 V ~) typ. 0,5 W (24 V =)
Measuring range temp	passive TRV | TRA TRV1 | TRA1 TRV2 | TRA2 TRV3 | TRA3 TRV4 | TRA4 TRV8 | TRA8	depending on used sensor adjustable at the transducer -50..+50 °C -10..+120 °C 0..+50 °C 0..+160 °C -15..+35 °C
Accuracy temperature	passive TRV | TRA	depending on length of the connection wire depending on used sensor \pm 1% of measuring range (typ. at 21 °C)
Sensor	passive	2-wire (standard), 3-wire or 4-wire
Enclosure		PA6, pure white, with quick lock screws, (only active)
Protection		IP65 according to DIN EN 60529, SI-Protection
Cable entry		M20 for cable max. \varnothing =8 mm
Connection electrical	TRV | TRA	terminal block max. 1,5 mm ² connection wire PVC, \varnothing =25 mm, sensor wire active silicone, \varnothing =25 mm, 1 m (standard), 2 m, 4 m, 6 m, for other lengths please request
Pocket		aluminium, \varnothing =11 mm, mounting length 28 mm
Ambient condition	Enclosure	-35..+100 °C, max. 85% rH short term condensation -35..+70 °C, max. 85% rH short term condensation
Weight	passive TRV | TRA	35 g 125 g
Notes		other sensors and cable lengths on request

Mounting Advices

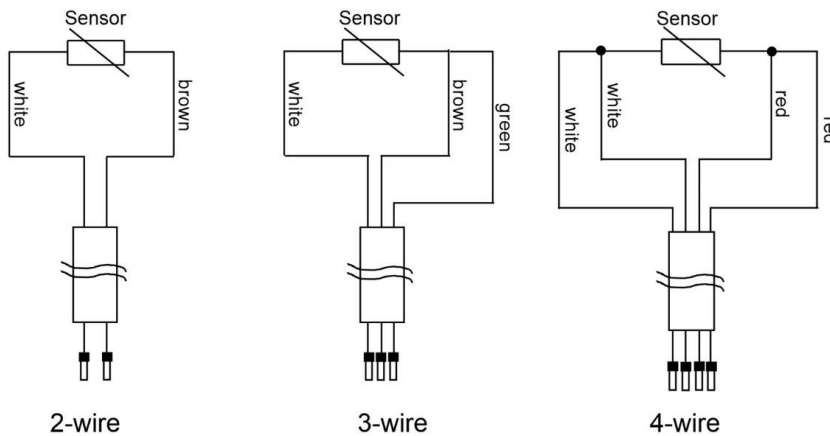
Fixing is done by tightening strap. Use contact fluid for better heat transfer between sensor and measuring medium.

To avoid permeation of condensate, mount the sensor on top of the tube, if possible.

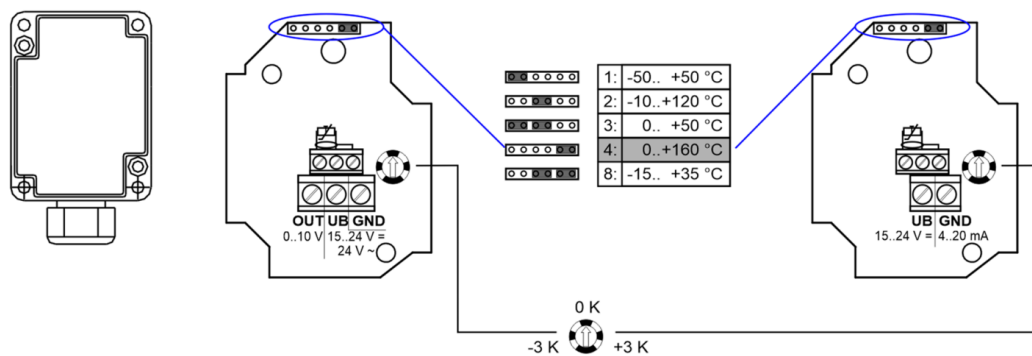


Connection Plan

Passive



Active

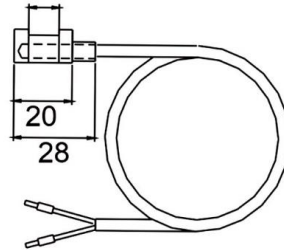
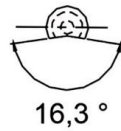
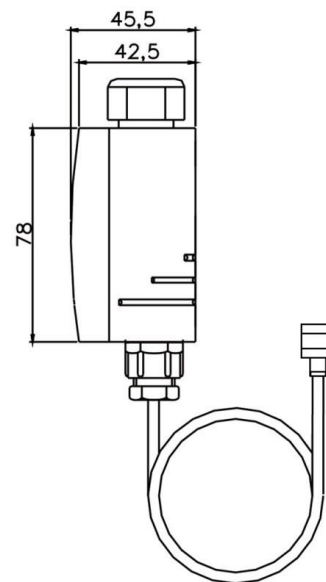
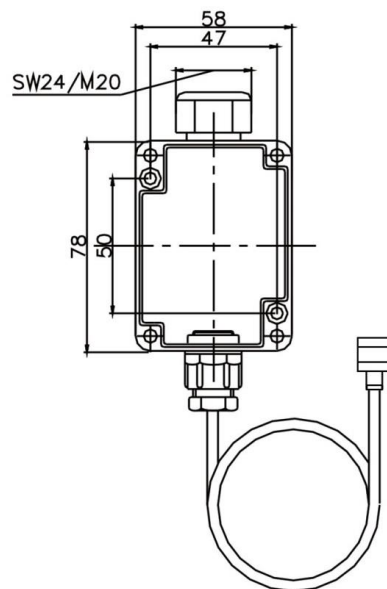


Caution

With electronic sensors e.g. AD592, SMT160, LM235, DS1820 use: brown= plus (+), white= minus (-), green=out

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Dimensions (mm)**Passive****Active****Accessories (optional)**

Tightening strap 2" with contact fluid
Tightening strap 900 mm with contact fluid

Item No. 102254
Item No. 102315

B.3 Differential pressure sensor

INSTRUCTIONS

PTH-6201 & PTH-6202 & PTH-6502

57065A 03/12 - (MBC)



- Svenska
- Norsk
- Dansk
- English
- Deutsch
- Français

Svenska

FIGURÖVERSIKT

- Följande figurer finns längst bak i instruktionen:
- Fig. 1: Måttitrning
 Fig. 2: Placering av transmitter mht. krökar och förgreningar
 Fig. 3: Anslutningsritning PTH-6202/6502
 Fig. 4: Modbusanslutningar
 Fig. 5: Konfigurationsexempel
 Fig. 6: Anslutningsritning PTH-6201

ALLMÄNT

PTH-6201/6202/6502 är en elektrisk transmitter som kommunicerar via RS485 RTU Modbus och är primärt användbar som mätning av differenstryck i en ventilationsanläggning. Trycktransmittern används i samband med övervakning, kontroll och reglering via en elektronisk regulator, t.ex. PLC-, BMS- eller SCADA-system. Alla kommandon och data mellan PTH-6201/6202/6502 och regulatornheten skickas som digitala värden via RS485 RTU Modbus-protokoll. Den integrerade Modbus-kommunikationen gör PTH-6201/6202/6502 attraktiv för integrering i PLC-, BMS- och SCADA-system som reducerad installationskostnad.

Normala användningsområden:

- Mätning av tryck på given plats i ventilationsanläggning
- Differenstryckmätning över ett ventilationsfilter för optimalt filterbyte
- Differensmätning över en ventilator för reglering av kanaltryck

PRODUKTPROGRAM

Typ	Produkt
PTH-6201	RS485 RTU Modbus, IP54, 1,5 mm ²
PTH-6202	RS485 RTU Modbus, IP54, RJ12, 2500 Pa
PTH-6502	RS485 RTU Modbus, IP54, RJ12, 5000 Pa

FUNKTION

PTH-6201/6202/6502 är en trycktransmitter för komfort- eller processventilation som kommunicerar via RS485-Modbus med en ansluten regulatornhet (se fig. 5) och som via Modbus-kommunikationen visar ett värde, beroende på inställt mätområde, i den anslutna regulatornheten som är proportionalt med det uppmätta trycket. PTH är konstruerat med halvedartryckmätarelement luftgenomströmning – vilket skyddar mot damm från ventilationsanläggningen. Tryckelementet är temperaturkompenserat så att trycket mäts optimalt över hela det specificerade temperaturområdet (se "Tekniska data").

INSTALLATION

Kapslingen öppnas verktygsfritt genom att trycka på snäpplåset som går ner på sidan av studsarna.

PTH-6201/6202/6502 fästs på plan yta med 2 skruvar på fast underlag. PTH-6201/6202/6502 kan valfritt monteras i alla riktningar utan att precisionen påverkas. PTH-6201/6202/6502 fungerar även med endast en slang monterad på studsarna (+ eller -), men av hänsyn till bevaringen av kapslingsgraden bör det finnas slangar på båda slangstudsarna – om studsarna inte pekar nedåt.

Tryckmätningen ansluts med hjälp av slangar på så sätt att det högsta trycket går till "+"-studsen och det lägsta trycket går till "-"-studsen (se fig. 3).

Tryckslangarna ska vara så korta som möjligt och fästas så att vibrationer undviks.

Med hänsyn till optimal tryckmätning ska trycket mätas där det är minsta möjliga risk för turbulent strömning. D.v.s. mitt i ventilationskanalerna och med ett avstånd på minst två gånger kanaldiametern från krökar och sex gånger till förgreningar (se fig. 2). Om det finns risk för kondensbildning i anslutnings slangarna ska PTH-6201/6202/6502 placeras så att den kondenserande vätskan inte kan rinna tillbaka in i trycktransmittern. Kapslingen har inbyggda fastgöringshål (se fig. 1).

Installering av Modbus-kabel

Kapslingen öppnas verktygsfritt genom att trycka på snäpplåset som går ner på sidan av studsarna.

PTH-6201: Du ansluter Modbus till PTH-6201 i de 4 plintarna. PTH-6201 har 4 skruvplintar för anslutning och slingning av Modbus till de övriga Modbus-komponenterna i applikationen. Matningsspänningen till PTH-6201 är 24 V DC. Den ska anslutas till PTH-6201 i plintarna 1 (+) och 4 (-), se fig. 6.

PTH-6202/6502: Modbus ansluts till PTH-6202/6502 via RJ12 stickkontakt. PTH-6202/6502 är utrustad med 2 st. Modbus RJ12 stickkontakter för anslutning och slinganslutning av Modbus till övriga Modbuskomponenter i applikationen. Strömförsörjningen för PTH-6202/6502 är 24 V DC och PTH-6202/6502 driftförsörjs via RJ12 stickkontakt (se fig. 4). Kapslingen är försedd med ett gummimembran, både på locket och på kapslingens nedre kant, så att Modbus-kabeln (flatkabel, kabeltyp MPFK6S eller motsvarande) kan ledas in i kapslingen via locköppningen. När locket är stängt sluter gummimembranet så tätt runt Modbus-kabeln att kapslingen uppfyller IP54.

TEKNISKA DATA

Strömförsörjning..... 24 V DC ±15% via Modbus
 Elanslutning, PTH-6201..... 4 skruvplintar,
max 1,5 mm²

Elanslutning, PTH-6202/6502 2 st. RJ12 6/6
stickkontakter
 Modbusprotokoll 38,4 kBaund, 1 startbit,
8 databits, 1 stopbit.
 Mätområden tryck 6201/6202 0 – 2 500 Pa
 Mätområden tryck 6502 0 – 5 000 Pa
 Max. höjd över havet.....1 300 m
 Precision, utgångssignal, PTH-6201/6202
0,5 %xMV + 2,5 Pa
 Precision, utgångssignal, PTH-6502
0,5 %xMV + 5,0 Pa
 (MV = uppmätt värde)

Maximalt tryck20 kPa
 Luftfuktighet 10-95% RH ej kondenserande
 Dimensioner kapsling75 x 36 x 91 mm
 Kabeldimension MPFK6S eller motsvarande
 Tryckslangar2 x ø 6,2

Miljödata

Effektförbrukning.....4 VA (-20/+5 °C)
2,5 VA (+5/+40 °C)
 Omgivningstemperatur.....-20/+40 °C, drift
 (kortvarigt -30/+50 °C)
 Omgivningstemperatur förvaring.....-50/+70 °C
 Kapslingsklass.....IP54
 Vikt.....110 g

DRIFT

Statusljus vid normal drift:

När strömförsörjningen från Modbus är ansluten indikeras detta med att "Power ON" (grön LED) lyser. Giltig kommunikation på Modbus indikeras också med en "Modbus Communications" (gul LED) som blinkar beroende på kommunikationsintensitet.

LED	ON (TILL)	BLINKAR	OFF [FRÅN]
Översta (gul)		Valid Modbus kommunikation (giltig)	Invalid Modbus kommunikation (ogiltig)
Nedersta (grön)	Power ON (till)		Power OFF (från)

Modbus-protokoll

PTH-6201/6202/6502 har ett adresseringsområde på 16 och kan ställas in på adresser mellan 0x50 (hex) (dec. 80) och 0x5F (hex) (dec.95) och kommunikations-protokollet är: 38,4 kB, 1 startbit, 8 databits, 1 stopbit och ingen paritet. Adressen ställs in på adressväxlaren i PTH-6201/6202/6502.

Modbus adresser

HexEn koder: ID
 0 – 0x59 (89 dec)
 1 – 0x56 (86 dec)
 2 – 0x50 (80 dec)
 3 – 0x51 (81 dec)
 4 – 0x57 (87 dec)
 5 – 0x52 (82 dec)
 6 – 0x58 (88 dec)
 7 – 0x55 (85 dec)
 8 – 0x53 (83 dec)
 9 – 0x54 (84 dec)
 10 – 0x5A (90 dec)
 11 – 0x5B (91 dec)
 12 – 0x5C (92 dec)
 13 – 0x5D (93 dec)

14 – 0X5E (94 dec)
15 – 0X5F (95 dec)

HOLDING

Addr-0 (REG-1) ExternCalibrate
Kalibrerings Status (1 = Nollkalibrering)

INGÅNG:

Addr-0 (REG-1) SoftwareVer Software
Version 1/100
Addr-1 (REG-2) Tryck Sensortryck i Pa
Addr-4 (REG-5) PressHiRes Givartryck i 0,1
pA
Addr-5 (REG-6) PressAvrDyn Dynamisk med-
elvärdesbildning
av PressHiRes
Addr-6 (REG-7) PressAvrAbs Dynamisk med-
elvärdesbildning
av de 30 senaste
mätningarna på
PressHiRes

SERVICE OCH UNDERHÅLL

PTH-6201/6202/6502 innehåller inga komponenter som kräver service eller underhåll. Kontakta leverantören om det uppstår problem.

MILJÖ OCH AVFALLSHANTERING

Hjälp till att skydda miljön genom att göra dig av med emballage och använda produkter enligt gällande miljöföreskrifter.

Bortskaffning av produkten

Produkter med detta märka får inte slängas bland vanligt hushållsavfall utan ska samlas in separat enligt gällande lokala miljöföreskrifter.

OJ Electronics A/S

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Tel. +45 73 12 13 14 • Fax +45 73 12 13 13
oj@ojelectronics.com • www.ojelectronics.com

CE-MÄRKNING

OJ Electronics A/S intygar under ansvar att denna produkt uppfyller Rådets direktiv 92/31 och efterföljande ändringar betr. elektromagnetisk kompatibilitet samt Rådets direktiv 73/23 och efterföljande ändringar betr. elektriskt materiel ämnat för användning inom vissa spänningsgränser.

Använda normer

EMC-emission SS-EN 61000-6-3:2001
EMC-immunitet SS-EN 61000-6-2:2001

Norsk**FIGUROVERSIKT**

Følgende figurer finnes bakerst i instruksjonen:

- Fig. 1: Målskisse
Fig. 2: Plassering av transmitter i forh. til bend og forgreninger
Fig. 3: Tilkoblingsdiagram, PTH-6202/6502
Fig. 4: Modbus-tilkoblinger
Fig. 5: Konfigurasjonseksempel
Fig. 6: Tilkoblingsdiagram, PTH-6201

GENERELT

PTH-6201/6202/6502 er en elektronisk trykkt transmitter som kommuniserer via RS485 RTU Modbus og er primært egnet til å måle differansetrykk i et ventilasjonsanlegg. Trykkt transmitteren benyttes i forbindelse med overvåking, kontroll og regulering via en elektronisk regulator, eks. PLC-, BMS- eller SCADA-system, og alle kommandoer og data mellom PTH-6201/6202/6502 og regulatorenheten sendes som digitale verdier via RS485 RTU Modbus-protokoll. Den integrerte Modbus-kommunikasjonen gjør PTH-6201/6202/6502 gunstig til integrering i PLC-, BMS- og SCADA-systemer i form av reduserte installeringskostnader.

Typiske bruksområder er:

- Måling av et trykk på et bestemt sted i et ventilasjonsanlegg
- Differansetrykkmåling over et ventilasjonsfilter for optimal utskifting av filter
- Differansetrykkmåling over en vifte for regulering av kanaltrykk

PRODUKTPROGRAM

Type	Produkt
PTH-6201	RS485 RTU Modbus, IP54, 1,5 mm ²
PTH-6202	RS485 RTU Modbus, IP54, RJ12, 2500 Pa
PTH-6502	RS485 RTU Modbus, IP54, RJ12, 5000 Pa

FUNKSJON

PTH-6201/6202/6502 er en trykkt transmitter for komfort- eller prosessventilasjon som kommuniserer via RS485-Modbus med en tilkoblet regulatorenhet (se fig. 5). Via Modbus-kommunikasjonen viser den en verdi som er proporsjonal med det målte trykket avhengig av innstilt måleområde, i den tilkoblede regulatorenheten. PTH er bygd opp med et halvleder-trykkmålingselement uten luftgjennomstrømning. Det beskytter mot støv fra ventilasjonsanlegget. Trykkelementet er temperaturkompensert, slik at det oppnås optimal trykkmåling i hele det spesifiserte temperaturområdet (se "Tekniske data").

INSTALLASJON

Man kan åpne kapslingen uten å bruke verktøy ved å trykke på smekklåsen som er plassert ved siden av stussene.

PTH-6201/6202/6502 festes på en plan flate med 2 skruer på et fast underlag. PTH-6201/6202/6502 kan monteres valgfritt i alle retninger uten at nøyaktigheten blir påvirket. PTH-6201/6202/6502 fungerer også med kun én slange montert på stussene (+ eller -), men for å overholde kapslingsklassen bør det være slanger på begge slangestussene hvis stussene ikke vender ned.

Trykkmålingen tilkobles ved hjelp av slanger slik at det høyeste trykket går til "+ stussen" og det laveste trykket til "- stussen" (se fig. 3). Trykkslangene må være så korte som mulig, og festes slik at man unngår vibrasjoner.

Av hensyn til optimal trykkmåling må trykket måles der det er minst mulig risiko for turbulent strøm, dvs. midt i ventilasjonskanaler og med en avstand på minst to ganger kanal diameteren fra bend og 6 ganger til forgreninger (se fig. 2). Hvis det er fare for kondensdannelse i tilkoblingslangene, må PTH-6201/6202/6502 plasseres slik at den kondenserte væsken ikke kan renne tilbake inn i trykkt transmitteren. Kapslingen har innebygde festehuller (se fig. 1).

Installasjon av Modbus-kabel

Kapslingen åpnes uten bruk av verktøy ved å trykke på smekklåsen, som går ned ved siden av stussene.

PTH-6201: Modbus kobles til PTH-6201 via de 4 klemmeterminalene. PTH-6201 har 4 stk. skrueterminaler for tilkobling og parallellkobling av Modbus til andre Modbus-komponenter i oppsettet. Matespenningen til PTH-6201 er 24 V DC og PTH-6201 får spenning fra skrueterminalens klemme 1(+) og 4 (GND), se fig. 6.

PTH-6202/6502: Modbus tilkobles PTH-6202/6502 via RJ12-pluggen. PTH-6202/6502 har 2 stk. Modbus RJ12-pluggen for tilkobling og parallellkobling av Modbus til andre Modbus-komponenter i oppsettet. Spenningen til PTH-6202/6502 er 24 V DC, og PTH-6202/6502 får spenning gjennom RJ12-plugg (se fig. 4). Kapslingen har en gummimembran på både lokket og den nederste kanten av kapslingen slik at Modbus-kabelen (flatkabel som kabeltype MPFK6S eller tilsvarende) kan føres inn i kapslingen gjennom lokkåpningen. Når lokket er stengt, sitter gummimembranen så tett omkring Modbus-kabelen at kapslingen overholder IP54.

FELSØKNING

Symptom	Orsak	Åtgård
Inget ljus i den grønne lysdioden	Matningsspänning saknas	Kontrollera matningsspänning Kontrollera elanslutningar
	Defekt PTH-6201/6202/6502	Kontrollera stickkontakter Byt ut PTH-6201/6202/6502
Inget ljus i den gula lysdioden	Avbrott eller kortslutning i Modbus	Kontrollera elanslutningarna längs hela Modbus
	Fel adress	Ställ in korrekt Modbusadress på adressväljare i PTH-6201/6202/6502
	Felaktig kommunikationshastighet	Ställ in kommunikationen: 38,4 kBaud, 1 startbit, 8 databits, 1 stopbit, ingen paritet
	Defekt PTH-6201/6202/6502	Byt ut PTH-6201/6202/6502
Negativt avläst mätvärde	Slanger förväxlade	Placera om anslutningslångar till plus (+) och minus (-) anslutningsstuds
	Defekt PTH-6201/6202/6502	Byt ut PTH-6201/6202/6502
Mätavvikelse	PTH-6201/6202/6502 är placerad i temperatur utanför angivet temperaturområde	Anpassa omgivningstemperaturen till det området som anges i denna anvisning
	Bristfällig eller reducerad förbindelse genom mättryckslångar	Kontrollera mättryckslångar beträffande korrekt montering
	Tryck saknas i mätpunkter	Starta fläkten
	Defekt PTH-6201/6202/6502	Byt ut PTH-6201/6202/6502
Nollpunktsavvikelse	Ingen nollkalibrering	Gör PTH-6201/6202/6502 trycklös ev. genom att avlägsna båda tryckslångarna och genomför nollkalibrering.
	Defekt PTH-6201/6202/6502	Byt ut PTH-6201/6202/6502

TEKNISKE DATA

Matespenning 24 V DC \pm 15 % via Modbus
Elektrisk tilkobling, PTH-6201
..... 4 x skrueterminaler, maks. 1,5 mm²
Elektrisk tilkobling, PTH-6202/6502 ..2 stk. RJ12
..... 6/6-plugger
Modbusprotokoll 38,4 kBaud, 1 startbit,
..... 8 databits, 1 stoppbit
Måleområder trykk, PTH-6201/6202.. 0/2500 Pa
Måleområder trykk, PTH-6502 0/5000 Pa
Maks. høyde over havet 1300 m
Nøyaktighet, utgangssignal, PTH-6201/6202
..... 0,5 %xMV + 2,5 Pa
Nøyaktighet, utgangssignal, PTH-6502
..... 0,5 %xMV + 5,0 Pa
(MV = målt verdi)
Maksimalt trykk 20 kPa
Luftfuktighet ... 10-95 % RF ikke kondenserende
Dimensjoner kapsling 75 x 36 x 91 mm
Kabeldimensjon MPFK6S eller tilsvarende
Trykkslanger 2 x ϕ 6,2

Miljødata

Effektforbruk 4 VA (-20/+5 °C) 2,5 VA (+5/+40 °C)
Omgivelsestemperatur -20/+40 °C, drift
..... (kortvarig -30/+50 °C)
Omgivelsestemperatur lagring -50/+70 °C
Kapslingsklasse IP54
Vekt 110 g

DRIFT

Statuslys ved normal drift:
Når spenningen fra Modbus er tilkoblet, vises
dette ved at "Strøm PÅ" (grønt LED) lyser. Gyldig
kommunikasjon på Modbus vises dessuten
ved at "Modbus-kommunikasjon" (gul LED)
blinker avhengig av kommunikasjonsintensitet.

LED	PÅ	BLINK	AV
Øverste (grønt)		Gyldig Modbus-kommunikasjon	Ugyldig Modbus-kommunikasjon
Nederste (gul)	Strøm PÅ		Strøm AV

Modbus-protokoll

PTH-6201/6202/6502 har et adresseringsområde på 16, og kan innstilles til adressene mellom 0x50 (hex) (des. 80) og 0x5F (hex) (dec.95) og kommunikasjonsprotokollen er: 38,4 kB, 1 startbit, 8 databits, 1 stoppbit og ingen paritet. Adressen innstilles på adresseveksleren i PTH-6201/6202/6502.

Modbus-adresser

HexKoder: ID

0-	0x59(89 des)
1-	0x56(86 des)
2-	0x50(80 des)
3-	0x51(81 des)
4-	0x57(87 des)
5-	0x52(82 des)
6-	0x58(88 des)
7-	0x55(85 des)
8-	0x53(83 des)
9-	0x54(84 des)
10-	0x5A(90 des)
11-	0x5B(91 des)
12-	0x5C(92 des)
13-	0x5D(93 des)
14-	0x5E(94 des)
15-	0x5F(95 des)

HOLDING:

Adr-0 (REG-1)
EksernKalibrering
Kalibreringsstatus (1 = NullKalibrering)

INPUT:

Adr-0 (REG-1) ProgramvareVer Programvare
Versjon 1/100
Adr-1 (REG-2) Trykk Følertrykk i Pa
Addr-4 (REG-5) PressHiRes Følertrykk i 0,1
Pa
Addr-5 (REG-6) PressAvrDyn Dynamisk
gjennomsnittsberegning av
PressHiRes
Addr-6 (REG-7) PressAvrAbs Dynamisk
gjennomsnittsberegning av
de 30 siste målingene på
PressHiRes


SERVICE OG VEDLIGEHOLD

PTH-6201/6202/6502 inneholder ingen komponenter som krever service eller vedlikehold. Kontakt vennligst leverandøren i tilfelle av problemer.

MILJØ OG FJERNING AV AVFALL

Vær med på å beskytte miljøet ved å avhende emballasje og brukte produkter på en miljøriktig måte.

Kassering av produktet

 Produkter med dette merket må ikke avhendes som alminnelig husholdningsavfall, men må samles inn særskilt i henhold til de gjeldende lokale regler.

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CE-MERKING

OJ Electronics A/S erklærer herved at dette produktet oppfyller Rådets direktiv 92/31 og senere endringer om elektromagnetisk kompatibilitet, og Rådets direktiv 73/23 og senere endringer om elektrisk materiell som er bestemt til bruk innenfor visse spenningsgrenser.

Benyttede standarder

EMC-emisjon EN 61000-6-3:2001
EMC-immunitet EN 61000-6-2:2001

Dansk**FIGUROVERSICHT**

Følgende figurer finnes bakerst i instruksjonen:
Fig. 1: Målskitse
Fig. 2: Placering af transmitter i fh.t. bøjninger og forgreninger
Fig. 3: Tilslutningsdiagram, PTH-6202/6502
Fig. 4: Modbus connections
Fig. 5: Konfigurations eksempel
Fig. 6: Tilslutningsprogram, PTH-6201

GENERELT

PTH-6201/6202/6502 er en elektronisk tryktransmitter som kommuniserer via RS485 RTU Modbus og er primært anvendelig til måling differensstryk i et ventilationsanlæg. Tryktransmitteren anvendes i forbindelse med overvåging, kontrol og regulering via en elektronisk regulator, eks. PLC-, BMS- eller SCADA-system og alle kommandoer og data mellem PTH-6201/6202/6502 og regulatorenheden sendes som digitale værdier via RS485 RTU Modbus-protokol. Den integrerede Modbus kommunikation gør PTH-6201/6202/6502 attraktiv til integration i PLC-, BMS- og SCADA-systemer i form af reducerede installationsomkostninger. Typiske anvendelses områder er:

- Måling af et tryk på et givet sted i et ventilationsanlæg.
- Differensstrykmåling over et ventilationsfilter

FEILSØKING

Symptom	Årsak	Handling
Ikke lys i den grønne LED-en	Manglende matespenning	Kontroller matespenning Kontroller elektriske forbindelser Kontroller kontakter
	Defekt PTH-6201/6202/6502	Bytt PTH-6201/6202/6502
Ikke lys i den gule LED-en	Avbrutt/kortsluttet Modbus	Kontroller elektriske kontakter på hele lengden av Modbus
	Feil adresse	Innstill korrekt Modbusadresse på adressevelger i PTH-6201/6202/6502
	Gal kommunikasjonshastighet	Innstill kommunikasjon: 38,4 kBaud, 1 startbit, 8 databits, 1 stoppbit, ingen paritet
	Defekt PTH-6201/6202/6502	Bytt PTH-6201/6202/6502
Negativ vist måleverdi	Slanger byttet om	Bytt om tilkoblingsslanger på pluss (+) og minus (-) tilkoblingstusser
	Defekt PTH-6201/6202/6502	Bytt PTH-6201/6202/6502
Måleavvik	PTH-6201/6202/6502 er plassert i temperatur utenfor angitt temperaturområde	Tilpass omgivelsestemperatur til det området som er angitt i denne instruksjonen
	Manglende eller redusert forbindelse gjennom måletrykkslanger	Kontroller måletrykkslanger for riktig montasje
	Manglende trykk på målepunkter	Start viften
	Defekt PTH-6201/6202/6502	Bytt PTH-6201/6202/6502
Nullpunktsavvik	Manglende null-kalibrering	Gjør PTH-6201/6202/6502 trykklos ev. ved å fjerne begge trykkslangene og utføre nullkalibrering.
	Defekt PTH-6201/6202/6502	PTH-6201/6202/6502

for optimal udskiftning af filter
- Differenstrykmåling over en ventilator for regulering af kanaltryk

PRODUKTPROGRAM

Type	Produkt
PTH-6201	RS485 RTU Modbus, IP54, 1,5 mm ²
PTH-6202	RS485 RTU Modbus, IP54, RJ12, 2500 Pa
PTH-6502	RS485 RTU Modbus, IP54, RJ12, 5000 Pa

FUNKTION

PTH-6201/6202/6502 er en tryktransmitter til komfort- eller procesventilation som kommunikerer via RS485-Modbus med en tilsluttet regulatorenhed (se fig. 5) og via Modbus kommunikationen, viser en værdi afhængig af indstillet måleområde, i den tilsluttede regulatorenhed som er proportionalt med det målte tryk. PTH er opbygget med et halveder trykmålingselement uden luftgennemstrømning, hvilket beskytter mod støv fra ventilationsanlægget. Trykelementet er temperaturkompenseret, således at der opnås optimal trykmåling i hele det specificerede temperaturområde. (Se "Tekniske Data")

INSTALLATION

Åbning af kapslingen foregår uden brug af værktøj ved at trykke på snaplåsen, som er placeret ved siden af studsene. PTH-6201/6202/6502 fastgøres på en plan flade med 2 skruer på et fast underlag. PTH-6201/6202/6502 kan monteres valgfrit i alle retninger uden nøjagtigheden påvirkes. PTH-6201/6202/6502 fungerer også med kun én slange monteret på studsene (+ eller -) men af hensyn til opretholdelsen af kapslingsgraden bør der være slanger på begge slangestudser, hvis studsene ikke vender nedad. Trykmålingen tilsluttes ved hjælp af slanger, således det højeste tryk går til "+ studsen" og det laveste tryk til "- studsen" (se fig. 3). Trykslangerne skal være så korte som muligt og fastgøres, så vibrationer undgås. Af hensyn til optimal trykmåling skal trykret måles, hvor der er mindst mulig risiko for turbulent strømning, hvilket vil sige midt i ventilationskanaler og med en afstand på mindst to gange kanaldiameteren fra bøjninger og 6 gange til forgreninger. (se fig. 2). Hvis der er fare for kondensdannelse i tilslutningslanger, skal PTH-6201/6202/6502 placeres således at den kondenserende væske ikke kan løbe tilbage ind i tryktransmitteren. Kapslingen har indbyggede fastgørelseskapsler, se fig. 1.

Installation af Modbus-kabel

Kapslingen åbnes uden brug af værktøj ved at trykke på snaplåsen, som går ned ved siden af studsene. PTH-6201: Modbus tilsluttes PTH-6201 via de 4 klemmeterminaler. PTH-6201 er forsynet med 4 stk. skrueterminaler for tilslutning og sløjfe-forbindelse af Modbus, til øvrige Modbus-komponenter i applikationen. Forsyningsspændingen til PTH-6201 er 24 V DC og PTH-6201 driftforsynes skrueterminalens klemme 1(+) og 4 (GND), se fig.6. PTH-6202/6502: Modbus tilsluttes PTH-6202/6502 via RJ12 stikforbindelse. PTH-6202/6502 er forsynet med 2 stk. Modbus RJ12 stik for tilslutning og sløjfeforbindelse af Modbus, til øvrige Modbus-komponenter i applikationen. Forsyningsspændingen til PTH-6202/6502 er 24 V DC og PTH-6202/6502 driftforsynes gennem RJ12 tilslutningsstik. Se fig.4 Kapslingen er forsynet med en gummimembran på både låget og kapslingens nederste kant således at Modbus-kabel (Fladkabel; som kabeltype MPFK6S eller tilsvarende) kan føres ind i kapslingen gennem lågeåbningen. Når låget er lukket, slutter gummimembranen så tæt omkring Modbus-kabel at kapslingen overholder IP54.

TEKNISKE DATA

Forsyningsspænding...24V DC ±15% via Modbus Elektrisk tilslutning, PTH-6201	..... 4 x skrueterminaler, max. 1,5 mm ²
Elektrisk tilslutning, PTH-6202/6502	..... 2 stk. RJ12 6/6 stikforbindelser
Modbusprotokol	..... 38,4Kbaud, 1 start bit, 8 data bit, 1 stop bit.
Måleområder tryk, PTH-6201/6202	..... 0/2500 Pa
Måleområder tryk, PTH-6502	..... 0/5000 Pa
Max højde over havet	..... 1300 m
Nøjagtighed udgangssignal, PTH-6201/6202	..... 0,5 %xMV + 2,5 Pa
Nøjagtighed udgangssignal, PTH-6502	..... 0,5 %xMV + 5,0 Pa (MV = målt værdi)
Maksimalt tryk	..... 20 kPa
Luftfugtighed	..... 10-95%RH ikke kondenserende
Dimensioner kapsling	..... 75 x 36 x 91 mm
Kabeldimension	..... MPFK6S eller tilsvarende
Trykslanger	..... 2 x ø 6,2
Miljødata	
Effektforbrug	..... 4 VA (-20/+5°C) 2,5 VA (+5/+40°C)
Omgivelsestemperatur	..... -20/+40°C Drift
..... (kortvarigt -30/+50°C)	
Omgivelsestemperatur opbevaring	..... -50/+70°C
Kapsling	..... IP54
Vægt	..... 110 g

DRIFT

Status lys ved normal drift:
Når spændingsforsyningen fra Modbus er tilsluttet indikeres dette ved at "Power ON" (grøn LED) lyser. Gyldig kommunikation på Modbus indikeres ligeledes ved en "Modbus Communications" (gul LED) der blinker afhængig af kommunikationsintensitet.

LED	ON	BLINK	OFF
Øverste (gul)		Valid Modbus kommunikation	Invalid Modbus kommunikation
Nederste (grøn)	Power ON		Power OFF

Modbus protokol

PTH-6201/6202/6502 har et adresseringsområde på 16 og kan indstilles til adresserne mellem 0x50 (hex) (dec.80) og 0x5F (hex) (dec.95) og kommunikationsprotokollen er: 38,4KB, 1 start-bit, 8 data, stop-bit og ingen paritet. Adressen indstilles på adresseomskifteren i PTH-6201/6202/6502.

Modbus adresser

HexEncoder:	ID
0-	0x59(89 dec)
1-	0x56(86 dec)
2-	0x50(80 dec)
3-	0x51(81 dec)
4-	0x57(87 dec)
5-	0x52(82 dec)
6-	0x58(88 dec)
7-	0x55(85 dec)
8-	0x53(83 dec)
9-	0x54(84 dec)
10-	0x5A(90 dec)
11-	0x5B(91 dec)
12-	0x5C(92 dec)
13-	0x5D(93 dec)
14-	0x5E(94 dec)
15-	0x5F(95 dec)

HOLDING:

Addr-0 (REG-1)
ExternCalibrate
Kalibrerings Status (1 = NulKalibrering)

FEJLFINDING

Symptom	Årsag	Handling
Ingen lys i den grønne LED	Manglende forsyningsspænding	Kontroller forsyningsspænding Kontroller elektriske forbindelser Kontroller stikforbindelser
	Defekt PTH-6201/6202/6502	Udskift PTH-6201/6202/6502
Ingen lys i den gule LED	Afbrudt/kortsluttet Modbus	Kontroller elektriske forbindelser på hele længden af Modbus
	Forkert adresse	Indstil korrekt Modbus adresse på adressevælger i PTH-6201/6202/6502
	Forkert kommunikations-hastighed	Indstil kommunikation : 38,4Kbaud, 1 start bit, 8 data bit, 1 stop bit, ingen paritet
	Defekt PTH-6201/6202/6502	Udskift PTH-6201/6202/6502
Negativ udlæst måleværdi	Slanger forbyttet	Ombyt tilslutningslanger på plus (+) og minus (-) tilslutningsstudse
	Defekt PTH-6201/6202/6502	Udskift PTH-6201/6202/6502
Måleafvigelse	PTH-6201/6202/6502 er placeret i temperatur udenfor angivet temperaturområde	Tilpas omgivelsestemperatur til det i denne instruktion angivne område
	Manglende eller reduceret forbindelse gennem måletrykklanger	Kontroller måletrykklanger for rigtig montage
	Manglende tryk på målepunkter	Start ventilatoren
	Defekt PTH-6201/6202/6502	Udskift PTH-6201/6202/6502
Nulpunktsafvigelse	Manglende nul-kalibrering	Gør PTH-6201/6202/6502 trykløs evt. ved at fjerne begge trykklanger og udfør nul-kalibrering.
	Defekt PTH-6201/6202/6502	Udskift PTH-6201/6202/6502

INPUT:

Addr-0 (REG-1)	SoftwareVer	Software Version 1/100
Addr-1 (REG-2)	Pressure	Sensor tryk i Pa
Addr-4 (REG-5)	PressHiRes	Sensor tryk i 0,1 Pa
Addr-5 (REG-6)	PressAvrDyn	Dynamisk mid- ling af PressHiRes
Addr-6 (REG-7)	PressAvrAbs	Dynamisk midling af 30 sidste målinger på PressHiRes

SERVICE OG VEDLIGEHOLD

PTH-6201/6202/6502 indeholder ingen komponenter der kræver service eller vedligehold. Kontakt venligst leverandøren til tilfælde af problemer.

MILJØ OG BORTSKAFFELSE

Hjælp med at beskytte miljøet, ved at bortskaffe emballage og brugte produkter, på en miljørigtig måde.

Bortskaffelse af produktet

Produkter med dette mærke, må ikke bortskaffes som almindeligt husholdningsaffald, men skal indsamles særskilt i henhold til de gældende lokale regler.

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CE MÆRKNING

OJ Electronics A/S erklærer under ansvar, at dette produkt opfylder Rådets Direktiv 92/31 og efterfølgende ændringer om elektromagnetisk kompatibilitet samt Rådets Direktiv 73/23 og efterfølgende ændringer om elektrisk materiel bestemt til anvendelse indenfor visse spændingsgrænser.

Benyttede standarder

EMC-emission EN 61000-6-3:2001
EMC-immunitet EN 61000-6-2:2001

English**LIST OF FIGURES**

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

- Fig. 1: Dimensioned drawing
- Fig. 2: Position of transmitter in relation to bends and branches
- Fig. 3: Wiring diagram, PTH-6202/6502
- Fig. 4: Modbus connections
- Fig. 5: Example of configuration
- Fig. 6: Wiring diagram, PTH-6201

INTRODUCTION

PTH-6201/6202/6502 is an electronic pressure transmitter which communicates via RS485 RTU Modbus and is primarily used to measure differential pressure in a ventilation system. The pressure transmitter is used in association with monitoring, control and regulation via an electronic regulator, i.e. in PLC, BMS or SCADA systems. All commands and data exchanged between the PTH-6201/6202/6502 and the regulator unit are sent as digital values via the RS485 RTU Modbus protocol. The integrated Modbus communication makes the PTH-6201/6202/6502 highly suitable for integration into PLC, BMS and SCADA systems, due to reduced installation costs.

Typical areas of application include:

- Measurement of pressure at a given point in a ventilation system.
- Measurement of differential pressure across

- a ventilation filter for optimum filter replacement.
- Measurement of differential pressure across a fan for the regulation of duct pressure

PRODUCT PROGRAMME

Type	Product
PTH-6201	RS485 RTU Modbus, IP54, 1,5 mm ²
PTH-6202	RS485 RTU Modbus, IP54, RJ12, 2500 Pa
PTH-6502	RS485 RTU Modbus, IP54, RJ12, 5000 Pa

FUNCTION

PTH-6201/6202/6502 is a pressure transmitter for comfort or process ventilation. The unit communicates via the RS485-Modbus with a connected regulator unit (see fig. 5), and displays, via Modbus communication, a value dependent on the set measurement range in the connected regulator unit which is proportional to the measured pressure. PTH uses a semiconductor pressure measurement unit with no air through flow, which protects the unit from dust from the ventilation system. The pressure element is temperature compensated to provide accurate pressure measurement throughout the specified temperature range (see 'Technical Data').

INSTALLATION

The enclosure is opened without the use of tools by pressing the snap lock at the side of the tube connectors. PTH-6201/6202/6502 is attached onto a level surface by 2 screws, which are screwed into a solid underlay. PTH-6201/6202/6502 can be fitted in all directions without accuracy being affected. PTH-6201/6202/6502 also functions with only one tube fitted to the connectors (+ or -). However, two tubes should always be fitted to ensure a suitable enclosure rating, if the connectors do not face downwards. Pressure is supplied to the measurement unit by tubes, the highest pressure being connected to the '+ connector' and the lowest pressure to '- connector' (see fig. 3). 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. 2). If there is a risk of condensation forming in connection tubes, PTH-6201/6202/6502 is to be located in such a way that condensed fluids cannot flow back into the pressure transmitter. The enclosure is equipped with screw holes (see fig. 1).

Modbus cable installation

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

PTH-6201: Modbus is connected to PTH-6201 via the four terminals. PTH-6201 is equipped with four screw terminals for Modbus connection and loops to other Modbus components in the application concerned. PTH-6201 must be provided with a 24 V DC power supply connected to screw terminals 1(+) and 4 (GND), see fig. 6.

PTH-6202/6502: Connect the Modbus cable to PTH-6202/6502 using the RJ12 socket. PTH-6202/6502 is equipped with two Modbus RJ12 sockets, allowing Modbus connection and loops to other Modbus components in the application concerned. The supply voltage for PTH-6202/6502 is 24 V DC and PTH-6202/6502 is supplied with electrical power through the RJ12 socket (see fig. 4).

A rubber membrane is fitted to both the lid and the bottom edge of the enclosure so that the

Modbus cable (flat transmission cable, such as cable type MPFK6S or equivalent) can be led into the enclosure through the lid opening. When the lid is fitted, the rubber diaphragm is pressed sufficiently tightly around the Modbus cable to make the enclosure comply with IP54.

TECHNICAL DATA

Supply voltage.....	24 V DC ±15% via Modbus
Electrical connections, PTH-6201	.....4 x screw terminals, max. 1.5 mm ²
Electrical connections, PTH-6202/6502	.....2 x RJ12 6/6 sockets
Modbus protocol	38.4 kBaud, 1 start bit, .....8 data bits, 1 stop bit
Measurement ranges, pressure	PTH-6201/6202.....0/2500 Pa
Measurement ranges, pressure	PTH-6502.....0/5000 Pa
Max. height above sea level	.....1300 m
Accuracy output signal, PTH-6201/6202	.....0.5 %xMV + 2.5 Pa
Accuracy output signal, PTH-6502	.....0.5 %xMV + 5.0 Pa (MV = measured value)
Maximum pressure.....	20 kPa
Ambient air humidity	.....10-95 %RH, non-condensing
Enclosure dimensions	.....75 x 36 x 91 mm
Cable dimension.....	MPFK6S or similar
Pressure tubes.....	2 x ø 6,2

Environment data

Power consumption.....	4 VA (-20/+5°C) 2.5 VA
.....	(+5/+40°C)
Ambient temperature.....	-20/+40°C (operation)
.....	(transient -30 to +50°C)
Ambient temperature, storage	-50/+70° to +70°C
Enclosure rating.....	IP54
Weight.....	110 g

OPERATION

Status light in normal operation: "Power ON" (green LED) lights up to indicate that voltage is received from the Modbus cable. Valid communication on Modbus is similarly indicated by a 'Modbus Communications' (yellow LED) which flashes, the intensity of flashing being dependent on communication intensity.

LED	ON	FLASHING	OFF
Top (yellow)		Valid Modbus communication	Invalid Modbus communication
Bottom (green)	POWER ON		Power OFF

Modbus protocol

PTH-6201/6202/6502 has an address range of 16 and can be set to addresses between 0x50 (hex) (dec 80) and 0x5F (hex) (dec 95). The communication protocol is: 38.4 kB, 1 start bit, 8 data bits, 1 stop bit and no parity. The address can be set on the address switch inside the PTH-6201/6202/6502.

Modbus addresses

HexEncoder: ID	
0-	0x59(89 dec)
1-	0x56(86 dec)
2-	0x50(80 dec)
3-	0x51(81 dec)
4-	0x57(87 dec)
5-	0x52(82 dec)
6-	0x58(88 dec)
7-	0x55(85 dec)
8-	0x53(83 dec)
9-	0x54(84 dec)
10-	0x5A(90 dec)
11-	0x5B(91 dec)
12-	0x5C(92 dec)
13-	0x5D(93 dec)
14-	0x5E(94 dec)
15-	0x5F(95 dec)

TROUBLESHOOTING

Symptom	Cause	Action
Green LED not lit	No supply voltage	Check supply voltage
		Check electrical connections
		Check sockets
	Defective PTH-6201/6202/6502	Replace PTH-6201/6202/6502
Yellow LED not lit	Modbus disconnected/short-circuited	Check the electrical connections along the entire length of the Modbus
	Incorrect address	Set correct Modbus address on the address selector in PTH-6201/6202/6502
	Incorrect communication speed	Set communication: 38.4 kBaud, 1 start bit, 8 data bits, 1 stop bit, no parity
	Defective PTH-6201/6202/6502	Replace PTH-6201/6202/6502
Negative measurement value read out	Tubes have been connected to incorrect connectors.	Switch the connection tubes around on the plus (+) and minus (-) connectors.
	Defective PTH-6201/6202/6502	Replace PTH-6201/6202/6502
Measurement deviation	PTH-6201/6202/6502 is located at a point where the temperature is outside the specified temperature range	Adjust the ambient temperature to the range specified in these instructions
	No or reduced flow through pressure measurement tubes	Check that the pressure measurement tubes are correctly fitted
	Zero pressure at measurement points	Start the fan
	Defective PTH-6201/6202/6502	Replace PTH-6201/6202/6502
Zero point deviation	Zero-calibration has not been carried out	Disconnect all sources of pressure from PTH-6201/6202/6502 by removing both pressure tubes and carry out a zero-calibration.
	Defective PTH-6201/6202/6502	Replace PTH-6201/6202/6502

HOLDING:

Addr-0 (REG-1)
ExternCalibrate
Calibration Status (1 = Zero calibration)

INPUT:

Addr-0 (REG-1)	SoftwareVer	Software Version 1/100
Addr-1 (REG-2)	Pressure	Sensor pressure in Pa
Addr-4 (REG-5)	PressHiRes	Sensor pressure in 0,1 Pa
Addr-5 (REG-6)	PressAvrDyn	Dynamic averaging of PressHiRes
Addr-6 (REG-7)	PressAvrAbs	Dynamic av- eraging of last 30 PressHiRes measurements

SERVICE AND MAINTENANCE

PTH-6201/6202/6502 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.

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CE MARKING

OJ Electronics A/S hereby declares that the product is manufactured in accordance with Council Directive 92/31/EEC on electromagnetic compatibility (and subsequent amendments) and Council Directive 73/23/EEC on electrical equipment designed for use within certain voltage limits (and subsequent amendments).

Applied standards

EMC emission EN 61000-6-3:2001
EMC immunity EN 61000-6-2:2001

Deutsch**ABBILDUNGEN**

Folgende Abbildungen finden sich ganz hinten in der Anleitung:
Abb. 1: Maßskizze
Abb. 2: Platzierung des Messumformers i. V. m. Biegungen und Abzweigen
Abb. 3: Anschlussdiagramm, PTH-6202/6502
Abb. 4: Modbus-Anschlüsse
Abb. 5: Konfigurationsbeispiel
Abb. 6: Anschlussdiagramm, PTH-6201

ALLGEMEINES

PTH-6201/6202/6502 ist ein über RS485-RTU-Modbus kommunizierender elektronischer Druckmessumformer, der insbesondere für die Differenzdruckmessung in Lüftungsanlagen

geeignet ist. Der Druckmessumformer kommt in Zusammenhang mit der Überwachung, Kontrolle und Regelung über einen elektronischen Regler, z. B. in einer SPS-, BMS- oder SCADA-Anlage, zum Einsatz. Alle Kommandos und Daten zwischen PTH-6201/6202/6502 und der Regeleinheit werden digital per RS485-RTU-Modbus-Protokoll gesandt. Mit integrierter Modbus-Kommunikation ist PTH-6201/6202/6502 dank reduzierter Installationskosten besonders für die Integration in SPS-, BMS- und SCADA-Systemen geeignet. Typische Anwendungsbereiche sind:

- Messung des Drucks an einer gegebenen Stelle in einer Lüftungsanlage.
- Differenzdruckmessung über einem Lüftungsfilter, zur Ermittlung des optimalen Zeitpunkts für den Filteraustausch.
- Differenzdruckmessung über einem Gebläse zur Regelung des Kanaldrucks.

PRODUKTPROGRAMM

Typ	Produkt
PTH-6201	RS485 RTU Modbus, IP54, 1,5 mm ²
PTH-6202	RS485 RTU Modbus, IP54, RJ12, 2500 Pa
PTH-6502	RS485 RTU Modbus, IP54, RJ12, 5000 Pa

FUNKTION

PTH-6201/6202/6502 ist ein Druckmessumformer für die Komfort- oder Prozessbelüftung, der über RS485-Modbus mit einer angeschlossenen Regeleinheit kommuniziert (siehe Abb. 5), und abhängig vom eingestellten Messbereich mittels Modbus-Kommunikation einen mit dem gemessenen Druck proportionalen Wert an die angeschlossene Regeleinheit übermittelt. PTH ist mit einem Halbleiter-Druckmeselement ohne Luftdurchsatz ausgestattet, und daher vor Staub von der Lüftungsanlage geschützt. Das Druckelement ist temperaturkompensiert, sodass im gesamten spezifizierten Temperaturbereich eine optimale Druckmessung erzielt wird (siehe „Technische Daten“).

INSTALLATION

Die Öffnung der Kapselung erfolgt ohne Werkzeug durch Druck auf den Schnappverschluss, der sich seitlich der Stutzen befindet. PTH-6201/6202/6502 ist mit 2 Schrauben auf ebener und fester Unterlage zu befestigen. PTH-6201/6202/6502 kann lageunabhängig montiert werden, ohne dass die Genauigkeit davon beeinträchtigt wird. PTH-6201/6202/6502 wirkt auch wenn nur ein Schlauch auf den Stutzen (+ oder -) montiert ist, aber mit Rücksicht auf die Schutzart sind auf allen nicht nach unten gerichteten Schlauchstutzen Schläuche vorzusehen. Die Druckmessung erfolgt über Schläuche, wobei der höhere Druck am „+ Stutzen“ und der niedrigere Druck am „- Stutzen“ anzuschließen ist (siehe Abb. 3). Druckschläuche sind so kurz wie möglich zu halten und so zu befestigen, dass Schwingungen vermieden werden. Mit Rücksicht auf eine optimale Druckmessung ist die Messung dort vorzunehmen, wo die geringste Gefahr turbulenter Strömung vorhanden ist, das heißt mitten im Lüftungskanal und mit einem Abstand von mindestens dem zweifachen Kanaldurchmesser von Biegungen und dem sechsfachen von Abzweigen (siehe Abb. 2). Besteht die Gefahr von Kondenswasserbildung in den Anschlusschläuchen, ist PTH-6201/6202/6502 so anzubringen, dass die kondensierende Flüssigkeit nicht in den Druckmessumformer zurückfließen kann. Die Kapselung verfügt über Befestigungslöcher (siehe Abb. 1).

Installation des Modbus-Kabels

Das Gehäuse lässt sich ohne Werkzeug öffnen, durch Druck auf den Schnappverschluss, der sich seitlich der Stutzen befindet.
PTH-6201: Der Modbus wird über die vier Anschlussklemmen mit dem PTH-6201 verbunden. PTH-6201 ist mit vier Schraubklemmen zum Anschluss und Verschleifen des Modbus mit weiteren Modbus-Komponenten der Anwendung ausgestattet. Die Versorgungsspannung des PTH-6201 ist 24 V= und wird über die Schraubklemmen 1 (+) und 4 (Erde) zugeführt, siehe Abb. 6.
PTH-6202/6502: Der Modbus ist über die RJ12-Steckverbindung an PTH-6202/6502 anzuschließen. PTH-6202/6502 ist mit zwei Modbus RJ12-Steckverbindungen zum Anschluss und zur Verschleifung des Modbus mit den übrigen Modbus-Komponenten in der Anlage ausgestattet. Die Betriebsspannung des PTH-6202/6502 ist 24 V DC und wird über den RJ12-Steckverbindungen zugeführt (siehe Abb.4).
 Das Gehäuse ist sowohl auf dem Deckel als auch auf der Gehäuseunterkante mit einer Gummimembrane versehen, sodass Modbus-Kabel (Flachkabel, wie Typ MPFK6S oder entsprechend) durch die Deckelöffnung ins Gehäuse geführt werden können. Bei geschlossenem Deckel schließt die Gummimembrane so dicht um das Modbus-Kabel, dass Schutzart IP54 eingehalten wird.

TECHNISCHE DATEN

Spannungsversorgung24 V DC ±15 % über Modbus
 Elektrische Anschlüsse, PTH-62014 Schraubklemmen, max. 1,5 mm²
 Elektrische Anschlüsse, PTH-6202/6502 2 St. RJ12 6/6-Steckverbindungen
 Modbus-Protokol.....38,4 kBaud, 1 Startbit,
8 Datenbits, 1 Stoppbit.
 Druckmessbereiche, PTH-6201/6202 0/2500 Pa
 Druckmessbereiche, PTH-6502 0/5000 Pa
 Max. Höhe über dem Meeresspiegel1300 m
 Genauigkeit Ausgangssignal, PTH-6201/62020,5 %xMV + 2,5 Pa
 Genauigkeit Ausgangssignal, PTH-65020,5 %xMV + 5,0 Pa
 (MV = Messwert)
 Maximaler Druck20 kPa
 Luftfeuchtigkeit.....10-95 % RF,
 Gehäuseabmessungen.....75 x 36 x 91 mm
 Kabelabmessungen.....MPFK6S
 oder dementsprechend
 Druckschläuche..... 2 x Ø6,2

Umweltdaten

Leistungsaufnahme..... 4 VA (-20/+5 °C)
 2,5 VA (+5/+40 °C)
 Umgebungstemperatur -20/+40 °C Betrieb
 (kurzzeitig -30/+50 °C)
 Umgebungstemperatur Lagerung -50/+70 °C
 SchutzartIP54
 Gewicht110 g

BETRIEB

Zustandsleuchte bei Normalbetrieb:
 „Power ON“ (grüne LED) zeigt vorhandene Spannungsversorgung über das Modbus-Kabel an. „Modus-Kommunikation“ (gelbe LED) zeigt Kommunikation über den Modbus mit von der Kommunikationsintensität und -geschwindigkeit abhängigen Blinksignalen an.

LED	EIN	BLINKEND	AUS
Obere (gelb)		Gültige Modbus-Kommunikation	Ungültige Modbus-Kommunikation
Untere (grün)	Netz EIN		Netz AUS

Modbus-Protokoll

PTH-6201/6202/6502 verfügt über einen Adressierungsbereich von 16 und kann auf die Adressen zwischen 0x50 (hex) (dez 80) und 0x5F (hex) (dec.95) mit folgendem Kommunikationsprotokoll eingestellt werden: 38,4 kB, 1 Startbit, 8 Datenbits, 1 Stoppbit und keine Parität.
 Die Adresse wird am Adressenumschalter im PTH-6201/6202/6502 eingestellt.

Modbus-Adressen

HexEncoder: ID

0-	0x59(89 dec)
1-	0x56(86 dec)
2-	0x50(80 dec)
3-	0x51(81 dec)
4-	0x57(87 dec)
5-	0x52(82 dec)
6-	0x58(88 dec)
7-	0x55(85 dec)
8-	0x53(83 dec)
9-	0x54(84 dec)
10-	0x5A(90 dec)
11-	0x5B(91 dec)
12-	0x5C(92 dec)
13-	0x5D(93 dec)
14-	0x5E(94 dec)
15-	0x5F(95 dec)

HOLDING:

Addr-0 (REG-1) SoftwareVer Software
 ExternCalibrate Version 1/100
 Kalibrierungszustand (1 = Nullkalibrierung)

EINGANG:

Addr-0 (REG-1)	SoftwareVer	Software
Addr-1 (REG-2)	Druck	Fühlerdruck in Pa
Addr-4 (REG-5)	PressHiRes	Fühlerdruck in 0,1 Pa
Addr-5 (REG-6)	PressAvrDyn	Dynamische Mittelung von PressHiRes
Addr-6 (REG-7)	PressAvrAbs	Dynamische Mittelung der 30 letzten Messungen von PressHiRes

SERVICE UND WARTUNG

PTH-6201/6202/6502 enthält keine Komponenten, für die Service oder Instandhaltung erforderlich ist.
 Bei Problemen bitte mit dem Zulieferer Kontakt aufnehmen.

UMWELT UND ENTSORGUNG

Helfen Sie mit, die Umwelt zu schützen, und entsorgen Sie Verpackung und gebrauchte Produkte auf umweltgerechte Weise.

FEHLERSUCHE

Symptom	Ursache	Aktion
Die grüne LED leuchtet nicht auf	Fehlende Spannungsversorgung	Spannungsversorgung kontrollieren. Elektrische Anschlüsse kontrollieren. Steckverbindungen kontrollieren.
	PTH-6201/6202/6502 defekt	PTH-6201/6202/6502 austauschen.
Die gelbe LED leuchtet nicht auf	Modbus unterbrochen/kurzgeschlossen	Elektrische Anschlüsse auf der gesamten Modbusstrecke kontrollieren.
	Falsche Adresse	Korrekte Modbus-Adresse am Adressenumschalter im PTH-6201/6202/6502 einstellen.
	Falsche Kommunikationsgeschwindigkeit	Kommunikation einstellen: 38,4 kBaud, 1 Startbit, 8 Datenbits, 1 Stoppbit, keine Parität
	PTH-6201/6202/6502 defekt	PTH-6201/6202/6502 austauschen.
Abgelesener Messwert negativ	Schläuche vertauscht	Anschlussschläuche auf den Plus- (+) und Minus- (-) Anschlusstutzen vertauschen.
	PTH-6201/6202/6502 defekt	PTH-6201/6202/6502 austauschen.
Messabweichung	Die Umgebungstemperatur des PTH-6201/6202/6502 liegt außerhalb des angegebenen Temperaturbereichs.	Umgebungstemperatur an den in dieser Anleitung angegebenen Bereich anpassen.
	Fehlende oder reduzierte Verbindung über die Druckmessschläuche	Druckmessschläuche auf korrekte Montage kontrollieren.
	Fehlender Druck an den Messpunkten	Lüfter einschalten.
	PTH-6201/6202/6502 defekt	PTH-6201/6202/6502 austauschen.
Nullpunktabweichung	Fehlende Null-Kalibrierung	PTH-6201/6202/6502 drucklos machen – evtl. beide Druckschläuche entfernen – und Null-Kalibrierung vornehmen.
	PTH-6201/6202/6502 defekt	PTH-6201/6202/6502 austauschen.

Entsorgung des gebrauchten Produkts



Produkte mit dieser Kennzeichnung dürfen nicht als normaler Hausmüll entsorgt werden, sondern sind gemäß den geltenden lokalen Vorschriften gesondert einzusammeln.

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CE-KENNZEICHNUNG

OJ Electronics A/S erklärt in Eigenverantwortung, dass dieses Produkt die EU-Richtlinie 92/31/EWG und spätere Änderungen über elektromagnetische Verträglichkeit sowie die EU-Richtlinie 73/23/EWG und spätere Änderungen über elektrische Betriebsmittel zur Anwendung innerhalb bestimmter Spannungsgrenzen erfüllt.

Angewandte Standards

EMV-Emission EN 61000-6-3:2001
EMV-Immunität EN 61000-6-2:2001

Français

LISTE DES FIGURES

Les figures suivantes sont situées au dos des instructions :

- Fig. 1: Dessin avec dimensions
- Fig. 2: Position du transmetteur par rapport aux coudes et embranchements
- Fig. 3: Schéma de filerie, PTH-6202/6502
- Fig. 4: Connexion Modbus
- Fig. 5: Exemple de configuration
- Fig. 6: Schéma de filerie, PTH-6201

INTRODUCTION

Le PTH-6201/6202/6502 est un transmetteur électronique de pression qui communique par le RS485 RTU Modbus et qui est principalement utilisé pour mesurer la pression différentielle dans un système de ventilation. Le transmetteur de pression est utilisé pour le monitoring, le contrôle et la régulation via un régulateur électronique, par ex. dans des systèmes API, GTS ou SCADA. Toutes les commandes et données échangées entre le PTH-6201/6202/6502 et l'unité de régulation sont transmises comme valeurs numériques via le protocole RS485 RTU Modbus. La communication intégrée Modbus rend le PTH-6201/6202/6502 très approprié pour une intégration dans des systèmes API, GTS et SCADA par la réduction des coûts d'installation.

Les domaines d'application typiques incluent :

- Mesure de la pression à un point donné dans un système de ventilation.
- Mesure de la pression différentielle de part et d'autre d'un filtre de ventilation pour optimiser le remplacement du filtre.
- Mesure de la pression différentielle de part et d'autre d'un ventilateur pour la régulation de la pression de conduite

GAMME DE PRODUITS

Type	Produit
PTH-6201	RS485 RTU Modbus, IP54, 1,5 mm ²
PTH-6202	RS485 RTU Modbus, IP54, RJ12, 2500 Pa
PTH-6502	RS485 RTU Modbus, IP54, RJ12, 5000 Pa

FONCTION

Le PTH-6201/6202/6502 est un transmetteur de pression pour la ventilation de confort ou de procédé. L'unité communique par un RS485-Modbus avec une unité de régulation (voir fig. 5) et affiche, via la communication Modbus, une valeur dépendante de la plage de mesure réglée dans l'unité de régulation raccordée qui est proportionnelle à la pression mesurée. Le

PTH utilise une unité de mesure de pression à semiconducteur sans débit d'air ce qui protège l'unité de la poussière du système de ventilation. L'élément capteur de pression est compensé pour la température afin de fournir une mesure précise pour toute la plage de température spécifiée (voir « Caractéristiques techniques »).

INSTALLATION

Le boîtier s'ouvre sans l'utilisation d'outils en appuyant sur la fermeture à pression au côté des connecteurs de tube. Le PTH-6201/6202/6502 est fixé sur une surface plane par 2 vis qui sont vissées dans un renforcement solide. Le PTH-6201/6202/6502 peut être monté dans toutes orientations sans que sa précision soit affectée. Le PTH-6201/6202/6502 fonctionne également avec seulement un tube fixé aux connecteurs (+ ou -). Il est cependant préférable de toujours utiliser deux tubes pour assurer la classe adéquate du boîtier si les connecteurs ne sont pas orientés vers le bas.

La pression est fournie à l'unité de mesure par des tubes, la plus forte pression étant raccordée au « connecteur + » et la plus faible au « connecteur - » (voir fig. 3).

Les tubes pression doivent être les plus courts possible et fixés pour prévenir leur vibration. 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, des coudes, et six fois la largeur, des embranchements (voir fig. 2).

S'il y a un risque de condensation dans les tubes de connexion, le PTH-6201/6202/6502 doit être positionné de façon à ce que les condensats ne puissent pas retourner dans le transmetteur de pression.

Le boîtier est muni de trous pour vis (voir fig. 1).

Installation du câble Modbus

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

PTH-6201: Le Modbus est raccordé au PTH-6201 par les quatre bornes. Le PTH-6201 est muni de quatre bornes à vis pour connecter le Modbus et boucler d'autres composants du Modbus de l'application concernée. Il faut raccorder une alimentation 24 VCC aux bornes à vis 1(+) et 4 (terre/GND), voir fig. 6.

PTH-6202/6502: Raccordez le câble Modbus au PTH-6202/6502 en utilisant la douille RJ12. Le PTH-6202/6502 est muni de deux douilles Modbus RJ12 permettant la connexion Modbus et les bouclages vers d'autres composants Modbus dans l'application concernée. La tension d'alimentation du PTH-6202/6502 est 24 V CC et le PTH-6202 est alimenté via la douille RJ12 (voir fig. 4).

Une membrane de caoutchouc est ajustée au couvercle et à la bordure du bas du boîtier afin que le câble Modbus (câble plat de transmission comme le type MPFK6S ou son équivalent) puisse être inséré dans le boîtier par l'ouverture du couvercle. Quand le couvercle est ajusté, le diaphragme de caoutchouc presse suffisamment autour du câble Modbus pour que le boîtier soit conforme à IP54.

CARACTÉRISTIQUES TECHNIQUES

Tension d'alimentation	.....24 V CC
.....	..... ±15 % via Modbus
Raccordements électriques, PTH-6201	.....
.....	..... 4 x bornes à vis max. 1,5mm ²
Raccordements électriques, PTH-6202/6502	.....
.....	..... 2 x douilles, RJ12 6/6
Protocole Modbus	..... 38,4 kBd, 1 bit de départ,
.....	..... 8 bits de données, 1 bit d'arrêt
Plages de mesure, pression, PTH-6201/6202	.....
.....	..... 0/2500 Pa

Plages de mesure, pression, PTH-6502	.....
.....	..... 0/5000 Pa
Hauteur max. au-dessus	.....
du niveau de la mer	.....1300 m
Précision, signal de sortie, PTH-6201/6202	.....
.....	.....0,5 %xMV + 2,5 Pa
Précision, signal de sortie, PTH-6502	.....
.....	.....0,5 %xMV + 5,0 Pa
.....	.....(MV = valeur mesurée)
Pression maximum	.....20 kPa
Humidité de l'air ambiant	.....10-95 % RH,
.....	..... sans condensation
Dimensions du boîtier	.....75 x 36 x 91 mm
Dimension du câble	..... MPFK6S ou similaire
Tubes pression	..... 2 x 6,2

Données environnementales

Puissance consommée	..... 4 VA (-20/+5 °C)
.....	..... 2,5 VA (+5/+40 °C)
Température ambiante	..... -20/+40 °C (opération)
.....	..... (transitoire -30/+50 °C)
Température ambiante, remisage	..... -50/+70 °C
Norme du boîtier	.....IP 54
Poids	.....110 g

FONCTIONNEMENT

Lampe d'état en marche normale : « Alimentation activée » (DEL verts) s'allume pour indiquer que la tension est reçue du câble Modbus. Une communication valide sur le Modbus est indiquée de façon similaire par « Communications Modbus » (DEL jaunes) qui clignote avec une intensité de clignotement qui dépend de l'intensité de la communication.

DEL	ON (marche)	CLIGNOTANTE	OFF (arrêt)
Haut (jaunes)		Communication Modbus valide	Communication Modbus non valide
Bas (verts)	Alimentation activée		Alimentation désactivée

Protocole Modbus

Le PTH-6201/6202/6502 possède une plage d'adresse de 16 et peut être réglé aux adresses entre 0x50 (hex) (déc 80) et 0x5F (hex) (déc.95). Le protocole de communication est : 38, kBd, 1 bit de départ, 8 bits de données, 1 bit d'arrêt et pas de parité. L'adresse peut être réglée sur le commutateur d'adresse à l'intérieur du PTH-6201/6202/6502.

Adresses Modbus

HexEncoder: IDENTIF.

0-	0x59(89 dec)
1-	0x56(86 dec)
2-	0x50(80 dec)
3-	0x51(81 dec)
4-	0x57(87 dec)
5-	0x52(82 dec)
6-	0x58(88 dec)
7-	0x55(85 dec)
8-	0x53(83 dec)
9-	0x54(84 dec)
10-	0x5A(90 dec)
11-	0x5B(91 dec)
12-	0x5C(92 dec)
13-	0x5D(93 dec)
14-	0x5E(94 dec)
15-	0x5F(95 dec)

HOLDING:

Addr-0 (REG-1) ExternCalibrate
État de calibration (1 = Calibration zéro)

ENTRÉE :

Addr-0 (REG-1)	SoftwareVer	Logiciel
		Version 1/100
Addr-1 (REG-2)	Pression	Sonde de pression en Pa
Addr-4 (REG-5)	PressHiRes	Pression du capteur à 0,1 Pa

DÉPANNAGE

Symptôme	Cause	Action
Aucune lumière dans le voyant DEL vert	Pas de tension d'alimentation	Vérifier tension d'alimentation Vérifier les raccords électriques Vérifier les douilles
	PTH-6201/6202/6502 défectueux	Remplacer le PTH-6201/6202/6502
Aucune lumière dans le voyant DEL jaune	Modbus déconnecté/courtcircuité	Vérifier les raccords électriques sur toute la longueur du Modbus
	Adresse erronée	Régler la bonne adresse Modbus sur le sélecteur d'adresse dans le PTH-6201/6202/6502
	Mauvaise vitesse de communication	Régler communication : 38, kBd, 1 bit de départ, 8 bits de données, 1 bit d'arrêt, pas de parité
	PTH-6201/6202/6502 défectueux	Remplacer le PTH-6201/6202/6502
Affichage d'une valeur de mesure négative	Les tubes ont été raccordés aux mauvais connecteurs.	Changer les tubes de raccord sur les connexions plus (+) et moins (-).
	PTH-6201/6202/6502 défectueux	Remplacer le PTH-6201/6202/6502
Déviation de mesure	Le PTH-6201/6202/6502 est situé à un point où la température est à l'extérieur de la plage spécifiée	Ramener la température ambiante à l'intérieur de la plage spécifiée dans ces instructions.
	Pas de débit ou réduction de débit dans les tubes de mesure de pression	Vérifier que les tubes de mesure de pression sont bien ajustés
	Pas de pression aux points de mesure	Démarrer le ventilateur
	PTH-6201/6202/6502 défectueux	Remplacer le PTH-6201/6202/6502
Déviation du point zéro	La calibration du zéro n'a pas été faite	Déconnecter toutes les sources de pression du PTH-6201/6202/6502 en enlevant les deux tubes de pression et faire une calibration du zéro.
	PTH-6201/6202/6502 défectueux	Remplacer le PTH-6201/6202/6502

Addr-5 (REG-6) PressAvrDyn Moyenne dynamique de PressHiRes
Addr-6 (REG-7) PressAvrAbs Moyenne dynamique des 30 dernières mesures sur PressHiRes

SERVICE ET ENTRETIEN

Le PTH-6201/6202/6502 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 les règlements locaux en vigueur.

**OJ ELECTRONICS A/S**

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oj@ojelectronics.com • www.ojelectronics.com

HOMOLOGATION CE

OJ Electronics A/S déclare par la présente que le produit est fabriqué pour répondre aux exigences de la directive 92/31/CEE du conseil au sujet de la compatibilité électromagnétique (et de ses amendements subséquents) ainsi qu'aux exigences de la directive 73/23/CEE du conseil au sujet d'équipements électriques conçus pour une utilisation sous certaines limites de tension (et de ses amendements subséquents).

Normes appliquées

Émission - compatibilité électromagnétique (CEM) EN 61000-6-3:2001
Immunité - compatibilité électromagnétique (CEM) EN 61000-6-2:2001

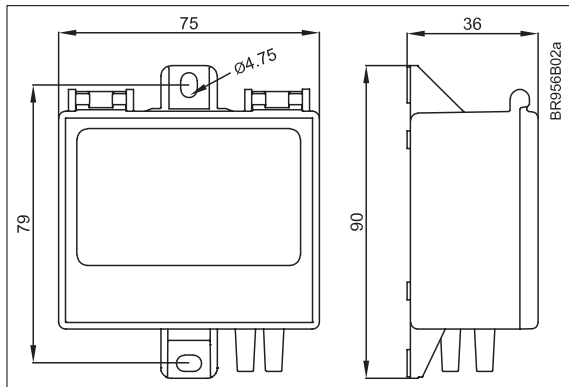


Fig. 1
Dimensioned drawing

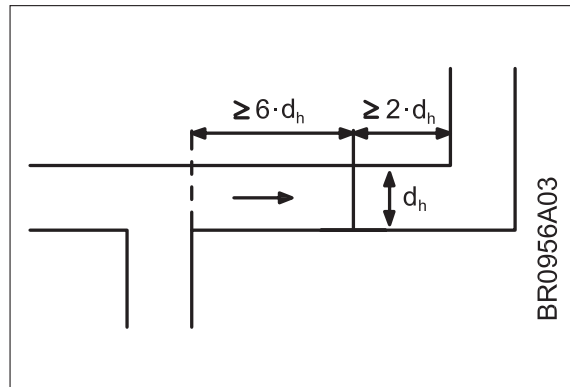


Fig. 2
Position of transmitter in relation to bends and branches

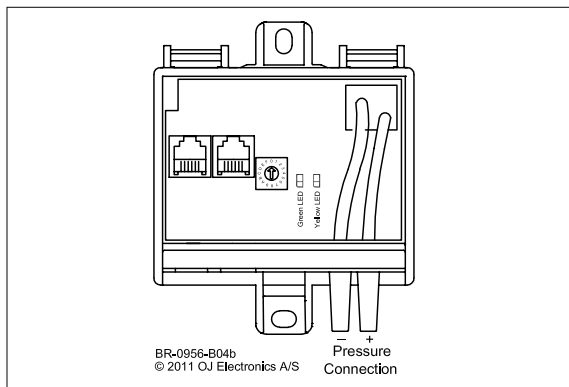


Fig. 3
Wiring diagram PTH-6202/6502

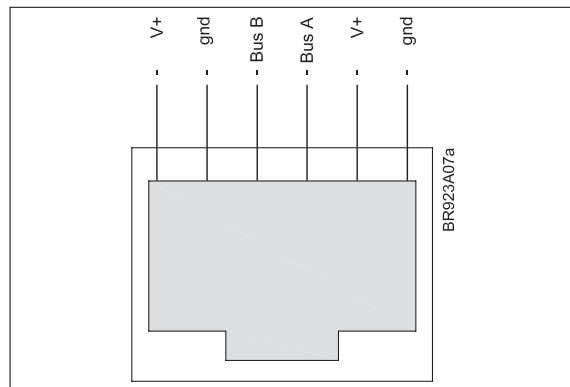


Fig. 4
Modbus connections

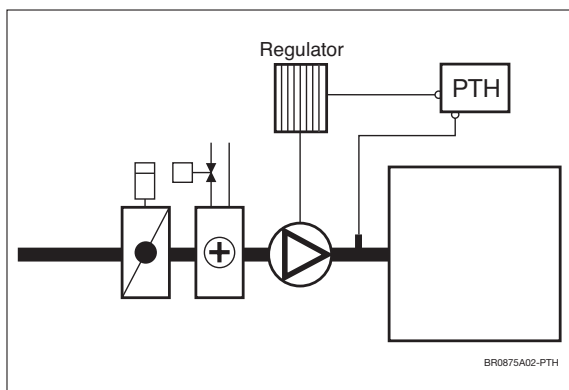


Fig. 5
Example of configuration

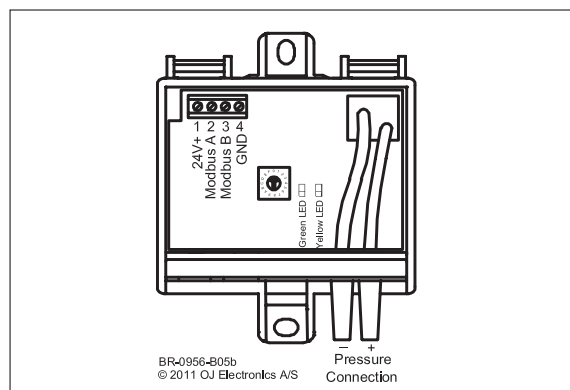


Fig. 6
Wiring diagram PTH-6201

B.4 FTK temperature sensor

FTK RS485 Modbus

Kanalfühler rel. Feuchte und Temperatur mit RS485 Modbus Schnittstelle
Duct sensor for relative humidity and temperature with RS485 Modbus Interface

thermokon
Sensortechnik GmbH

DE - Datenblatt

Technische Änderungen vorbehalten
Stand 27.07.2012

EN - Data Sheet

Subject to technical alteration
Issue date 2012/07/27



Anwendung

Kanalfühler zur Messung der rel. Feuchte und Temperatur in gasförmigen Medien von Heizungs-, Lüftungs- und Klimaanlage (z.B. in Zuluft-/ Abluftkanälen). Ausgelegt zur Aufschaltung an Regler- und Anzeigesysteme.

Typenübersicht

FTK140/270/400 RS485 Modbus Kanalfühler 140/270/400mm, mit RS485 Modbus Schnittstelle

Normen und Standards

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

EMV: EN 60730-1: 2009
Produktsicherheit: EN 60730-1: 2009

Technische Daten

Versorgungsspannung: 15-24VDC ($\pm 10\%$) / 24AC ($\pm 10\%$)
Leistungsaufnahme typ. 0,4W / 0,8VA
Schnittstelle: RS485 Modbus (Slave),
Übertragungsmodus: RTU oder ASCII,
Baudrate: 9.600, 19.200 38.400 oder 57.600,
Parität: keine, gerade, ungerade
max. 32 Busteilnehmer,
Anschluss über Twisted Pair Kabel (120 Ohm)
Messbereiche: Feuchte: 0...100%rH
Temp.: -20...+80°C
Genauigkeit: siehe Diagramm
Anschlussklemme: Federkraftklemme,
für Kabelquerschnitt 0,5 ... 1,5mm²
Einbaulänge L: 140/270/400mm
Fühlerrohr: PA6, Farbe schwarz
Filterelement: Edelstahl, Maschenweite 80µm
Anschlusskopf: Material PA6, Farbe weiß
Schutzart: Anschlusskopf IP65 gemäß EN 60529
Kabeleinführung: Einfach M16 für Leiter mit max. D=8mm
Umgebungstemp.: -20...+70°C, max. 85%rH nicht kond.
Gewicht: ca. 170g

Application

Duct sensor for measuring relative humidity and temperature in gaseous media of heating, cooling and air-conditioning systems (e.g. in fresh air/ exhaust air ducts). Designed for locking on to control and display systems.

Types Available

FTK140/270/400 RS485 Modbus Duct sensor 140/270/400mm with RS485 Modbus Interface

Norms and Standards

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

EMC: EN 60730-1: 2009
Product safety: EN 60730-1: 2009

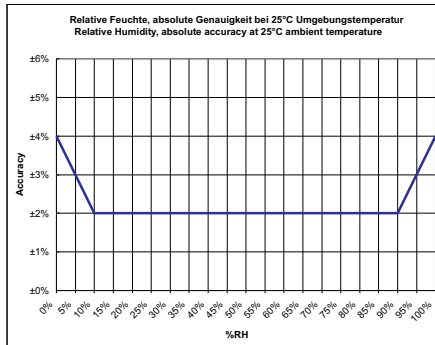
Technical Data

Power supply: 15-24VDC ($\pm 10\%$) / 24AC ($\pm 10\%$)
Power consumption: typ. 0,4W / 0,8VA
Interface: RS485 Modbus (Slave),
Mode: RTU or ASCII,
Baudrate: 9.600, 19.200 38.400 or 57.600,
Parity: no, even, odd
max. 32 devices per bus segment,
connection via twisted pair cable (120 Ohm)
Measuring ranges: Humidity: 0...100%rH
Temp.: -20...+80°C
Accuracy: see diagram
Clamps: spring clamp,
wire cross section 0,5 ... 1,5mm²
Mounting length L: 140/270/400mm
Sensor tube: PA6, colour black
Filter element: stainlesssteel, mesh size 80µm
Connection head: Material PA6, colour white
Protection: Connection head IP65 according to EN 60529
Cable entry: Single entry M16 for cable max. D=8mm
Ambient temperature: -20...+70°C, max 85%rH no condensate
Weight: approx. 170g

Thermokon Sensortechnik GmbH - Aarstrasse 6 - 35756 Mittenaar - Tel.: 02772/65010 - Fax: 02772/6501400 - www.thermokon.de - email@thermokon.de
produktblatt_ftk_rs485_modbus © 2012

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Genauigkeit



Modbus Registerdefinitionen

Daten-Adresse	Funktions-Code	Bedeutung	Typ
3x0249 hex	4	Relative Feuchte [1/10] %	SIGNED 16 Bit
3x024B hex	4	Temperatur [1/100] %	SIGNED 16 Bit

Sicherheitshinweis 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.

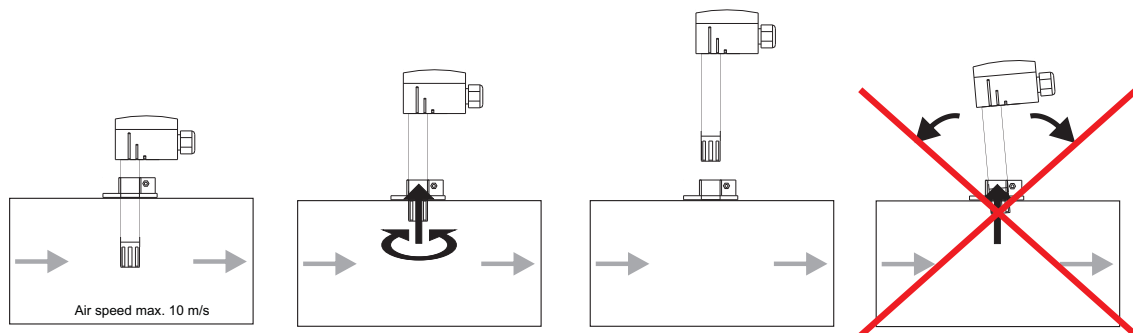
Elektrischer Anschluss

Die Geräte sind für den Betrieb an Schutzkleinspannung (SELV) ausgelegt. Beim elektrischen Anschluss der Geräte gelten die techn. Daten der Geräte. Bei Fühlern mit Messumformer sollte dieser in der Regel in der Messbereichsmittle betrieben werden, da an den Messbereichsendpunkten erhöhte Abweichungen auftreten können. Die Umgebungstemperatur der Messumformerelektronik sollte konstant gehalten werden. Die Messumformer müssen bei einer konstanten Betriebsspannung (±0,2V) betrieben werden. Strom-/Spannungssitzen beim Ein-/Ausschalten der Versorgungsspannung müssen bauseits vermieden werden.

Montagehinweise

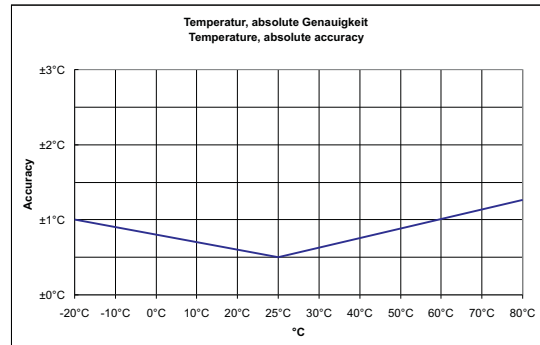
Der Sensor kann mittels Montageflansch am Lüftungskanal befestigt werden.

Bei möglicher Kondensatbildung im Fühlerrohr bzw. Tauchhülse unbedingt die Hülse so einbauen, dass entstehendes Kondensat ablaufen kann.



Page 2

Accuracy



Modbus Register Definition

Data-Address	Function Code	Description	Type
3x0249 hex	4	Relative Humidity [1/10] %	SIGNED 16 Bit
3x024B hex	4	Temperature [1/100] %	SIGNED 16 Bit

Security 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

The devices are constructed for the operation of protective low voltage (SELV). For the electrical connection, the technical data of the corresponding device are valid. Sensing devices with transducer should in principle be operated in the middle of the measuring range to avoid deviations at the measuring end points. The ambient temperature of the transducer electronics should be kept constant. The transducers must be operated at a constant supply voltage (±0,2V). When switching the supply voltage on/off, power surges must be avoided on site.

Mounting Advices

The sensor can be mounted on the ventilation duct by a mounting flange.

For risk of condensate permeation in the sensor tube respectively in the immersion pocket, the bushing must be installed in that way, that occurred condensate can run off.

Anwenderhinweise

Durch Luftumwälzungen können sich im Laufe der Zeit auf dem Sinterfilter, der die Sensoren schützt, Schmutz und Staubpartikel ansammeln, die die Funktion des Fühlers behindern können. Nach erfolgter Demontage des Filters kann dieser durch Ausblasen mit ölfreier, gefilterter Pressluft, Reinstluft, Stickstoff oder Auswaschen mit destilliertem Wasser wieder gereinigt werden. Zu stark verschmutzte Filter sollten getauscht werden.

Jegliche Berührung der empfindlichen Feuchtesensoren ist zu unterlassen und führt zum Erlöschen der Gewährleistung.

Bei normalen Umgebungsbedingungen empfehlen wir ein Intervall für die Nachkalibrierung von 1 Jahr um die angegebene Genauigkeit beizubehalten.

Bei hohen Umgebungstemperaturen und hohen Luftfeuchtigkeiten, sowie beim Einsatz in aggressiven Gasen kann ein vorzeitiges Nachkalibrieren oder ein Feuchtesensortausch notwendig werden. Eine solche Nachkalibrierung oder etwaiger Sensortausch fallen nicht unter die allgemeine Gewährleistung.

Fühler mit elektronischen Bauelementen besitzen immer eine elektrische Verlustleistung, die die Temperaturmessung der Umgebungsluft beeinflusst. Die auftretende Verlustleistung in aktiven Temperaturfühlern steigt i.d.R. linear mit der steigenden Betriebsspannung. Diese Verlustleistung muss bei der Temperaturmessung berücksichtigt werden. Bei einer festen Betriebsspannung geschieht dies in der Regel durch addieren bzw. subtrahieren eines konstanten Offsetwertes. Da Thermokon Messumformer mit variabler Betriebsspannung arbeiten, kann aus fertigungstechnischen Gründen nur eine Betriebsspannung berücksichtigt werden. Die Messumformer werden standardmäßig bei einer Betriebsspannung von 24VDC eingestellt, d.h. bei dieser Spannung ist der zu erwartende Messfehler des Ausgangssignals am geringsten. Bei anderen Betriebsspannungen vergrößert oder verkleinert sich der Offsetfehler aufgrund der veränderten Verlustleistung der Fühlerelektronik. Sollte beim späteren Betrieb eine Nachkalibrierung direkt am Fühler notwendig sein, so ist dies durch das auf der Fühlerplatine befindliche Trimpoti möglich (bei Fühlern mit Bus Schnittstelle über eine entsprechende Softwarevariable. Alternativ kann der Offset Wert im nach geschalteten Reglersystem korrigiert werden.

Auftretende Zugluft führt die Verlustleistung am Fühler besser ab. Dadurch kommt es zu zeitlich begrenzten Abweichungen bei der Temperaturmessung.

Die Genauigkeit der Temperaturmessung ist neben einem geeignetem repräsentativen der Temperatur entsprechendem Montageort auch direkt von der Temperaturdynamik der Wand abhängig. Dies Phänomene müssen ebenfalls entsprechend in der Auswertung im Regelsystem berücksichtigt werden.

Application Notice

Due to air circulations dirt and dust particles can be piled up in the course of time on the sintered filter which is protecting the sensor. Thus, the function of the sensor can be affected. After having dismantled the filter, the same can be cleaned by blowing it out with oil-free and filtered compressed air, super-clean air or nitrogen or by washing it out with distilled water. If the filter is too dirty, the same should be replaced.

Refrain from touching the sensitive humidity sensor. Any touch of the same will result in an expiration of the warranty.

With normal environmental conditions we recommend a recalibration interval of around 1 year to maintain the indicated accuracy.

At high ambient temperatures and high humidity, or when using the sensor in aggressive gases, an early recalibration or a change of the humidity sensor can become necessary. Such a recalibration or a probable sensor change do not come under the general warranty.

Temperature sensor with electronic components always have a dissipated power, which affects the temperature measurement of the ambient air. The dissipation in active temperature sensors shows a linear increase with rising operating voltage. This dissipated power has to be considered when measuring temperature. In case of a fixed operating voltage, this is normally be done by adding or reducing a constant offset value. As Thermokon transducers work with a variable operating voltage, only one operating voltage can be taken into consideration, for reasons of production engineering. Transducers have a standard setting at a operating voltage of 24VDC. That is to say, that at this voltage, the expected measuring error of the output signal will be the least. As for other operating voltages, the offset error will be increased or lowered by a changing power loss of the sensor electronics. If a re-cabliation should become necessary later directly on the sensor, this can be done by means of a trimming potentiometer on the sensor board (for sensors with Bus-interface, a re-calibration can be done via corresponding software variable. Alternatively the offset value can be corrected in the control system next in line.

Occurred draft leads to a better carrying-off of dissipated power at the sensor. Thus, temporal limited fluctuations might occur upon temperature measurement.

Besides a suitable representative mounting place, corresponding to the room temperature, the accuracy of the temperature measurement also depends directly on the temperature dynamics of the wall. This phenomenon must be considered with the evaluation in the control system as well.

Anschlussplan

Terminal Connection Plan

Optionen
Options

ON
1 2 3 4 5 6

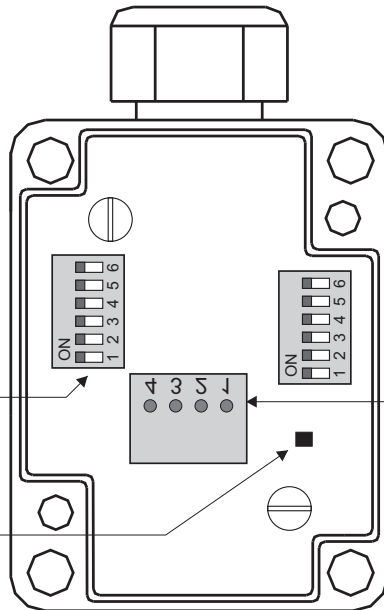
1 **Modus / Mode**
off RTU (Standard / default)
on ASCI

2 3 **Baud**
off off 9600 (Standard / default)
on off 19200
off on 38400
on on 57600

4 5 **Parität / Parity**
on off even (Standard / default)
off on odd
off off no

6 **Abschluss / Termination**
off inaktiv (Standard / default)
on 120Ohm

LED
Betriebsspannung: leuchtet
Busaktivität: blinkt
Power supply: lights
Bus activity: flashes



Geräteadresse
Device Address

ON
1 2 3 4 5 6

1	2	3	4	5	6	Adresse Address
off	off	off	off	off	off	0 (Standard / default)
on	off	off	off	off	off	1
off	on	off	off	off	off	2
on	on	off	off	off	off	3
:	:	:	:	:	:	:
on	on	on	on	on	on	63

binärcodiert
binary coded

Klemmenbelegung X1
Terminal connections X1

Spannungsversorgung - / AC2 ①
Power supply + / AC1 ②

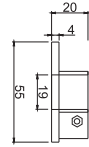
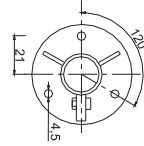
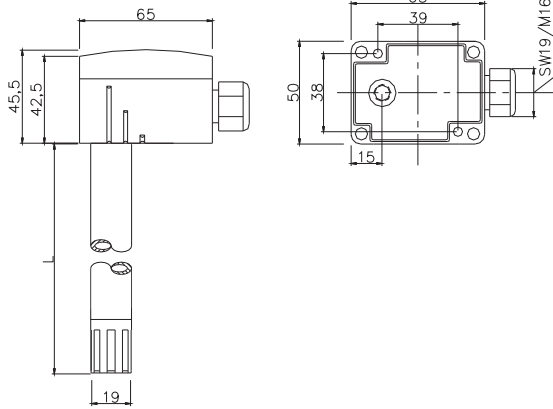
A ③
B ④

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Abmessungen (mm)

Dimensions (mm)



MF19-PA
Zubehör optional
Optional Accessories

Zubehör optional

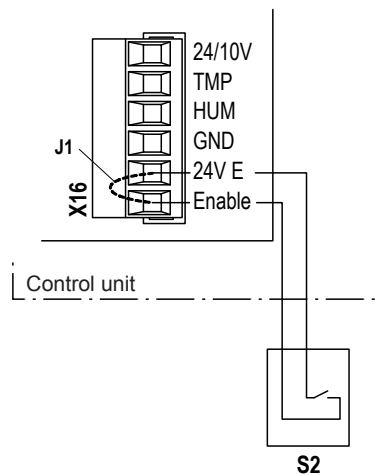
Optional Accessories

(MF19-PA) Montageflansch zur Befestigung des Fühlers am Lüftungskanal

(MF19-PA) Mounting flange for installation on ventilation duct

Legend wiring diagram Condair ME Control

A1	Driver board
A2	Control board
B1	Ventilation interlock
B2	Max. humidity monitor
B3	Air flow monitor
B4	Temperature and conductivity measuring
B5	Sensor temperature and conductivity measuring
B6	Level sensor dosing pump (option)
B7	Demand or humidity/temperature signal
B8	External On/Off switch (external enable)
B9	Air temperature monitoring duct (option)
BAT	Backup battery (CR2032, 3V)
CS1	Current sensor (UV lamp)
CS2	Current sensor (pump fault detection option) Note: wires must pass through the sensor in the direction shown
D.LVL	Terminal level switch dosing liquid tank
D.PUMP	Terminal dosing pump
F1	Fuse mains supply (6.3 A slow acting)
F2	Fuse 10/24 VDC supply(630 mA slow acting)
F3	Internal fuse mains supply (6.3 A slow acting)
F4	External fuse mains supply (10 A slow acting)
FAN	Internal cooling fan (large systems only)
H1	Remote operating and fault indication board (option)
J1	Cable bridge if no external On/Off switch is connected
J2	Cable bridge demand signal (for commissioning only)
J3	Cable bridge if no safety chain is connected
J4	Jumper for activating the terminating resistor for Modbus network (Jumper must be fitted, if Condair ME is the last unit in the Modbus network)
J7	Jumper fitted: Modbus communication via RS 485 interface (J6)
JP4	Jumper fitted= 24 V on X16 (JP5 removed)
JP5	Jumper fitted= = 10 V on X16 (JP4 removed)
JP/TR	Jumper fitted on the last driver board
K1	External safety chain
K2	Cable harness from hydraulic module
LS1	Leakage monitoring board (option)
LS2	Sensor leakage monitoring (option)
M1	Dosing pump (option)
NF	Mains filter
Q	Electrical isolator
S3	On /Off switch control unit
SD	Memory card
SF	Snap ferrite (wrap cable 3 times through ferrite)
SUPPLY	Terminal mains supply voltage
T1...T4	24V power supply (quantity varies with system size)
UV	UV lamp (option)
U.V.	Terminal UV lamp
X4	Terminal cable harness hydraulic module
X7	Not used
X5	Terminal current sensor (pump fault detection option)

External enable

The **potential-free contact** of an external enable switch is **connected to the contacts "24 V E" and "Enable" of the terminal block "X16"** on the driver board in accordance with the wiring diagram. The connecting cable must either be fed through the rectangular cable feed through or a free cable gland into the control unit

If no external enable switch is connected, a cable bridge "J1" must be installed on the contacts "24V E" and "Enable" of the terminal block "X16".

CAUTION! Do not apply any extraneous voltage to terminals via the enable switch.

TROX[®] TECHNIK

The art of handling air

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