



# Hydraulic unit for RAC systems



**TROX<sup>®</sup> TECHNIK**  
The art of handling air

TROX GmbH  
Heinrich-Trox-Platz  
47504 Neukirchen-Vluyn, Germany  
Germany  
Telephone: +49 (0) 2845 202-0  
Fax: +49 (0) 2845 202-265  
E-mail: [trox@trox.de](mailto:trox@trox.de)  
Internet: [www.trox.de](http://www.trox.de)

A00000063382, 6, GB/en  
01/2022

© TROX GmbH 2016

### About this manual

This manual enables operating or service personnel to use the hydraulic unit for run-around coil systems (RAC systems) safely and efficiently.

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

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

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

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

Illustrations in this manual are mainly for information and may differ from the actual design.

### Other applicable documentation

In addition to these instructions, the following documents apply:

- Order-specific approval 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 Service

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

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

Online	<a href="http://www.troxtechnik.com">www.troxtechnik.com</a>
Phone	+49 2845 202-400

### Copyright

This document, including all illustrations, is protected by copyright and pertains only to the corresponding product.

Any use without our consent may be an infringement of copyright, and the violator will be held liable for any damage.

This applies in particular to:

- Publishing content
- Copying content
- Translating content
- Microcopying content
- Saving content to electronic systems and editing it

### Limitation of liability

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

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

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

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

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

We reserve the right to make technical changes.

### Warranty claims

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

## Safety notes

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

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

### **DANGER!**

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

### **WARNING!**

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

### **CAUTION!**

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

### **NOTICE!**

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

### **ENVIRONMENT!**

Environmental pollution hazard.



## Tips and recommendations



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





## Specific safety notes

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

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

<b>1</b>	<b>Hydraulic unit overview</b> .....	<b>6</b>	<b>6</b>	<b>Initial commissioning</b> .....	<b>36</b>
	1.1 Tyre protection system description .....	7		6.1 Safety notes regarding initial commis-	36
<b>2</b>	<b>Safety</b> .....	<b>10</b>		6.2 Before initial commissioning .....	36
	2.1 Correct use .....	10		6.3 Setting up the hydraulic unit .....	37
	2.2 System owner's responsibility .....	10		6.3.1 Checking the diaphragm expansion	37
	2.3 Personnel requirements .....	10		vessel .....	37
	2.4 Personal protective equipment .....	11		6.3.2 Using the diaphragm expansion vessel	38
	2.5 Safeguards .....	12		.....	38
	2.6 Securing the unit against being switched	13		6.3.3 Parameter setting on the pressure	39
	on accidentally .....	13		sensor .....	39
	2.7 Residual risks .....	14		6.3.4 Venting .....	39
	2.7.1 General workplace hazards .....	14		6.3.5 Starting .....	40
	2.7.2 Electric shock hazards .....	14	<b>7</b>	<b>Maintenance</b> .....	<b>41</b>
	2.7.3 Hazards from the hydraulic system .....	15		7.1 Safety notes regarding maintenance .....	41
	2.7.4 Hazards from high temperatures .....	15		7.2 Switching off the hydraulic unit and	41
	2.7.5 Hazardous substances and operating	15		securing it against being switched on acci-	41
	fluids .....	15		dentally .....	41
	2.7.6 Hazard due to machine movements .....	15		7.3 Maintenance plan .....	42
<b>3</b>	<b>Transport and storage</b> .....	<b>17</b>		7.4 Maintenance .....	45
	3.1 Delivery of the hydraulic unit .....	17		7.4.1 Opening inspection access doors .....	45
	3.2 Delivery check .....	17		7.4.2 Diaphragm expansion vessel .....	45
	3.3 Moving packages .....	17		7.4.3 Centrifugal pump .....	47
	3.3.1 Safety notes regarding transport .....	17		7.4.4 Cleaning the dirt separator .....	47
	3.3.2 Moving packages with a forklift or pallet	18	<b>8</b>	<b>Index</b> .....	<b>48</b>
	truck .....	18		<b>Appendix</b> .....	<b>50</b>
	3.3.3 Moving packages with a crane .....	18		A Schematic illustrations of the system (exam-	51
<b>4</b>	<b>Installation</b> .....	<b>20</b>		ples) .....	51
	4.1 Safety instructions .....	20		B Supplier documents .....	53
	4.2 Installation location, requirements .....	20		B.1 Pressure sensor .....	53
	4.3 Safety notes regarding installation .....	21		B.2 Thermokon sensor .....	58
	4.4 <input checked="" type="checkbox"/> Connecting the run around coil system	24		B.3 Differential pressure sensor .....	64
	.....	24		B.4 FTK temperature sensor .....	75
	4.5 Filling and ventilating the hydraulic unit ...	26		B.5 Wiring diagram for Condair ME humidifier	79
	4.6 Connecting the unit to the power supply	28		.....	79
	.....	28			
	4.7 Wiring bus sensors .....	29			
	4.8 Installing components for cooling energy	29			
	recovery from dehumidification .....	29			
	4.9 Installing the adiabatic humidifier .....	29			
<b>5</b>	<b>Using X-CUBE Control</b> .....	<b>30</b>			
	5.1 Login on the user interface .....	30			
	5.2 System overview .....	31			
	5.3 System settings .....	32			
	5.3.1 Selecting the language .....	32			
	5.3.2 Setting the 'system mode' (operating	33			
	mode) .....	33			
	5.3.3 Setting the date and time .....	33			
	5.4 Setting manual mode .....	33			
	5.5 Acknowledging fault messages .....	35			

## 1 Hydraulic unit overview



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 | Tubular frame  | ⑬ | Pressure gauge                                     |
| ⑤ | Pipes for connecting the external cooling and heating energy feed          | ⑭ | Shut-off damper                                    |
| ⑥ | Pipes for connecting to the heat exchangers in the air handling unit (AHU) | ⑮ | Pump   |
| ⑦ | Shut-off valves (manual)   | ⑯ | Insulation   |
| ⑧ | 2-way valve for tyre protection  | ⑰ | Heat exchanger for heating and cooling energy feed |
| ⑨ | 3-way valve for output control   |   |  |

### **i** Note

The hydraulic unit may differ from the illustration shown above depending on the configuration.

**Pipe connections**

The hydraulic unit pipes for connecting the hydraulic unit to the heat exchangers in the air handling unit (AHU) are marked with stickers.

**Heat exchanger connection**

Connection on hydraulic unit	Heat exchanger AHU	Description
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 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

**1.1 Tyre protection system description**

The hydraulic unit and the heat exchangers in the air handling unit (AHU) form the run around coil system (RAC system). The RAC system transfers thermal energy from the extract air to the supply air; the goal is to achieve a very high degree of efficiency.

**Mode of action**

- Cooling - The heat of the outdoor air (ODA) is transferred to the extract air (ETA), and the supply air (SUP) is cooled as a consequence (summer mode).
- Heating - The heat of the extract air (ETA) is transferred to the outdoor air (ODA), and the supply air (SUP) is heated as a consequence (winter mode).

The hydraulic unit includes all components and integral controls required for an efficient run around coil system.

**Heat recovery**

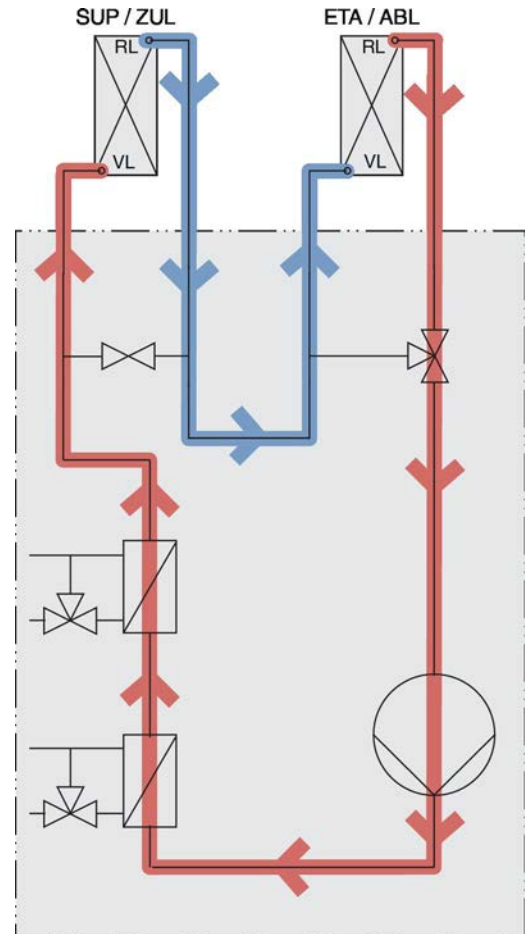


Fig. 2: Heat recovery flow diagram

In heat recovery mode and with 100% output required, the pump creates a water flow that is optimised with regard to the air volume flow rate. This optimisation and the use of special RAC heat exchangers with the maximum counter flow proportion result in highly efficient heat recovery.

## Output adjustment

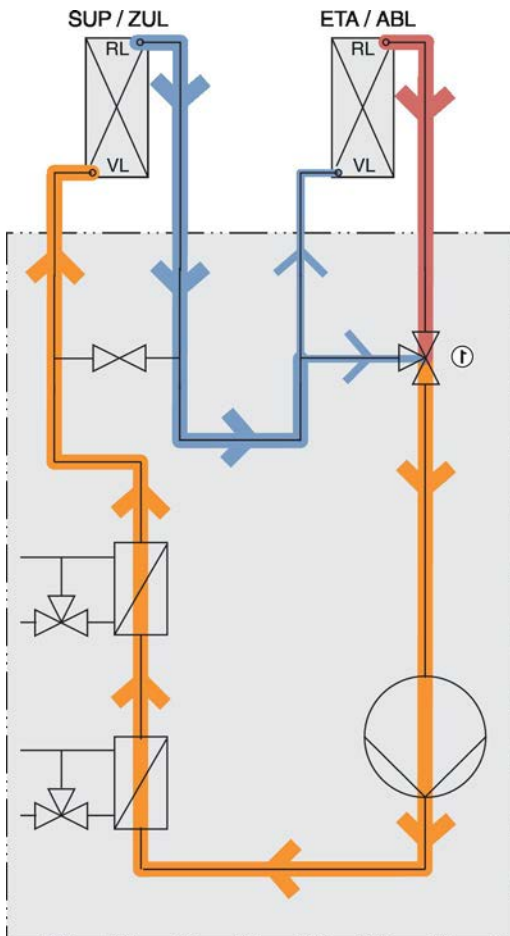


Fig. 3: Output adjustment flow diagram

A 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 pump speed is adjusted. If the output at minimal speed is still too high, the 3-way control valve opens the bypass, which results in a reduction of the extract air heat exchanger output.

## Frost protection

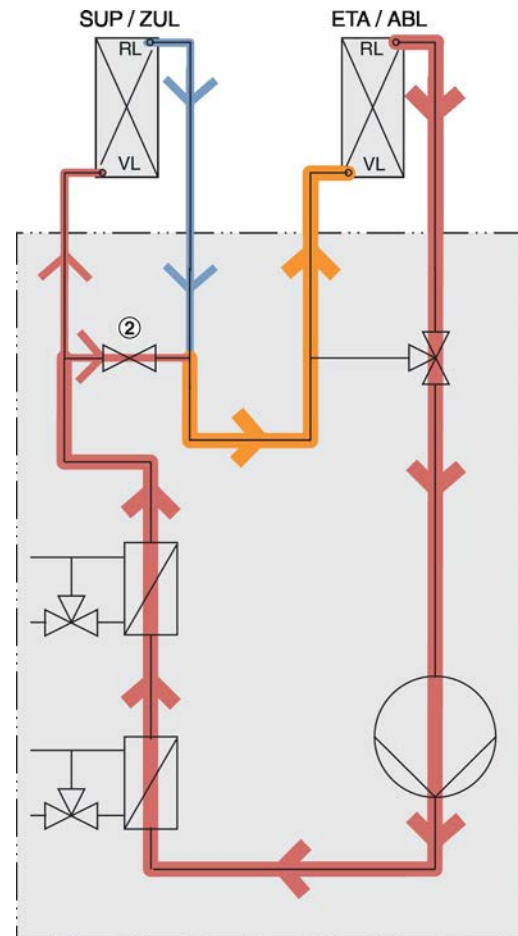


Fig. 4: Frost protection flow diagram

A 2-way control valve (2) in the bypass between the flow and return of the supply air heat exchanger protects the tyre protection from freezing. If, in case of low outside temperatures, the flow temperature in the extract air heat exchanger falls below the setpoint value (can be adjusted), the pump speed is increased. This results in an increase of the return temperature in the supply air heat exchanger and of the flow temperature in the extract air heat exchanger. If the temperature remains very low, the control valve gradually opens the bypass; this results in a mixed temperature, which prevents frost from developing in the extract air heat exchanger.



Feeding

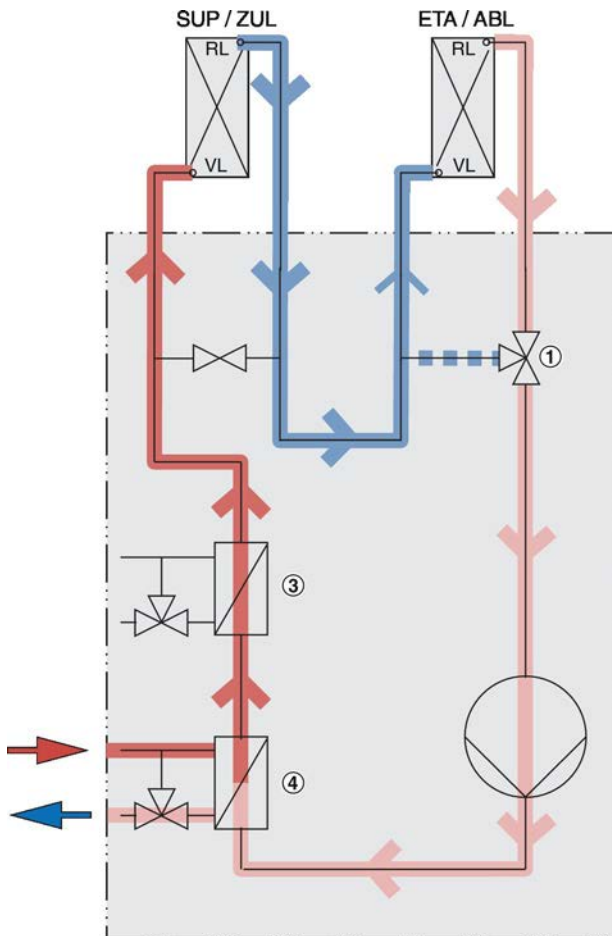


Fig. 5: Feeding of heating energy (100% feed)

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

In this mode the temperature difference between the inlet and the outlet of the extract air heat exchanger is continuously monitored. If the temperature difference reaches a set limit value (can be adjusted), heat recovery from the extract air is no longer possible. The 3-way valve (1) opens the bypass, and an alarm is emitted.

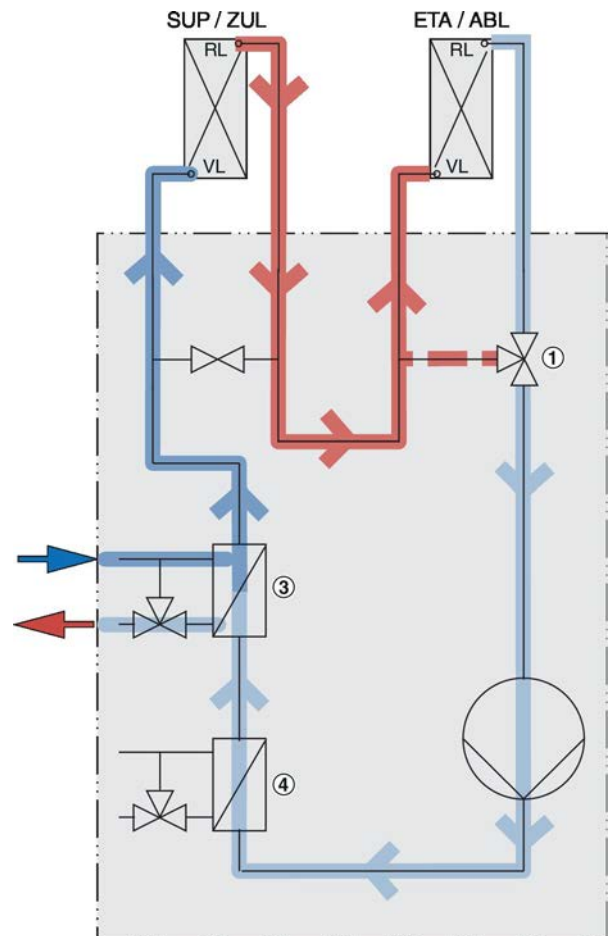


Fig. 6: Feeding of cooling energy (100% feed)

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

In this mode the temperature difference between the inlet and the outlet of the extract air heat exchanger is continuously monitored. If the temperature difference reaches a set limit value (can be adjusted), heat recovery from the extract air is no longer possible. The 3-way valve (1) opens the bypass, and an alarm is emitted.

## 2 Safety

### 2.1 Correct use

The TROX hydraulic unit is designed exclusively for heat recovery in combination with air handling units. The hydraulic unit and the heat exchangers in the air handling unit (AHU) form the run around coil system (RAC system). The hydraulic unit must not be used without the AHU.

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 unit can lead to dangerous situations.

Do not use the hydraulic unit

- in rooms with potentially explosive atmospheres
- for applications or in environments that do not meet the design specifications (see TROX data sheet)

### 2.2 System owner's responsibility

#### System owner

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

#### System owner's obligations

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

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

In particular:

- The system owner must establish on site a coherent lightning protection strategy and include the unit in this strategy.
- The system owner must name responsible persons for transport, storage, assembly, installation, commissioning, transfer, disassembly and removal of the unit.
- The system owner must commission a skilled qualified electrician to create equipotential bonding.

- The system owner has to ensure that all individuals who handle or use the unit have read and understood this manual.
- The system owner must provide the employees with the required personal protective equipment.
- The system owner must have all safeguards tested regularly to ensure that they are functional and complete.
- The system owner must ensure compliance with the national legal provisions.

### 2.3 Personnel requirements

##### **WARNING!**

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

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

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

#### Crane driver

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

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

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

Crane drivers have to be at least 18 years old.

#### Forklift driver

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

Forklift drivers are responsible for moving pallets.

#### HVAC technician

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

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

#### Instructed person

Instructed persons have been adequately advised or supervised to enable them to avoid any potential hazards related to the work under consideration. Instruction is provided by a qualified expert in the respective field.

Individuals who have been instructed in using a particular hydraulic unit are allowed to carry out the following jobs:

- Visual inspections
- Switching the hydraulic unit to manual mode
- Cleaning the heat exchanger

#### 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 from crushing, falling parts and prevent slipping on a slippery floor.

## 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.

### Hydraulic unit mains isolator

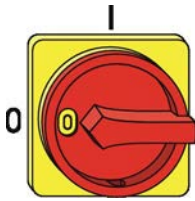


Fig. 7: Mains isolator

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

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

### Equipotential bonding

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

### Inside door handle

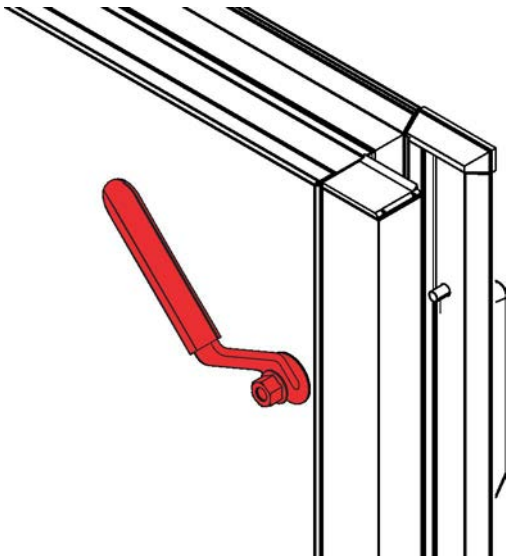


Fig. 8: Inside door handle on an inspection access door

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

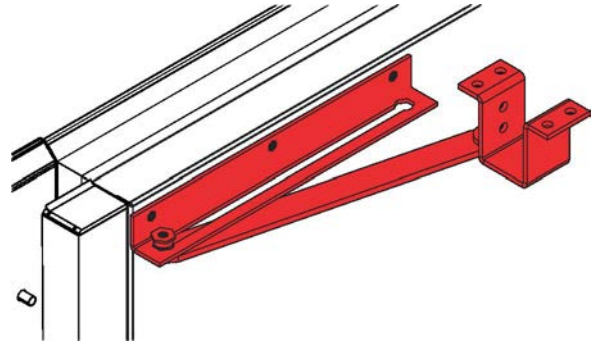


Fig. 9: Hold open device for outdoor air handling units

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

### Securing the unit against being switched on accidentally

**⚠ CAUTION!**

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

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

Switch off the hydraulic unit before you start working on the hydraulic unit or on any connected system and secure it against accidentally being switched on again.

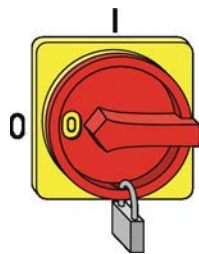


Fig. 10: Securing the mains isolator

1. ▶

**⚡ WARNING!**

**Electric shock hazard!**

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

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

2. ▶ Secure the mains isolator with a padlock ( Fig. 10 ).
3. ▶ Keep the key in a safe place.
4. ▶ Cover the mains isolator with a notice informing people that work is in progress.

## 2.7 Residual risks

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. This section describes the residual risks that have been identified in a risk assessment.

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

### 2.7.1 General workplace hazards

#### Working at height

 **WARNING!**

**Risk of a fall when you work at height!**

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

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

#### Leaks

 **CAUTION!**

**Risk of injury from slipping on a contaminated floor!**

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

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

### 2.7.2 Electric shock hazards

#### Electric current

 **DANGER!**

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

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

- Have work on the electrical system carried out only by skilled qualified electricians.
- 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 the earth; short circuit connection.
  - Either cover nearby parts that carry a voltage or install barriers.
- Do not bypass or disable any circuit breakers. Be sure to maintain the correct current rating when you replace a circuit breaker.
- Ensure that live parts do not come into contact with moisture. Moisture can cause a short circuit.

#### 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 Hazards from the hydraulic system

#### Jet of liquid from a defective hydraulic system

 **DANGER!**

**Risk to life from high pressure fluid injection!**

If a hose or a pipe or a component becomes defective, a jet of chilled water under pressure may escape. The jet of liquid can cause serious injuries as well as frostbite and burns.

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

### 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 Hazardous substances and operating fluids

#### Operating fluids with glycol

 **WARNING!**

**Health risk from operating fluids that contain glycol!**

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

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

### 2.7.6 Hazard due to machine movements

#### 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.



## 3 Transport and storage

### 3.1 Delivery of the hydraulic unit

The hydraulic unit is shipped either on a square timber frame or on a single use pallet.

Check delivered items immediately after arrival for shipping damage and completeness, ↪ *Chapter 3.2 'Delivery check' on page 17*.

### 3.2 Delivery check

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

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 Moving packages

### 3.3.1 Safety notes regarding transport

#### Improper transport equipment



#### WARNING!

#### Risk to life from using improper transport equipment!

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

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

↪ *2.7 'Residual risks' on page 14*

## 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).

## Damage to goods being moved

### NOTICE!

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

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

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

### 3.3.2 Moving packages with a forklift or pallet truck

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
- Hearing protection
- Safety shoes
- Protective gloves

### 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 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. 11: Carrying load with a forklift

1. ▶ Drive the forklift forward until the forks ( Fig. 11 /3) are fully between the square edge timber sections ( Fig. 11 /2) and protrude from underneath the base frame ( Fig. 11 /1) on the opposite side.
2. ▶ Ensure that the load cannot tip.
3. ▶ Slowly lift the load and start moving.

### 3.3.3 Moving packages with a crane

#### Lashing points

The units have lashing points for crane transport. Depending on the construction and weight of a unit, lashing points may be lifting eyes or eye nuts.

Lashing points are part of the supply package. If several units are to be moved, you will have to reuse lifting eyes or transport tubes.

Use only the factory lashing points to move units. If a unit has to be moved with different equipment, contact TROX beforehand to discuss the details.

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

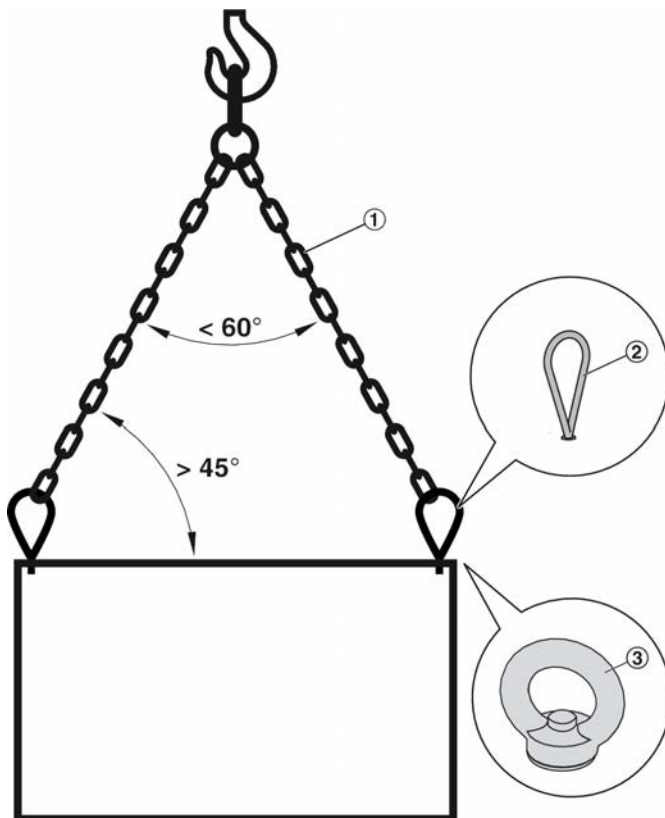


Fig. 12: Using lifting eyes for moving units with a crane

- 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.*

- ▶ **Using lifting eyes:** Remove the covers from the threaded holes in the top corners of the units.  
Insert all lifting eyes ( Fig. 12 /2) into the threaded holes.

**! Important!** Fully insert the thread!

- ▶ Hook the slings ( Fig. 12 /1) into the lifting eyes or eye nuts.

Note:

- Maintain an angle greater than  $45^\circ$  between the sling and the top of the unit.
- Do not spread slings by more than  $60^\circ$ .
- 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.*

- ▶ Slowly lift the load and start moving.

## 4 Installation

### 4.1 Safety instructions

#### 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 hydraulic unit 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.

### 4.2 Installation location, requirements

#### Indoor installation

For indoor installation please note:

- Do not use the hydraulic unit in 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 plant rooms may also apply.
- The installation room has to be
  - clean
  - dry
  - free from conductive dust particles
  - free from strong electromagnetic fields
  - free from aggressive atmospheres
  - free from frost
- There must be sufficient clearance for installation, operation, maintenance and repair.
- The structure on which the unit is to be installed must be suitable for the weight and have a level surface.

#### Escaping liquids

**NOTICE!**

**Risk of damage to property from escaping liquids!**

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

- Remove escaping liquids and dispose of them correctly.

#### Outdoor installation

For outdoor installation please note:

- Do not use the hydraulic unit in potentially explosive atmospheres.
- The installation location has to be
  - free from conductive dust particles
  - free from strong electromagnetic fields
  - free from aggressive atmospheres
- The structure on which the unit is to be installed must be suitable for the weight and have a level surface (see the order-specific data sheet for the unit).
- There must be sufficient clearance for installation, operation, maintenance and repair. The maintenance access has to be at least as deep as the unit.
- Make sure that the installation location meets local regulations to prevent the fall of people, and of tools and other objects.
- Use suitable fall arrest equipment.
- Prevent unauthorised individuals from accessing the hydraulic unit.
- Make sure that authorised individuals can access all parts safely.

- Keep the structural properties in mind and make sure the maximum roof load is not exceeded; do not neglect the effects of weather on the unit (rain, snow, wind, sun etc.).
- Only a skilled qualified professional must connect the hydraulic unit and prevent the cables from the effects of weather (rain, snow, wind, sun etc.).
- All heat transfer fluid pipes and hoses and the components to which they are connected must be frost-proof
- Do not use the hydraulic unit as a structural element or as a roof for a building.

### 4.3 Safety notes regarding installation

#### Incorrect installation

##### **WARNING!**

##### **Risk to life from incorrect installation!**

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

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

#### Inspection access doors slamming shut

##### **WARNING!**

##### **Risk of crushing from doors slamming shut**

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

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

#### 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.

#### 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.

## Safety notes regarding installation

### Setting up the hydraulic unit and connecting casing units

#### 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 without casing unit separator

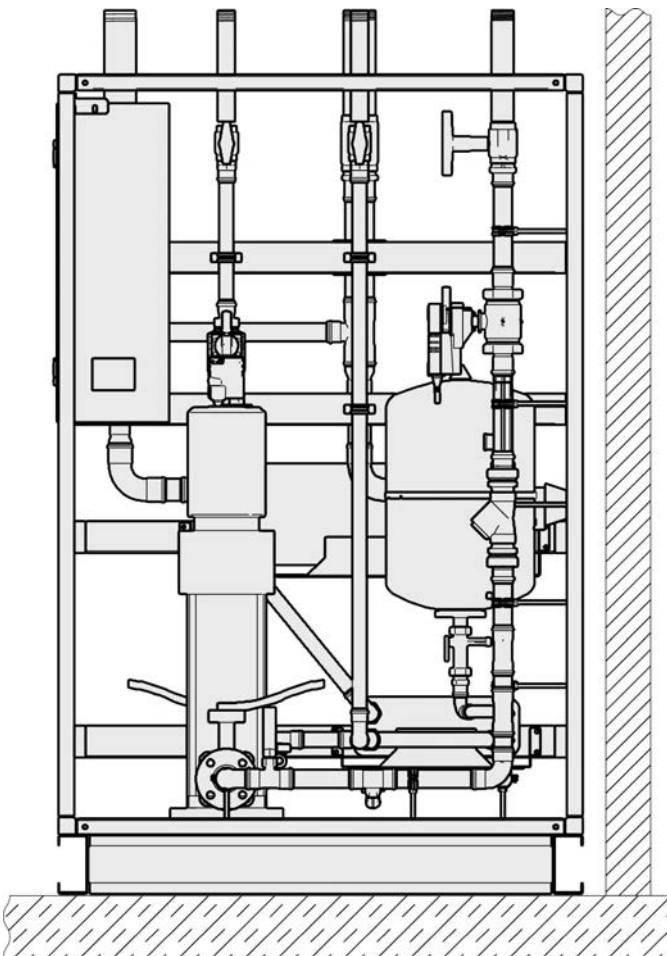


Fig. 13: Setting up the hydraulic unit

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

#### Alignment:

using the levelling feet

- Align the hydraulic unit using the levelling feet.

without levelling feet

- Level out floor unevenness using materials provided by others, e.g. rubber or elastomer sheets.

### Hydraulic unit with casing unit separator



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

Slide plates ( Fig. 14 /3) considerably simplify the process of positioning the casing units ( Fig. 14 /1) on a surface with a high friction coefficient, such as rubber or elastomer sheets ( Fig. 14 /4).

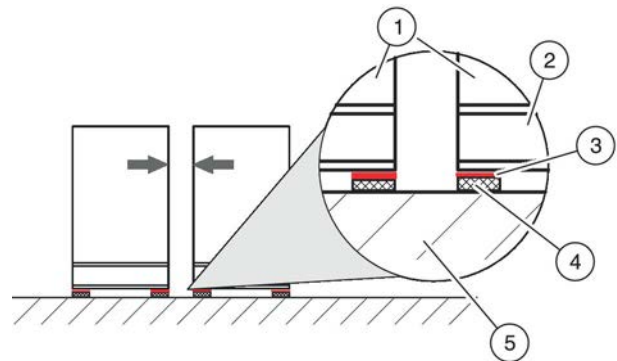


Fig. 14: Unit arrangement with anti vibration elements

- ▶ Position the slide plates ( Fig. 14 /3, by others) under the base frames ( Fig. 14 /2) of the individual casing units ( Fig. 14 /1).
- ▶ Move the casing units as close together as possible.

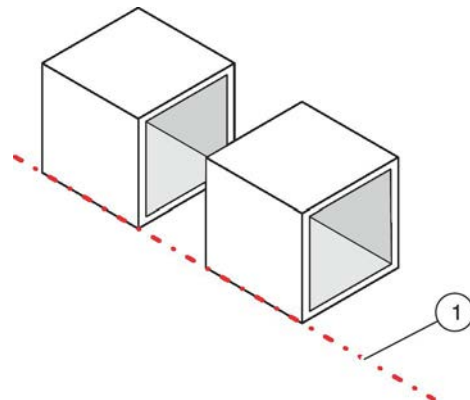


Fig. 15: Aligning casing units

- ▶ Align the casing units so that they are flush with one another ( Fig. 15 /1).

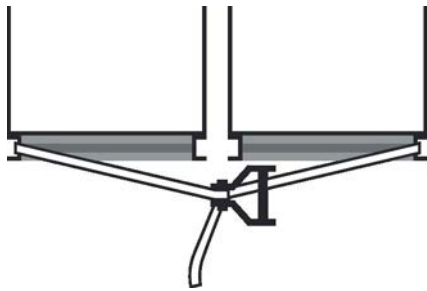


Fig. 16: Attaching a ratchet strap

4. ▶ Attach a ratchet strap to the base frames of two casing units ( Fig. 16 ).
5. ▶ Tighten the ratchet strap.
  - ⇒ The casing units come closer together as you tighten the strap around the base frames.

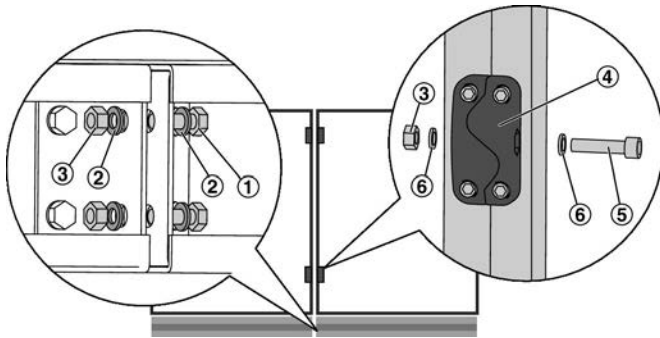


Fig. 17: Joining the base frames with screws/bolts

- ① Hexagon head screws
  - ② Washers
  - ③ Nuts
  - ④ Module connectors
  - ⑤ Allen screws
  - ⑥ Schnorr® washers
6. ▶ Use screws/bolts to join the casing units at the base frame and at the module connectors.

### Flange connection for casing unit separators

After the casing units are connected, the internal pipe-work of the hydraulic unit must be joined together using flange connections.

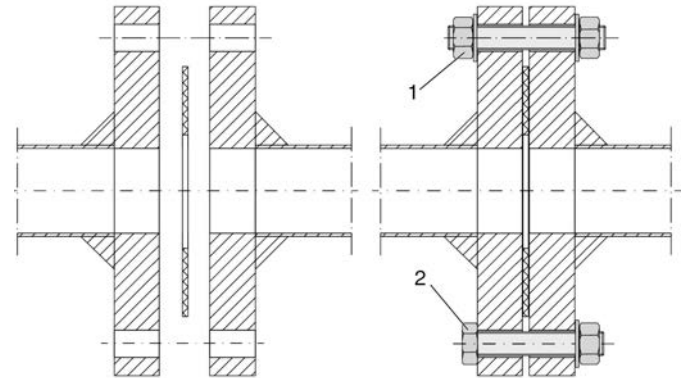


Fig. 18: Flange connection

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

### ! NOTICE!

#### Information on establishing a proper flange connection

Sheet metal reinforced seals are to be used as side seals between the flange connections. (Supply package)

- The flanges and seal must be clean and undamaged.
- Use seals individually and only once.
- Do not use sealant.
- Lubricate the 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 sealing class.

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

## Connecting the run around coil system

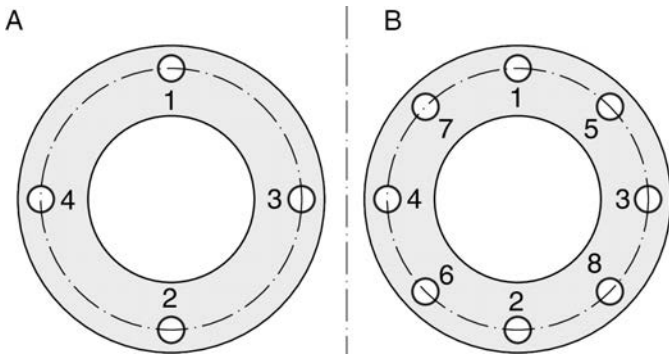


Fig. 19: Flange variants

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

1. ▶ Tighten the screws crosswise according to Fig. 19, with 30% of the nominal tightening torque.
2. ▶ Tighten the screws in the same manner as 1) to 60% of the nominal tightening torque.
3. ▶ Tighten the screws in the same manner as 1) to 100% of the nominal tightening torque.
4. ▶ Tighten the screws again all around with the full nominal 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

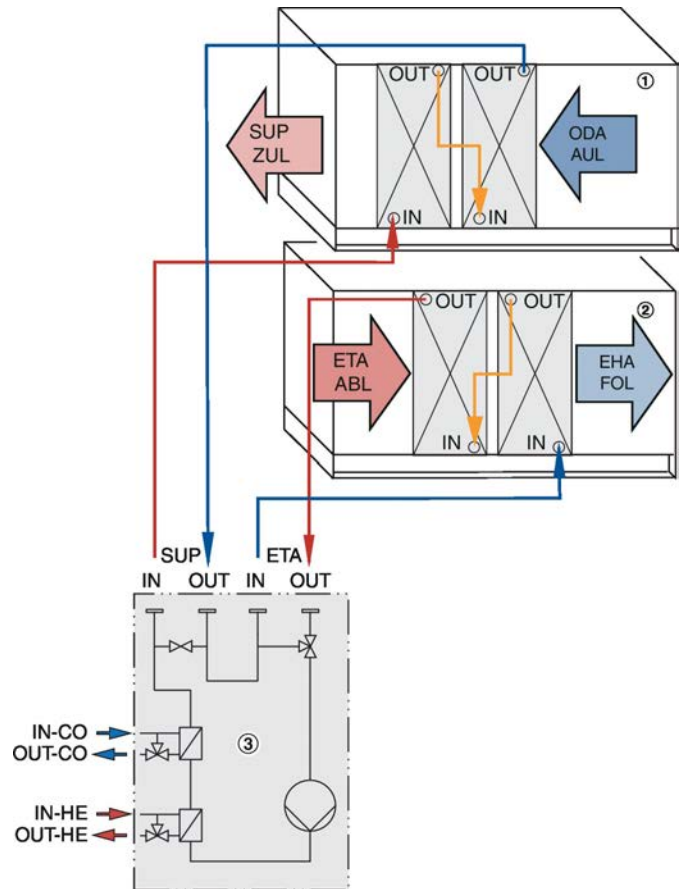


Fig. 20: Hydraulic system connection (example)

- 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. 20 ).

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. 20 ).

**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.

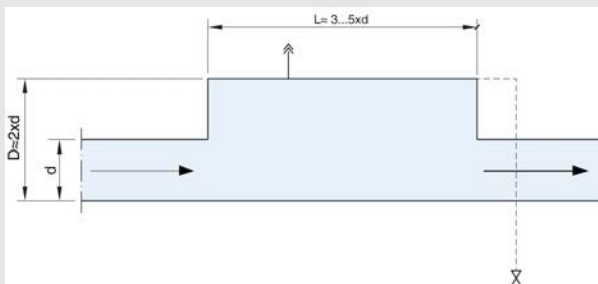


Fig. 21: Air separator with cross section enlargement

## 4.5 Filling and ventilating the hydraulic unit

### Personnel:

- HVAC technician

### Protective equipment:

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

### CAUTION!

#### Danger of poisoning due to brine

There is a danger of poisoning due to filling or ventilating with brine! (Comply with the safety data sheet provided by the manufacturer!)

### CAUTION!

#### Risk of injury from hot operating fluids and surfaces

Do not fill or ventilate with hot operating fluids as there is a risk of scalding. Do not touch hot surfaces. (danger of burns)

### Information on the filling medium

The system must be filled with the glycol-water mixture stipulated in the technical data sheets and in the specified concentration. This information is based on the planning guidelines from the system planner and must be checked for commissioning. The concentration must be designed by the planner based on the expected minimum outside air temperature.

### NOTICE!

#### Risk of damage due to incorrect glycol concentration

The components within the hydraulic unit are designed for a maximum glycol concentration of 50%.

If the proportion of glycol is too high, this leads to low performance and to destruction of the sealing materials; if the proportion of glycol is too low, this can lead to frost damage and corrosion.

The run around coil system is filled with a glycol-water mixture, water quality in accordance with VDI 2035.

The following types of glycol are used in practice:

- Monoethylene glycol (MEG)
- Propylene glycol

### NOTICE!

#### Risk of damage due to insufficiently mixed filling medium

Always fill the RAC system with a pre-mixed operating fluid. Filling the system with water and subsequently filling it with pure glycol will not guarantee fast mixing. There will still be a risk of freezing, particularly for external devices.

Never refill the RAC system with pure water, as this will not result in proper mixing and may cause frost damage.

### NOTICE!

#### Risk of damage due to incorrect filling medium

Filling and subsequently operating the system with water is only permitted if operating fluid temperatures within the system of  $<0^{\circ}\text{C}$  are excluded. Regulation of the RAC system does not include a function to prevent this condition.

### NOTICE!

#### Risk of damage due to long downtimes

Long downtimes when the system has been filled can lead to clogging and thus damage to seals.

The system should not be tested for tightness more than 4 weeks prior to commissioning and subsequently filled with the operating fluid.

### Leakage test of the system

Before filling the system, a leakage test must be carried out with air or with a glycol-water mixture.


**Attention:** Do not carry out the leakage test with pure water if the system is not set to be directly refilled, as corrosion could occur after draining or the water residues could freeze at low temperatures and damage the system.

### Cleaning the system

Before filling, clean the system to remove oil and contamination from assembly work from the pipe system.

### Fill the system and vent it.

Once the leakage test has been successfully carried out and the system has been cleaned, the system can be filled.

**Note:** Before filling, set the pre charge pressure on the diaphragm type extension tank (see the technical data sheet for the pre charge pressure setpoint), if changes have been made to the pipe system, this setpoint must be re-calculated,  on page 37.

**Filling quantity:** The volume required to fill the system can be found in the technical documentation for the system. It is also recommended to allow for a suitable reserve quantity.



Continue cleaning the system until air bubbles can no longer be seen on the open outlet. The cleaning process can be optimised with suitably placed tube connections.

Due to the complexity of the heat exchanger, it is difficult to loosen air deposits using conventional means. The use of a glycol-water mixture impedes ordinary ventilation, as the swirling motion results in the formation of foam, trapping air on the inside.

We recommend dividing the pipe network into three sub-sections:

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

For the division, shut-off devices (1-4) and feed cocks (a-d) must be positioned on the heat exchangers. This will enable the sections to be successively cleaned and the air pockets to be effectively removed.

**Note:** Deactivate the RAC system during the cleaning process!

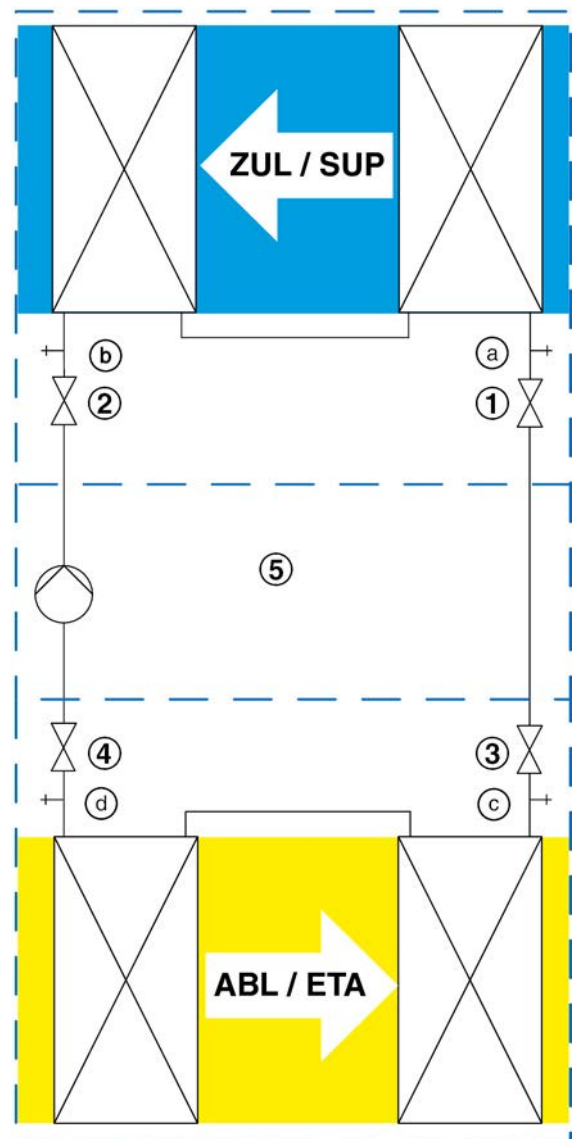


Fig. 22: RAC system ventilation

**Sub-system cleaning, supply air heat exchanger**

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

**Sub-system cleaning, extract air heat exchanger**

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

Connecting the unit to the power supply

## Subsystem cleaning, external pipe network (5)

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

## Subsystem cleaning, external pipe network (5)

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

The time for a complete cleaning process can vary depending on the size of the sub-systems.

**Recommendation:** If air can no longer be detected at the cleaning hose outlet, continue cleaning for 5 - 10 minutes.

## Optional ventilation device

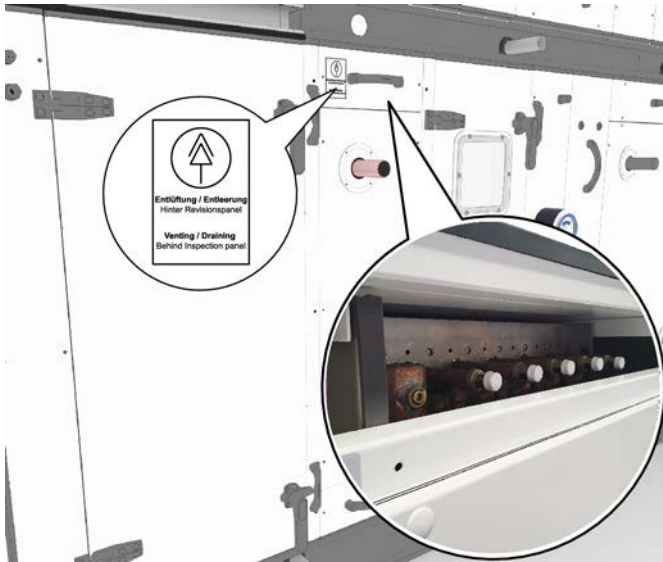


Fig. 23: Example of the ventilation equipment behind small inspection access panel on the X-CUBE

If there are ventilation devices on the RAC heat exchangers (optional), these are marked with a warning sign on the inspection panel and are accessible on the connection side via the inspection panel.

### **i** Optimum ventilation

For the best possible ventilation, we recommend installing on-site ventilation equipment at the highest point of the system, see ↗ 'Ventilation device' on page 25 .

## Setting the operating pressure

After ventilation, the system must be set to the required operating pressure. The operating pressure is determined as part of the design of the diaphragm type expansion tank and can be found in the technical data sheet for the RAC system.

### **i** Pressure fluctuations

The system pressure should remain virtually constant both when the pump is running (nominal speed approx. 80 - 90%, see display pump) and when the pump is stopped. Strong pressure fluctuations are an indication of air pockets in the system that will lead to reduced performance. If pressure fluctuations occur, ventilation must be carried out (again).

## 4.6 Connecting the unit to the power supply

### Electrical connection

#### **!** DANGER!

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

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

- Only a skilled qualified electrician must connect the power supply.
- Lay connecting cables in such a way that they cannot be accidentally damaged by mechanical impact or by heat.
- Earth the hydraulic unit according to the state of the art.
- When you connect any electrical components, follow the manufacturers' specifications, the local regulations and codes of good practice (DIN/VDE), and the general recommendations for avoiding electromagnetic interference,

### 1. ▶

#### **i** Circuit diagram

The wiring diagrams and terminal connection plans are part of the supplied circuit diagram. The circuit 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. ▶ Include the hydraulic unit in the equipotential bonding arrangement.
3. ▶ Test protective conductors and insulation resistance to EN 60204 (VDE 0113). Take the appropriate safety precautions!

#### 4.7 Wiring bus sensors

If the RAC system is fitted with air sensors, the sensors have to be connected to the hydraulic unit control system by others.

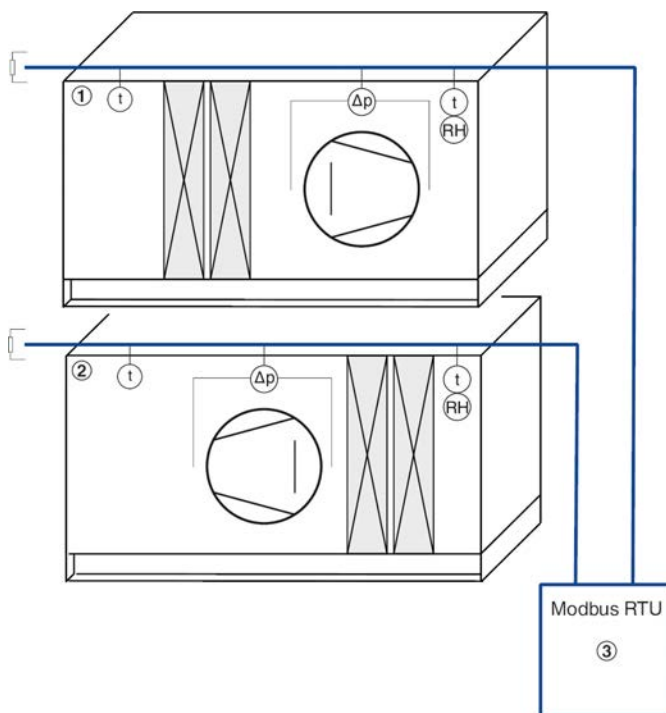


Fig. 24: Connecting bus sensors

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

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 circuit diagram (see switch cabinet of the hydraulic unit).
- For sensor data sheets see Appendix.
- To avoid cable reflections, network segments must be terminated at both ends with 120 Ω bus terminal resistors.
- Recommended data cable:
  - Cable used must be twisted pair, shielded and comply with Modbus specifications., e.g. HELUKABEL PAAR-TRONIC-CY-2x2x1 mm<sup>2</sup>
  - Do not exceed the maximum cable length (EIA-485 standard).
- Commissioning by the TROX Technical Service.

#### 4.8 Installing components for cooling energy recovery from dehumidification

The components (sensors, valve actuators) of RAC systems that allow for cooling energy recovery from dehumidification have to be connected by others to the hydraulic unit control system.

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

Please note:

- Components have to be connected by others and before commissioning
- Analogue wiring according to the manufacturers' documentation
- Connection according to the circuit diagram (see switch cabinet of the hydraulic unit).
- Commissioning by the TROX Technical Service.

#### 4.9 Installing the adiabatic humidifier

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

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

Please note:

- Components have to be connected by others and before commissioning
- Analogue wiring according to the manufacturers' documentation (see Appendix)
- Connection according to the circuit diagram (see switch cabinet of the hydraulic unit).
- Commissioning by the TROX Technical Service.

## 5 Using X-CUBE Control

X-CUBE Control is the control system for 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 unit (optional)
- Browser on your PC

### 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).

### 5.1 Login on the user interface


#### Displaying the 'Login / Write Permission' screen

##### Personnel:

- Instructed person



Fig. 25: Opening user administration

- ▶ Press .
  - ⇒ This displays the Login / Write Permission screen.

### Login

##### Personnel:

- Instructed person

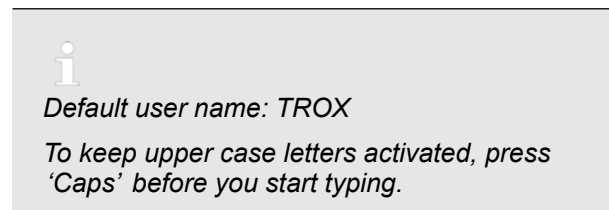
##### Prerequisite:

- The 'Login / Write Permission' screen is displayed.

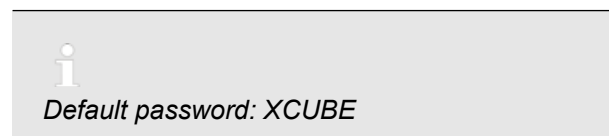



Fig. 26: Entering your user name and password

1. ▶ Select the 'Username' field ( Fig. 26 ), enter your user name and confirm your entry by pressing 'Enter'.



2. ▶ Select the 'password' field ( Fig. 26 ), enter your password and confirm your entry by pressing 'Enter'.



3. ▶ Press 'Login' ( Fig. 26 ).
  - ⇒ You have been logged in. The  symbol in the status bar indicates your user status. You can now select functions and set parameters.

Opening the 'system overview'

Personnel:

- Instructed person



Fig. 27: Opening the system overview screen, variant 1

- ▶ Once you are logged in, press ( Fig. 27 ).
- ⇒ This displays the system overview.

Alternatively:



Fig. 28: Opening the system overview screen, variant 2

- ▶ Press ( Fig. 28 ) on the starting screen or press the button in the navigation area ( Fig. 28 ).
- ⇒ This displays the system overview.

5.2 System overview

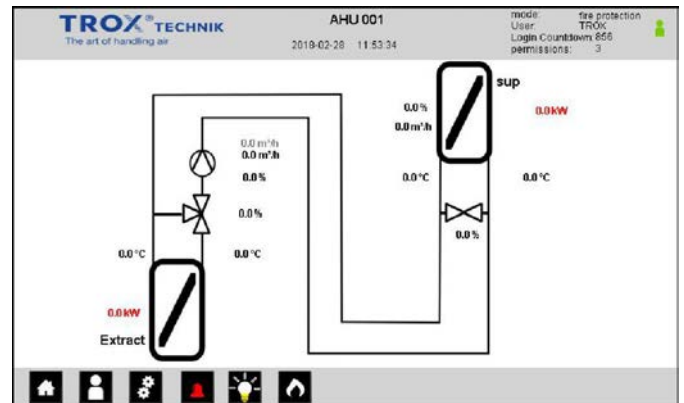


Fig. 29: System overview (example)

The system overview is a schematic illustration of the RAC system. You can select individual symbols to open the respective screens for setting parameters.

Header

Symbol	Function
Mode:	Shows the current operating mode <ul style="list-style-type: none"> <li>■ Off</li> <li>■ Standby</li> <li>■ Manual</li> <li>■ Auto</li> </ul>
User:	Shows the current user
Login:	Shows the time remaining until a new login is required
	User has been logged in
	User has been logged out

System overview

Symbol	Function
	AHU heat exchanger
	AHU fan
	2-way valve
	3-way valve

Symbol	Function
	Pump
	Plate heat exchanger for cooling energy feed
	Plate heat exchanger for heating energy feed

## Footer

Symbol	Function
	Opens the system overview
	Opens the login screen
	Opens the Settings screen
	Displays alarm status and fault messages
	No fault
	Warning, system remains switched on
	Fault, hydraulic unit is switched off

## 5.3 System settings

### Displaying the 'System settings' screen

#### Personnel:

- Instructed person

#### Prerequisite:

- You have been logged in.

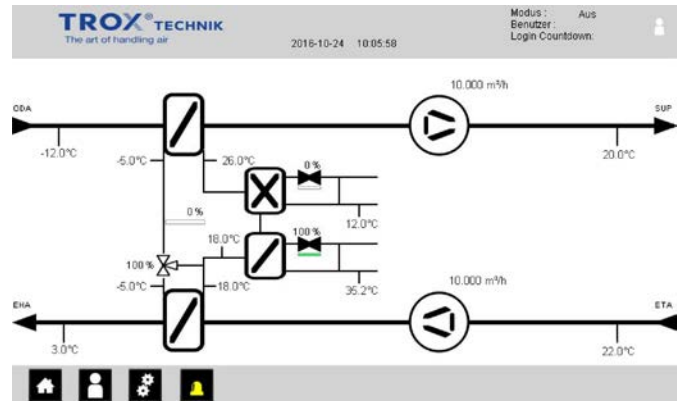


Fig. 30: 'System overview' screen (example)

- ▶ Press .
  - ⇒ This displays the 'System settings' screen.

### 5.3.1 Selecting the language

#### Selecting the language

#### Personnel:

- Instructed person

#### Prerequisite:

- You have been logged in.
- The 'System settings' screen is displayed.



Fig. 31: Selecting a language

- ▶ Press the 'language' field, then select a language from the list.
- ▶ Press 'apply'.
  - ⇒ The language has been set, texts will be displayed in this language.



### 5.3.2 Setting the 'system mode' (operating mode)

#### Selecting a 'system mode' (operating mode)

**Personnel:**

- Instructed person

**Prerequisite:**

- You have been logged in.
- The 'System settings' screen is displayed.

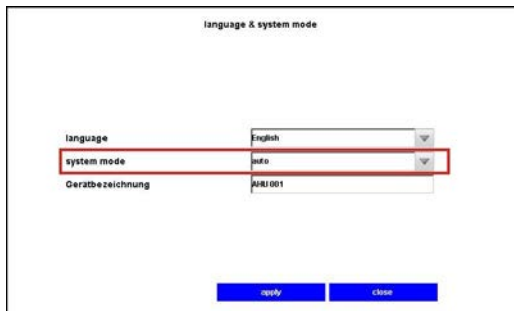


Fig. 32: Selecting a 'system mode' (operating mode)

- Select the 'system mode' field, then select a system mode from the list.

Operating mode	Description
OFF	The hydraulic unit is off.
Auto	The hydraulic unit is running. The control functions are active.
Manual	The hydraulic unit is in manual mode. All control elements can be controlled manually.

- Press 'apply'.
  - The system mode has been set.

### 5.3.3 Setting the date and time

#### Setting the date and time

**Personnel:**

- Instructed person

**Prerequisite:**

- You have been logged in.
- The 'System settings' screen is displayed.



Fig. 33: Setting the date and time

- Select the 'year' ( Fig. 33 ) field and enter the calendar year.
- Enter 'month', 'day', 'hour' and 'minute' ( Fig. 33 ) in the same way.
- Press 'apply'.
  - The date and time have been set.

## 5.4 Setting manual mode

### **i** Manual mode/automatic mode

Once the hydraulic unit has been commissioned, set it to automatic mode.

In some situations it may be useful to set the unit to manual mode, e.g. for commissioning or when the system has to be vented.

## Setting manual mode

### Personnel:

- Instructed person

### Prerequisite:

- You have been logged in, see [Chapter 5.1 'Login on the user interface' on page 30](#)
- The RAC system overview is displayed, see [Chapter 5.2 'System overview' on page 31](#)

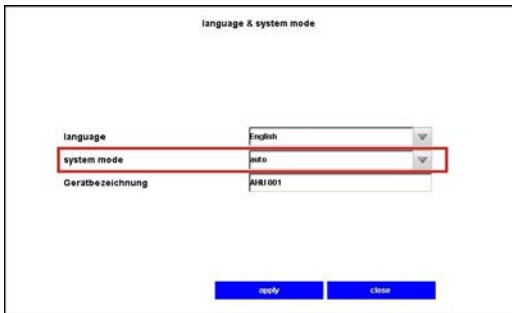


Fig. 34: Setting the 'system mode' (operating mode)

- ▶ Set the system mode to 'Manual', see [5.3.2 'Setting the 'system mode' \(operating mode\)' on page 33](#).
- ▶ In the system overview click on the schematic illustration.
  - ⇒ The 'State run-around coil' screen (RAC system status) displays.

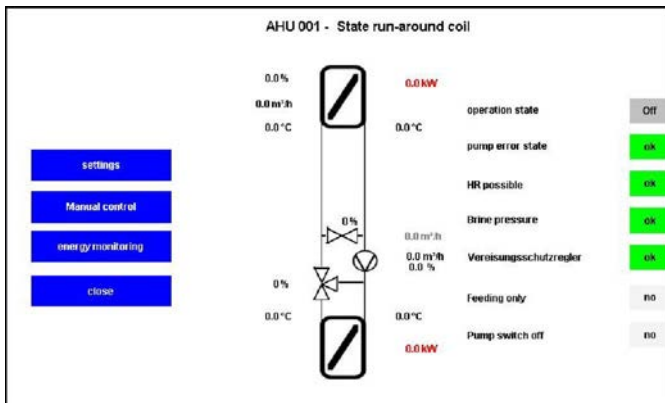


Fig. 35: RAC system status

- ▶ Select 'Manual control'.
  - ⇒ The 'Manual control' screen displays.

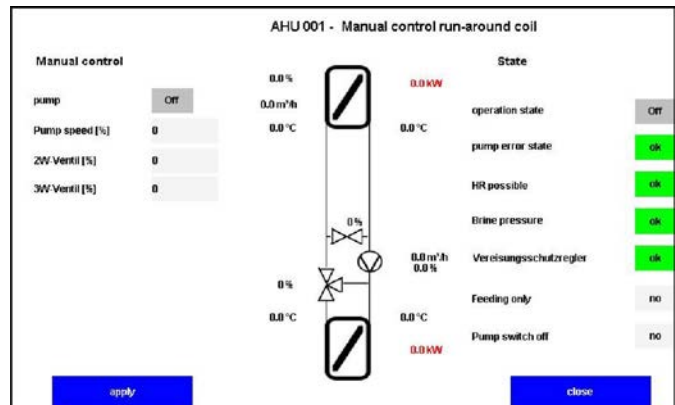


Fig. 36: Manual control

- ▶ Check the values on the right. All status values except 'operation state' have to be OK (green).

If this is not the case, there is a fault that prevents the manual mode. For troubleshooting, see [Chapter 5.5 'Acknowledging fault messages' on page 35](#).

If there is no fault, you can switch on the pump. To do so, go to the 'Pump' switch and click on it to change the setting from Off to On.

### CAUTION!

#### Risk of damage to the pump

Switching on the pump before the RAC system has been filled will damage the pump.

Fill the RAC system and vent it before you switch on the pump.

- ▶ Set the 'Pump speed [%]' to a value between 0 and 100%.
  - For venting, a low speed of 30% is sufficient.
- ▶ Then set the valves (standard values):
  - '2-way valve': 0%
  - '3-way valve': 100%
- ▶ Confirm your entries with 'Accept'.
  - ⇒ This will start the hydraulic unit with the values you have just set.
- ▶ If you want to return to the previous screen, select 'Close'. To return to the system overview, select 'Close' again.

## 5.5 Acknowledging fault messages

### Personnel:

- HVAC technician

### Prerequisite:

- You have been logged in.
- The RAC system overview is displayed.

#### 1. ▶ Select .

⇒ This displays the 'Alarms' screen.



Prio	Unit	Date - Time	Text	Delete
1	3	0 15. 4. 2014 - 13: 24: 0	Sammelstörung KVS-Pumpe	Delete
2	3	0 15. 4. 2014 - 13: 24: 0	KVS-Systemdruck kritisch	Delete
3	3	0 15. 4. 2014 - 13: 24: 0	Frostgefahr KVS-Einspeisung	Delete
4	2	0 15. 4. 2014 - 13: 24: 0	KVS-Systemdruck prüfen	Delete
5				0
6				
7				
8				
9				
10				

Fig. 37: Alarms

- #### 2. ▶ The 'Alarms' screen shows all current fault messages; you can delete a fault message only after the fault has been rectified.

To delete individual messages, mark the messages, then select 'Delete'; to delete all messages, select 'Delete All'.

⇒ The fault messages are deleted. If a fault has not been rectified, the corresponding fault message will reappear.

## 6 Initial commissioning

### 6.1 Safety notes regarding initial commissioning

#### Incorrect initial commissioning

**WARNING!**

**Risk to life from incorrect initial commissioning!**

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

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

#### 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.

### 6.2 Before initial commissioning

Before initial commissioning:

- Remove protective film, if any.
- Connect the pipes of the hydraulic unit to the air handling unit, on page 24 .
- Fill the system and vent it Chapter 4.5 'Filling and ventilating the hydraulic unit' on page 26 .
- Vent the pump of the hydraulic unit.
- Establish equipotential bonding and earthing.
- Connect the power supply 4.6 'Connecting the unit to the power supply' on page 28 .

**NOTICE!**

**Risk of damage due to the pump running dry!**

Switching on the pump before the RAC system has been filled will damage the mechanical seal of the pump and hence considerably reduce the service life of the pump. A defective mechanical seal results in the leakage of fluid.

Vent the pump before initial commissioning.

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

### 6.3 Setting up the hydraulic unit

#### 6.3.1 Checking the diaphragm expansion vessel

**Note:**

The volume of the diaphragm expansion vessel has been set based on the design data. You should check whether the result of the calculation is still correct.

If the basis of the calculation has changed, e.g. if the installation location or the length of a pipe has changed, a new calculation is required. For the original data see the project-specific technical data sheets for the hydraulic unit.

The calculations shown here have been simplified.

**Given data**

Safety valve	8 bar
Volume change due to temperature change	1.7%

- ▶ Calculating the expansion volume:

$$V_e = \frac{1,7 * V_{sys}}{100}$$

$V_e$  - Expansion volume [l]

$V_{sys}$  - Contained water (total system) [l]

- ▶ Calculating the pre charge pressure:

$$p_0 = p_{st} + 0,3bar$$

$p_0$  - Pre charge pressure [bar]

$p_{st}$  - Static pressure [bar]

**Note:**  $p_0$  should be at least 0.7 bar.

- ▶ Recalculating the required nominal volume:

$$f_N = \frac{8,5 \text{ bar}}{7,5 \text{ bar} - p_0}$$

**If:**  $\frac{15 \text{ l} * (1 - 0,2 * f_N)}{f_N} \geq V_e$       **Then:**  $V_{exp,min} = \frac{V_e * f_N}{1 - 0,2 * f_N}$

$V_{WR} = V_{exp,min} * 0,2$

**Otherwise:**

$V_{WR} = V_{sys} * 0,005$

$V_{exp,min} = (V_e + V_{WR}) * f_N$

$f_N$  - Utilisation factor

$V_{WR}$  - Water quantity to compensate for leaks [l]

$V_{exp,min}$  - Expansion vessel nominal volume [l]

- ▶ Calculating the minimum and maximum fill pressure for the system.

$$p_{a,min} = \frac{V_{exp} * p_0}{V_{exp} - V_{WR}} - 1 \text{ bar}$$

$p_{a,min}$  - Minimum fill pressure for the system [bar]

$V_{exp}$  - Expansion vessel nominal volume = see the hydraulic unit technical data sheet

$$p_{a,max} = \frac{8,5 \text{ bar}}{\frac{V_e * 8,5 \text{ bar}}{V_{exp} * (p_0 + 1 \text{ bar})}} - 1 \text{ bar}$$

$p_{a,max}$  - Maximum cold fill pressure [l]

**Calculation example:**

350 l - Volume of all heat exchangers in the system

100 l - Volume of the hydraulic unit and external pipes

10 m - Static height

Check whether the volume of the hydraulic unit expansion vessel is sufficient and which pre charge pressure to set on the expansion vessel.

Then calculate the fill pressure for the system:

Given data:

$V_{exp}$  - 25 l

$V_{sys}$  - 350 + 100 l = 450 l

$p_{st}$  - h = 10 m  $\cong$  1 bar

Calculating the fill pressure for the system:

$$p_{a,min} = \frac{25 \text{ l} * 1,3 \text{ bar}}{25 \text{ l} - 2,89 \text{ l}} - 1 \text{ bar} = 0,47 \text{ bar}$$

$$p_{a,max} = \frac{8,5 \text{ bar}}{\frac{7,65 \text{ l} * 8,5 \text{ bar}}{25 \text{ l} * (1,3 \text{ bar} + 1 \text{ bar})}} - 1 \text{ bar} = 6,5 \text{ bar}$$

The theoretical fill pressure for the system should be between 0.47 bar and 6.5 bar.

**Note:** Run the system with an operating pressure of at least 1.0 bar as otherwise the pump may be damaged. You can check and adjust the pressure values for the expansion vessel with a gauge and filling loop kit.

Eventually you have to reset the fill pressure for the system with the test pressure pump. So be sure to check beforehand whether any of the water glycol mixture used is still available.

## 6.3.2 Using the diaphragm expansion vessel

### Pressure setting

Either set the expansion vessel pressure before you fill 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:

- Gauge and filling loop kit for expansion vessels

#### CAUTION!

Make sure that the permitted operating pressure (→ expansion vessel rating plate) is not exceeded. Otherwise the vessel might burst.

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

### Set the pre charge pressure $p_0$

1. ▶ Use the charging valve on the expansion vessel to set the pre charge pressure for the system – at least 1.0 bar; fill up with nitrogen only.
2. ▶ Carefully open the water-side valve.

### Setting the operating pressure $p_a$ for the RAC system

3. ▶ Set an operating pressure between  $P_{a,min}$  and  $P_{a,max}$ .
  - ⇒ The diaphragm expansion vessel is now ready for use

### 6.3.3 Parameter setting on the pressure sensor

It is necessary to set the required switching points on the pressure sensor.

For detailed information on setting parameters on the pressure sensor see [Appendix B 'Supplier documents'](#) on page 53.

The following parameters have to be set:

Parameter	Name on the display	Setting
Switching point 1: System switch-off	SP1	1 bar below SP2; Lowest value: 1.0 bar
Switching point 1: Switch back point	rP1	0.3 bar below SP1
Switching point 2: Warning re system fill pressure test	SP2	0.3 to 0.5 bar below the operating pressure
Switching point 2: Switch back 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)
Unit of measure	Uni	bar

### 6.3.4 Venting

Requirements:

- All operating fluid pipes and hoses have been professionally connected.
- Pipes have been connected according to the suppliers' instructions.
- The hydraulic system has been filled with the operating fluid.
- The hydraulic system has already been vented to some extent.
- The diaphragm expansion vessel has been checked.
  - The volume of the diaphragm expansion vessel is sufficient for the system.
  - The pre charge pressure has been calculated and set based on the local conditions.
- The fill pressure for the system has been set.
- Supply voltage has been established.



Fig. 38: Switching on the mains isolator

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

2. ▶ Login to X-CUBE Control on the user interface. To do so, use the hydraulic unit touch panel, the AHU touch panel, or the central BMS (via your PC) [Chapter 5.1 'Login on the user interface'](#) on page 30.
3. ▶ Switch the hydraulic unit to manual mode, [Chapter 5.4 'Setting manual mode'](#) on page 33.  
Set a low pump capacity (50% max.) for venting.
4. ▶ Vent the system. Repeat several times, if necessary.

**Note:**

The fill pressure for the system has to remain nearly constant when you start the pump. A fluctuating fill pressure indicates that there is still air trapped in the system.

## 6.3.5 Starting

Prerequisites:

- The RAC system has been vented, ↗ 6.3.4 'Venting' on page 39
- Signal cables have been connected.
  - Release signal (digital)
  - Power requirement (analogue 0–10 V) o
  - Optional: Proportional signal for the airflow (analogue 0–10 V)
  - Optional: Status signals can be received, i.e. the cables have been connected (fault, warning, operating status; 'heat recovery not possible' message, risk of frost damage during feed process).
  - Alternatively: Modbus TCP/IP or BACnet IP communication cable has been connected.  
Depending on construction, see circuit diagram
- The unit is easily accessible; for outdoor units, the workplace regulations (health, safety and welfare) have been met. No danger of falling off.



Fig. 39: Switching on the mains isolator

1. ▶ Turn on the mains isolator to switch on the hydraulic unit
2. ▶ Login to X-CUBE Control on the user interface. To do so, use the hydraulic unit touch panel, the AHU touch panel, or the central BMS (via your PC)  
↗ Chapter 5.1 'Login on the user interface' on page 30 .
3. ▶ Set the automatic mode, ↗ 5.3.2 'Setting the system mode' (operating mode)' on page 33



## 7 Maintenance

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



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

### 7.1 Safety notes regarding maintenance

#### Incorrect maintenance



#### WARNING!

##### Risk of injury from incorrect maintenance!

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

- Before you start maintenance, switch off the hydraulic unit and secure it against being restarted accidentally.
- Have only authorised people carry out maintenance.
- Before you start, make sure that there is sufficient clearance for the work you have to complete.
- Keep the work area tidy and clean. Parts and tools that are loosely stacked or left lying around are a source of accident.
- When you reinstall previously removed parts, follow the correct procedure, use all fixing elements and tighten all screws with the correct torque.
- Before you recommission the unit, make sure that:
  - all maintenance jobs have been completed according to this manual.
  - all inspection access doors and covers have been closed.
  - all safeguards have been installed and function correctly.

#### 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 Switching off the hydraulic unit and securing it against being switched on accidentally

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

- ☞ 2.6 'Securing the unit against being switched on accidentally' on page 13

## 7.3 Maintenance plan

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

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



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

**Hydraulic unit, pipework**

Interval	Maintenance work	Personnel
Every 6 months	Visually check AHU casing units for contamination, damage and corrosion. Clean if necessary.	Instructed person
Every 12 months	Check joints 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
Every 12 months	Check function of feed and return pipes.	HVAC technician

 **Heating coil**

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

**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.	Skilled qualified electrician
	Measure current consumption and compare it with nominal current.	Skilled qualified electrician
	Check all safeguards for correct function.	Skilled 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; if the expansion vessel has been damaged, or if there is any 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 open the nitrogen valve; if water leaks, replace the expansion vessel.	HVAC technician
	Pressure setting,  on page 37	HVAC technician

### Control valves

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

### Electrical components and devices

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

### Controls

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

## 7.4 Maintenance

### 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.

### 7.4.1 Opening inspection access doors

#### Opening standard inspection access doors

##### Personnel:

- Instructed person

##### Protective equipment:

- Safety harness
- Industrial safety helmet
- Protective gloves

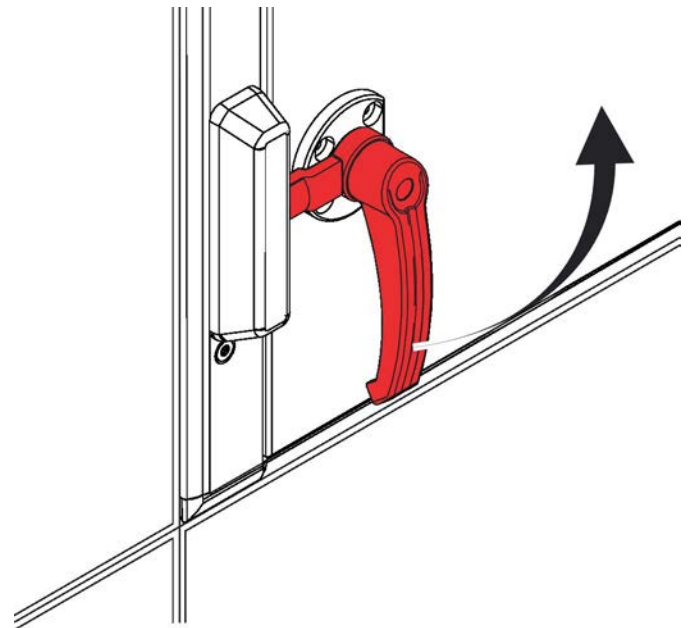


Fig. 40: Opening a door lock

- ▶ Turn the door handle anti-clockwise by 90° ( Fig. 40 ).
- ⇒ 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.

### 7.4.2 Diaphragm expansion vessel

#### Diaphragm check

##### Personnel:

- HVAC technician
  - ▶ Briefly open the charging valve so that some gas can escape.
- If no gas escapes from the vessel, set the pre charge pressure with gas.
- If liquid escapes, replace the diaphragm expansion vessel.

## Pressure setting

### Personnel:

- HVAC technician

Make sure that the permitted operating pressure (→ rating plate) is not exceeded. Otherwise the vessel might burst.

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

Run the system at a constant temperature and watch it.

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

### Set the pre charge pressure $p_0$

3. ▶ Check the charging valve for leakage. Important: If you have to carry out maintenance on the charging valve, be sure to vent (depressurise) the vessel beforehand.

### Set the fill pressure for the system $p_e$

- ⇒ The diaphragm expansion vessel is again ready for use

### 7.4.3 Centrifugal pump

#### Replacement intervals

Part or component subject to wear		Mechanical seal	Pump and motor bearings	Inverter	Motor winding
Service life		10,000 h to 20,000 h	12,000 h 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 per day 9 months per year	2 to 4 years	3 to 10 years	–	6 years

### 7.4.4 Cleaning the dirt separator

#### Personnel:

- HVAC technician

#### Protective equipment:

- Safety goggles
- Safety shoes

#### Materials:

- Receptacle for fluids with glycol

Clean the mesh insert of the dirt separator regularly. The cleaning intervals should be based on the degree of contamination of the operating fluid.

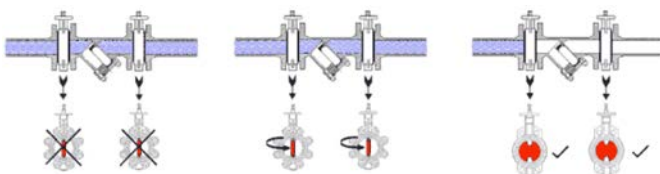


Fig. 41: Dirt separator

1. ▶ Close the shut-off valves upstream and downstream of the dirt separator so that no more operating fluid can flow into the dirt separator and the separator is not under pressure.
2. ▶ Carefully remove the mesh insert, use the receptacle for the operating fluid and professionally dispose of the fluid.
3. ▶ Clean the mesh insert.
4. ▶ Put the mesh insert back in and open the valves. Check for leakage.

## 8 Index

### C

Casing units	
Setup.....	22
Connecting the pipework.....	24
Copyright.....	3

### D

Defects liability.....	3
Delivery of the hydraulic unit.....	17
Diaphragm expansion vessel	
Calculation example.....	37
Expansion volume.....	37
Maximum fill pressure.....	37
Minimum fill pressure.....	37
Nominal volume.....	37
Pre charge pressure.....	37

### E

Electrical connection.....	28
Electric current.....	14

### F

Faults	
Acknowledge.....	35
Flange connection.....	24

### H

Hotline.....	3
Hydraulic connection.....	24
hydraulic unit.....	22
Electrical connection.....	28

### I

Improper transport equipment.....	17
Installation	
Run around coil system.....	24
Installation location, requirements	
Installation room.....	20
Outdoor installation.....	20

### J

Jet of liquid.....	15
--------------------	----

### L

Lashing points.....	18
Limitation of liability.....	3

### M

Mains isolator.....	12
Maintenance	
Opening standard inspection access doors.....	45
Maintenance plan.....	41 , 42
Controls.....	44
Control valves.....	44
Cooling coil.....	43
Diaphragm expansion vessel.....	44

Electrical components and devices.....	44
Electric motors.....	43
Heating coil.....	43
hydraulic unit.....	43
Pumps.....	43

### O

Opening inspection access doors	
Standard inspection access doors.....	45
Operation	
Using the touch panel.....	30
Other applicable documentation.....	3

### P

Packages	
Transport.....	18
Pipework.....	24

### Q

Qualification.....	10
--------------------	----

### R

Residual risks.....	14
Run around coil system	
Connection.....	24

### S

Safeguards	
Hold open device.....	12
Inside door handle.....	12
Mains isolator.....	12
Securing the unit against being switched on accidentally.....	13
Service.....	3
Setting manual mode.....	33
Software use	
Displaying system settings.....	32
Displaying the Login / Write Permission screen...	30
Login.....	30
Opening the system overview.....	31
Opening user administration.....	30
Selecting a 'system mode' (operating mode).....	33
Selecting the language.....	32
Setting the date.....	33
Setting the time.....	33
Specific hazards.....	14
Staff.....	10
Symbols.....	4
System owner.....	10
System owner's obligations.....	10



<b>T</b>		Delivery check.....	17
Technical Service.....	3	Forklift or pallet truck.....	18
Transport		Transport damage.....	17
Crane and lifting eyes.....	19	<b>W</b>	
Delivery.....	17	Warranty claims.....	3

## Appendix

**A Schematic illustrations of the system (examples)**

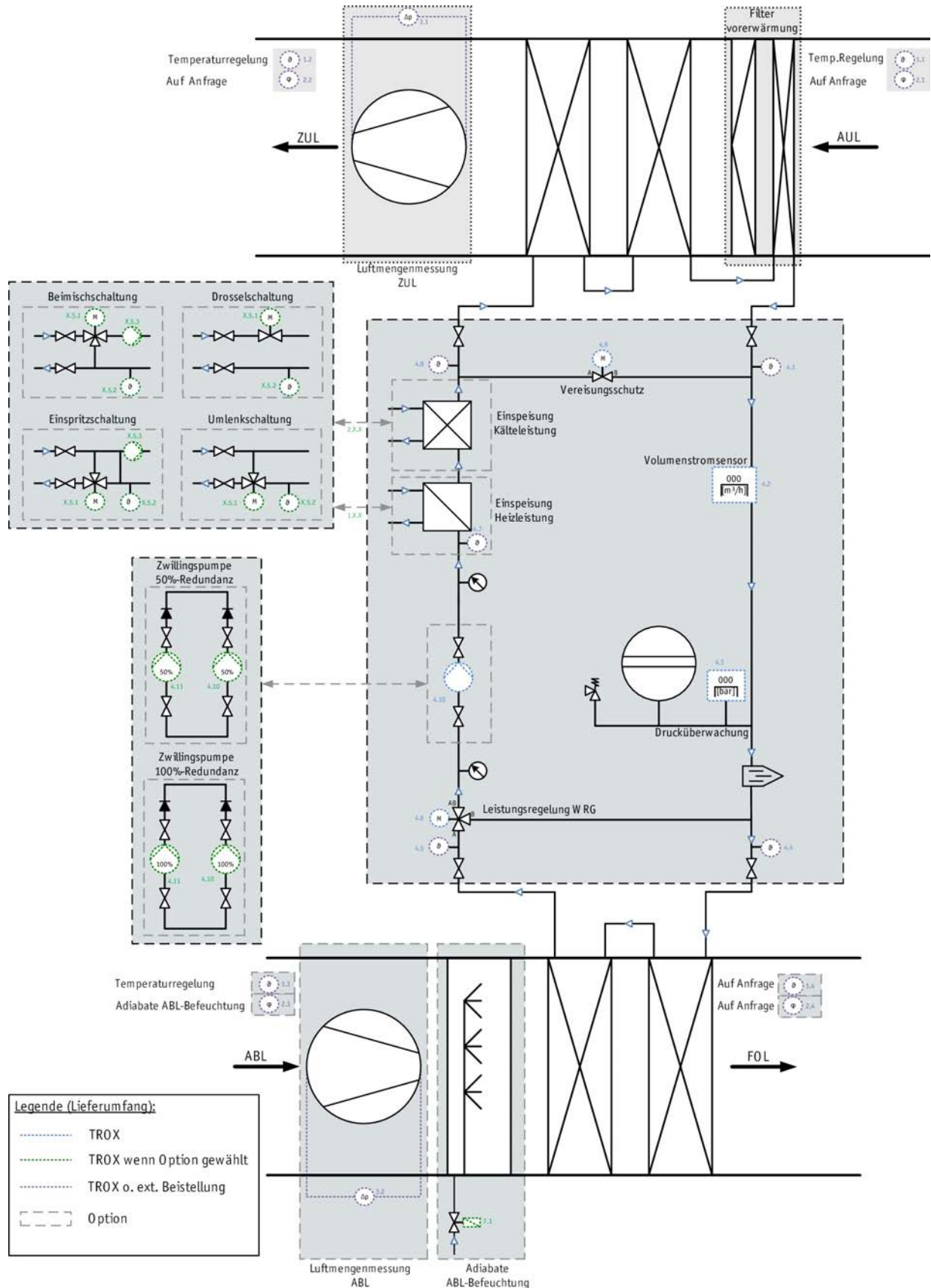


Fig. 42: RAC system with cooling energy feed

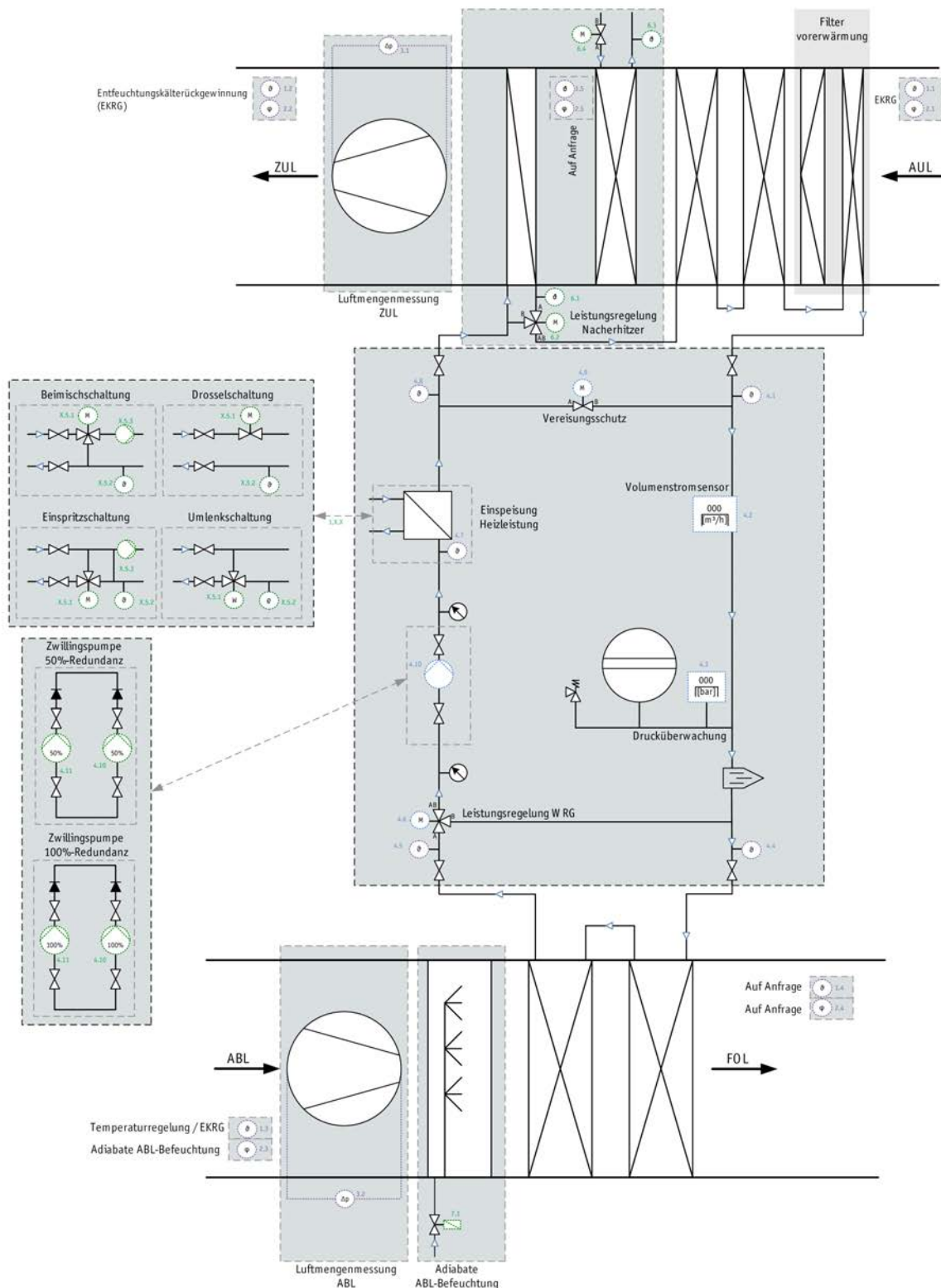


Fig. 43: RAC system with cooling energy recovery from dehumidification

# B Supplier documents

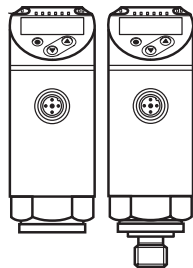
## B.1 Pressure sensor



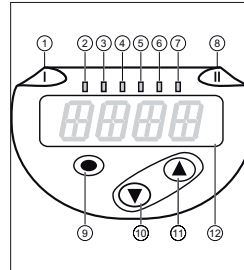
Operating instructions  
Electronic pressure sensor  
**efectorsod**  
PN7xxx

UK

80010579 / 00 07 / 2016



### 7 Operating and display elements

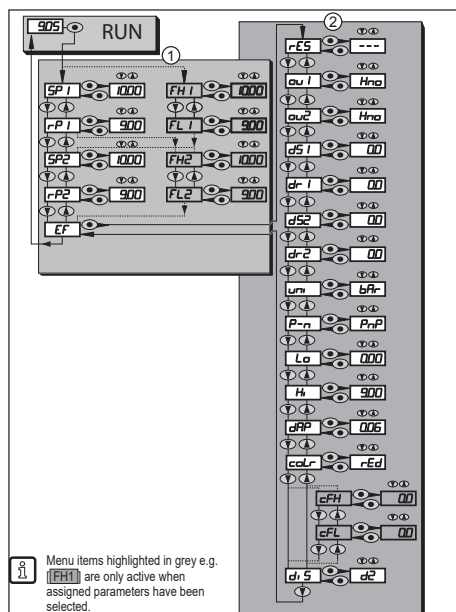


1 to 8: Indicator LEDs	
LED 1	Switching status OUT1 (lights when output 1 is switched).
LED 8	Switching status OUT2 (lights when output 2 is switched).
LEDs 2 - 7	System pressure in the indicated unit of measurement.
9: [Enter] button [•]	
- Selection of the parameters and acknowledgement of the parameter 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.	

10

### 8 Menu

#### 8.1 Menu structure: Main menu



UK

11

#### 8.2 Explanation of the menu

##### 8.2.1 Explanation of the menu level 1

SPx/FPx	Upper / lower limit value for system pressure at which OUT1 switches with hysteresis setting. SPx/FPx 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].
diS	Update rate and orientation of the display.

12

**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:

<p><b>1 Select parameter</b></p> <ul style="list-style-type: none"> <li>▶ Press [●] to get to the menu.</li> <li>▶ Press [▲] or [▼] until the requested parameter is displayed.</li> </ul>	
<p><b>2 Set parameter value</b></p> <ul style="list-style-type: none"> <li>▶ Press [●] to edit the selected parameter.</li> <li>▶ Press [▲] or [▼] for min. 2 s.</li> <li>&gt; After 2 s: setting value is changed: incrementally by pressing the button once or continuously by keeping the button pressed.</li> </ul> <p>Numerical values are incremented continuously with [▲] or decremented with [▼].</p>	
<p><b>3 Acknowledge parameter value</b></p> <ul style="list-style-type: none"> <li>▶ Briefly press [●].</li> <li>&gt; The parameter is displayed again. The new setting value is saved.</li> </ul>	

**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.

- 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:

<ul style="list-style-type: none"> <li>▶ Press [●] to get to the menu.</li> </ul>	
<ul style="list-style-type: none"> <li>▶ Press [▲] or [▼] until [EF] is displayed.</li> </ul>	
<ul style="list-style-type: none"> <li>▶ Press [●].</li> <li>&gt; The first parameter of the submenu is displayed (here: [rES]).</li> </ul>	

- Change from menu level 1 to menu level 2 when a parameter setting software is used:
  - ▶ Activate the [EF] button.

13

14

• Locking / unlocking

The unit can be locked electronically to prevent unintentional settings.

<ul style="list-style-type: none"> <li>▶ Make sure that the unit is in the normal operating mode.</li> <li>▶ Press [▲] + [▼] simultaneously for 10 s.</li> <li>&gt; [Loc] is displayed.</li> </ul>	
<p>During operation: [Loc] is briefly displayed if you try to change parameter values.</p> <p>For unlocking:</p> <ul style="list-style-type: none"> <li>▶ Press [▲] + [▼] simultaneously for 10 s.</li> <li>&gt; [uLoc] is displayed.</li> </ul>	

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.

**9.2 Configure display (optional)**

<ul style="list-style-type: none"> <li>▶ Select [Uni] and set the unit of measurement:                     <ul style="list-style-type: none"> <li>- [bAr], [mbAr],</li> <li>- [MPa], [kPa],</li> <li>- [PSI],</li> <li>- [inHG]</li> </ul> </li> </ul> <p> The selectable units of measurement depend on the respective unit.</p>	<p><b>uni</b></p>
<ul style="list-style-type: none"> <li>▶ Select [diS] and set the update rate and orientation of the display:                     <ul style="list-style-type: none"> <li>- [d1]: update of the measured values every 50 ms.</li> <li>- [d2]: update of the measured values every 200 ms.</li> <li>- [d3]: update of the measured values every 600 ms.</li> <li>- [rd1], [rd2], [rd3]: display as for d1, d2, d3; rotated by 180°</li> <li>- [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.</li> </ul> </li> </ul> <p> Even with unsteady pressure characteristics [d1] provides optimum readability; the corresponding algorithms are stored.</p>	<p><b>di S</b></p>

**9.3 Set output signals**

<p><b>9.3.1 Set output functions</b></p> <ul style="list-style-type: none"> <li>▶ Select [ou1] and set the switching function:                     <ul style="list-style-type: none"> <li>- [Hno] = hysteresis function/NO,</li> <li>- [Hnc] = hysteresis function/NC,</li> <li>- [Fno] = window function/NO,</li> <li>- [Fnc] = window function/NC.</li> </ul> </li> <li>▶ Select [ou2] and set the function:                     <ul style="list-style-type: none"> <li>- [Hno] = hysteresis function/NO,</li> <li>- [Hnc] = hysteresis function/NC,</li> <li>- [Fno] = window function/NO,</li> <li>- [Fnc] = window function/NC.</li> </ul> </li> </ul>	<p><b>ou 1</b></p> <p><b>ou 2</b></p>
<p><b>9.3.2 Define switching limits for the hysteresis function</b></p> <ul style="list-style-type: none"> <li>▶ [ou1] / [ou2] must be set as [Hno] or [Hnc].</li> <li>▶ Select [SP1] / [SP2] and set the value at which the output is set.</li> <li>▶ 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.</li> </ul>	<p><b>SP 1</b></p> <p><b>SP 2</b></p> <p><b>rP 1</b></p> <p><b>rP 2</b></p>

15


16

9.3.3 Define switching limits for the window function

▶ [ou1] / [ou2] must be set as [Fno] or [Fnc]. ▶ Select [FH1] / [FH2] and set the upper limit value.	FH1 FH2
▶ 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

[dS1] / [dS2] = switching delay for OUT1 / OUT2. [dr1] / [dr2] = reset delay for OUT1 / OUT2. ▶ 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.	

9.4.2 Set output logic for the switching outputs

▶ Select [P-n] and set [PnP] or [nPn].	P-n
--	-----

9.4.3 Set damping for the switching signal

▶ 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

▶ 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
--	----------

17

9.4.5 Reset all parameters to factory setting

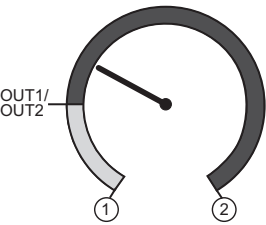
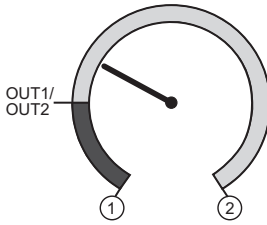
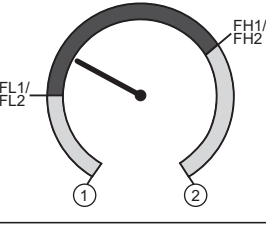
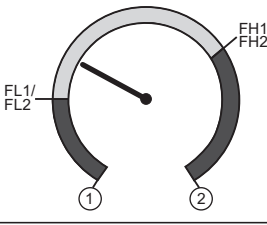


▶ Select [rES]. ▶ Press [•]. ▶ Press and hold [▲] or [▼] until [---] is displayed. ▶ Briefly press [•]. We recommend noting down your own settings before carrying out a reset (→ 12 Factory setting).	rES
--	-----

9.4.6 Set colour change of the display

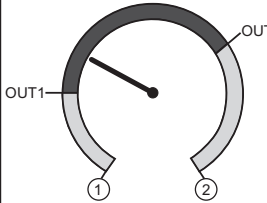
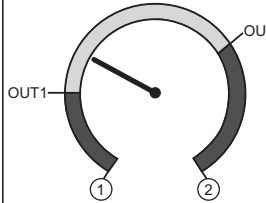
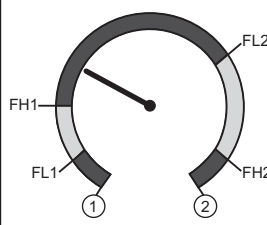
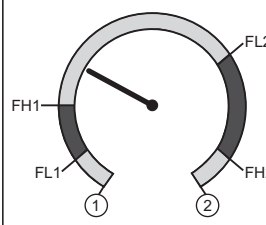


▶ Select [coLr] and set the function: - [rEd] = display colour red (independent of the measured value). - [GrEn] = display colour green (independent of the measured value). - [r1ou] = display colour red when OUT1 switches. - [G1ou] = display colour green when OUT1 switches. - [r2ou] = display colour 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]*.  *) The parameters [cFL] and [cFH] can only be selected in the menu tree when [r-cF] or [G-cF] were activated.	colr
▶ 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
▶ 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

18

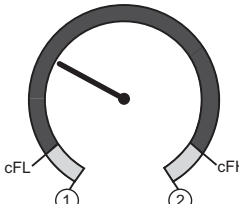
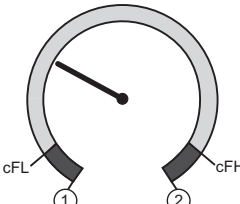


9.4.7 Graphical depiction of the colour change of the display

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

19

Display colour change for the parameters [r-12], mode hysteresis function	Display colour change for the parameters [G-12], mode hysteresis function
	
Measured value between OUT1 and OUT2; Display = red	Measured value between OUT1 and OUT2; Display = green
Display colour change for the parameters [r-12], mode window function	Display colour change for the parameters [G-12], mode window function
	
Measured value outside FL1...FH1 and FL2...FH2; Display = red	Measured value outside FL1...FH1 and FL2...FH2; Display = green
 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

20

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.

**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 OUT2 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.

21

**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

		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](http://www.ifm.com) → Data sheet search → Enter the article number.

23

24



**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](http://www.ifm.com)

## B.2 Thermokon sensor

### PR25

Contact temperature sensor

thermokon<sup>®</sup>  
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](mailto: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.**

Stand: 12.02.2016

Seite 3 / 5

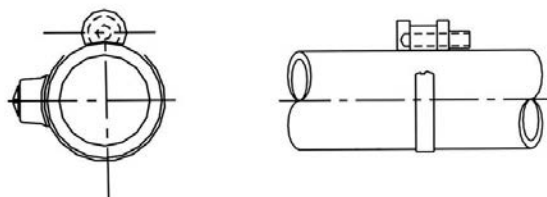
**Technical Data**

Measuring values		temperature
Output voltage	passive TRV	depending on used sensor 0..10 V, min. load 5 kΩ
Output Amp	TRA	4..20 mA, max. load 500 Ω
Power supply	TRV TRA	15..24 V = (±10%) or 24 V ~ (±10%), 15..24 V = (±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 ±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. Ø=8 mm
Connection electrical	TRV   TRA	terminal block max. 1,5 mm <sup>2</sup> connection wire PVC, Ø=25 mm, sensor wire active silicone, Ø=25 mm, 1 m (standard), 2 m, 4 m, 6 m, for other lengths please request
Pocket		aluminium, Ø=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**

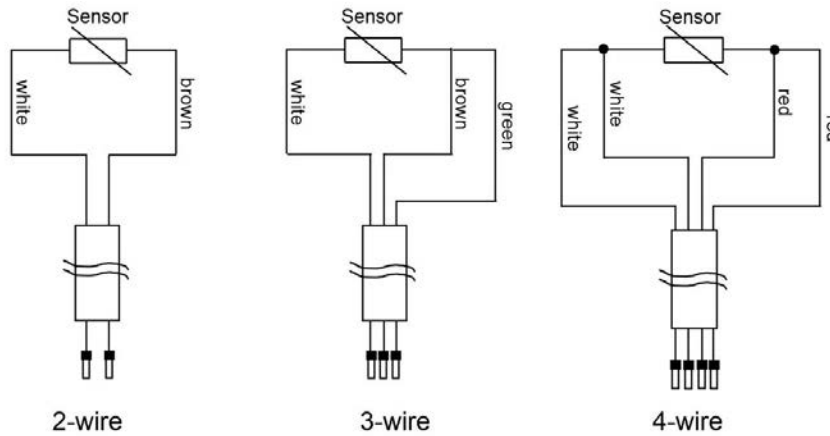
Fixing is done by tightening strap. Use contact fluid for better heat transfer between sensor and measuring medium.

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

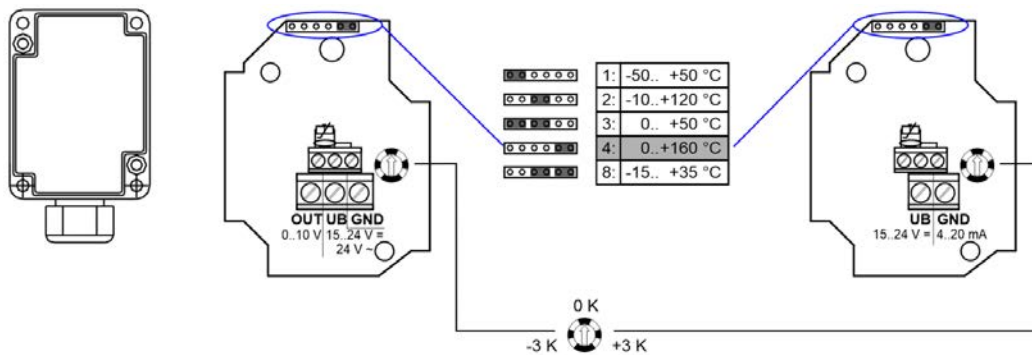


**Connection Plan**

**Passive**



**Active**

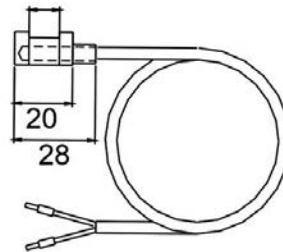
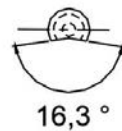
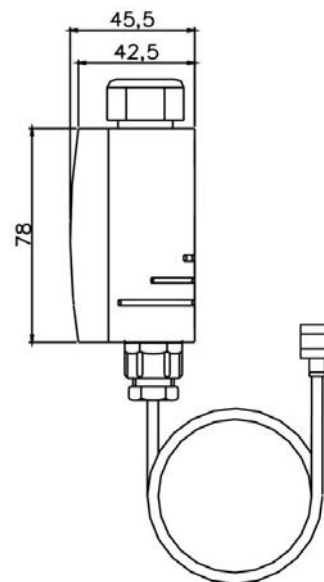
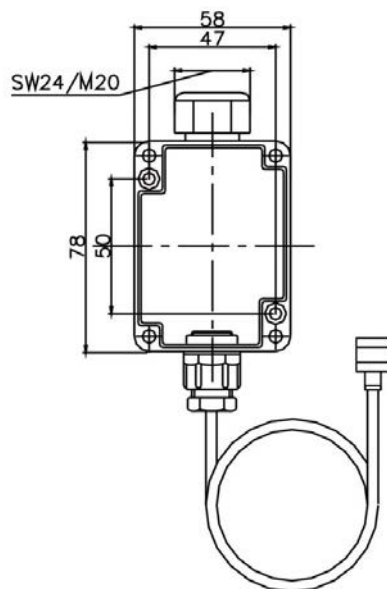


**Caution**

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

Stand: 12.02.2016

Seite 5 / 5

**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 &amp; PTH-6202 &amp; PTH-6502

57065A 03/12 - (MBC)



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

## Svenska

## FIGURÖVERSIKT

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

## ALLMÄNT

PTH-6201/6202/6502 är en elektrisk transmittor som kommunicerar via RS485 RTU Modbus och är primärt användbar som mätning av differenstryck i en ventilationsanläggning. Trycktransmittorn 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<sup>2</sup>  
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 trycktransmittor 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 halvledertryckmätarelement utan 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 snäplåset som går ner på sidan av studsarna. PTH-6201/6202/6502 fästas 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 anslutningsslangarna ska PTH-6201/6202/6502 placeras så att den kondenserande vätskan inte kan rinna tillbaka in i trycktransmittorn. Kapslingen har inbyggda fastgöringshål (se fig. 1).

## Inställning av Modbus-kabel

Kapslingen öppnas verktygsfritt genom att trycka på snäplåset 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 slingning 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  $\pm 15\%$  via Modbus  
Elanslutning, PTH-6201 ..... 4 skruvplintar,  
..... max 1,5 mm<sup>2</sup>

Elanslutning, PTH-6202/6502 ..... 2 st. RJ12 6/6  
..... stickkontakter  
Modbusprotokoll ..... 38,4 kBaud, 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 tryck ..... 20 kPa  
Luftfuktighet ..... 10-95% RH ej kondenserande  
Dimensioner kapsling ..... 75 x 36 x 91 mm  
Kabeldimension ..... MPFK6S eller motsvarande  
Tryckslangar ..... 2 x  $\phi$  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**

Stenager 13B • DK-6400 Sønderborg  
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: Modbuss-tilkoblinger  
Fig. 5: Konfigurasjonseksempel  
Fig. 6: Tilkoblingsdiagram, PTH-6201

**GENERELT**

PTH-6201/6202/6502 er en elektronisk trykktransmitter som kommuniserer via RS485 RTU Modbus og er primært egnet til å måle differansetrykk i et ventilasjonsanlegg. Trykktransmitteren 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 <sup>2</sup>
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 trykktransmitter for komfort- eller prosessventilasjon som kommuniserer via RS485-Modbus med en tilkoblet regulatorenhete (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 trykktransmitteren. 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 klemmeterminaleene. 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	Åtgärd
Inget ljus i den gröna lysdioden	Matningsspänning saknas	Kontrollera matningsspänning Kontrollera elanslutningar Kontrollera stickkontakter
	Defekt PTH-6201/6202/6502	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 anslutningslanger 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 mättryckslanger	Kontrollera mättrycksslanger 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 tryckslangarna 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 mm<sup>2</sup>  
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  $\phi$  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. Gyl-  
dig 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)

**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 (-) tilkoblingsstusser
	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 trykkløs ev. ved å fjerne begge trykkslangene og utføre nullkalibrering.
	Defekt PTH-6201/6202/6502	PTH-6201/6202/6502

**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.

**OJ Electronics A/S**

Stenager 13B • DK-6400 Sønderborg  
Tel. +45 73 12 13 14 • Fax +45 73 12 13 13  
oj@ojelectronics.com • www.ojelectronics.com

**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****FIGUROVERSIGT**

Følgende figurer finnes bagerst 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 kommunikerer via RS485 RTU Modbus og er primært anvendt til måling differensstryk i et ventilationsanlæg. Tryktransmitteren anvendes i forbindelse med overvågning, kontrol og regulering via en elektronisk regulator, eks. PLC-, BMS- eller SCADA-system og alle kommandoer og data mellem PTH-6201/6202/6502 og regulatoren 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

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

**PRODUKTPROGRAM**

Type	Produkt
PTH-6201	RS485 RTU Modbus, IP54, 1,5 mm <sup>2</sup>
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 regulerenhed (se fig. 5) og via Modbus kommunikationen, viser en værdi afhængig af indstillet måleområde, i den tilsluttede regulerenhed som er proportionalt med det målte tryk. PTH er opbygget med et halvleder 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 studserne.  
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 "+ studsene" og det laveste tryk til "- studsene" (se fig. 3). Trykslangerne skal være så korte som muligt og fastgøres, så vibrationer undgås.  
Af hensyn til optimal trykmåling skal trykket 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 fastgørelseshuller, 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 Modbuskomponenter 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 sløjfe-forbindelse 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 <sup>2</sup>
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 6 x 6,2
<b>Miljødata</b>	
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
	Defekt PTH-6201/6202/6502	Kontroller stikforbindelser 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
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 måletrykslanger	Kontroller måletrykslanger 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 tryklos evt. ved at fjerne begge trykslanger 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.

**OJ Electronics A/S**

Stenager 13B • DK-6400 Sønderborg  
Tel. +45 73 12 13 14 • Fax +45 73 12 13 13  
oj@ojelectronics.com • www.ojelectronics.com

**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 <sup>2</sup>
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 <sup>2</sup>
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)
.....	.....-30 to +50°C (transient)
Ambient temperature, storage.....	-50/+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 averaging 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.

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

**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<sup>2</sup>  
 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 Anschlussschläuchen, 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 Stützen 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**

Spannungsversorgung .....24 V DC ±15 % über Modbus  
 Elektrische Anschlüsse, PTH-6201  
 .....4 Schraubklemmen, max. 1,5 mm<sup>2</sup>  
 Elektrische Anschlüsse, PTH-6202/6502  
 ..... 2 St. RJ12 6/6-Steckverbindungen  
 Modbus-Protokoll .....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 Meeresspiegel .....1300 m  
 Genauigkeit Ausgangssignal, PTH-6201/6202  
 .....0,5 %xMV + 2,5 Pa  
 Genauigkeit Ausgangssignal, PTH-6502  
 .....0,5 %xMV + 5,0 Pa  
 (MV = Messwert)  
 Maximaler Druck .....20 kPa  
 Luftfeuchtigkeit .....10-95 % RF,  
 ..... nicht kondensierend  
 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  
 Schutzart .....IP54  
 Gewicht .....110 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) ExternCalibrate  
 Kalibrierungszustand (1 = Nullkalibrierung)

**EINGANG:**

Addr-0 (REG-1)	SoftwareVer	Software Version 1/100
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**

Helpen 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	Anschlusschläuche auf den Plus- (+) und Minus- (-) Anschlussstutzen 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.

**OJ Electronics A/S**

Stenager 13B • DK-6400 Sønderborg  
Tel. +45 73 12 13 14 • Fax +45 73 12 13 13  
oj@ojelectronic.com • www.ojelectronic.com

**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 <sup>2</sup>
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 <sup>2</sup>
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 rebus en conformité avec les règlements locaux en vigueur.

### OJ ELECTRONICS A/S

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

### 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



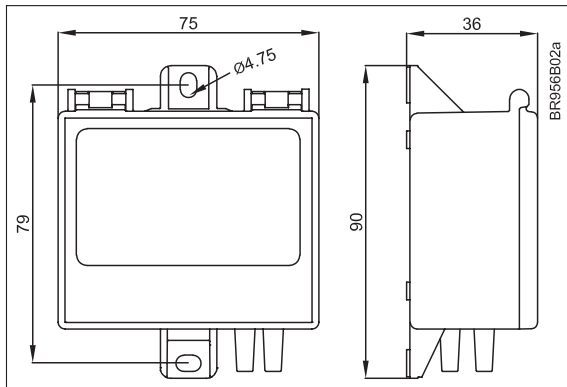


Fig. 1  
Dimensioned drawing

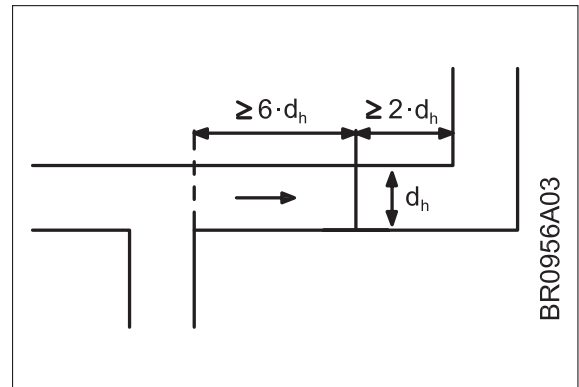


Fig. 2  
Position of transmitter in relation to bends and branches

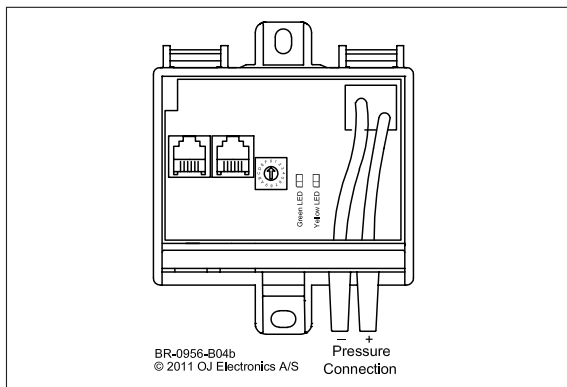


Fig. 3  
Wiring diagram PTH-6202/6502

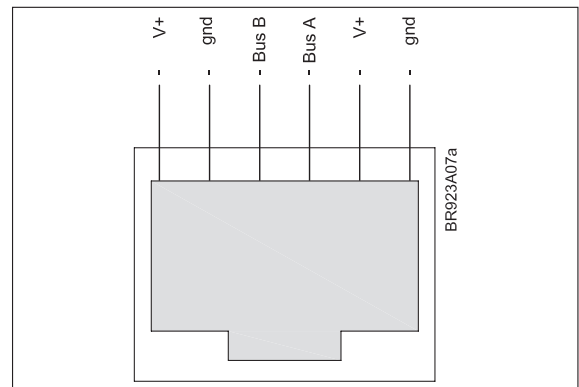


Fig. 4  
Modbus connections

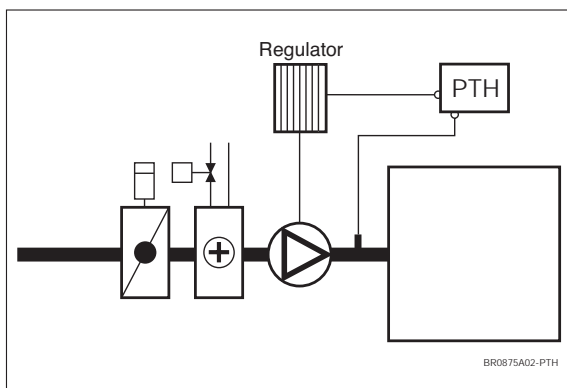


Fig. 5  
Example of configuration

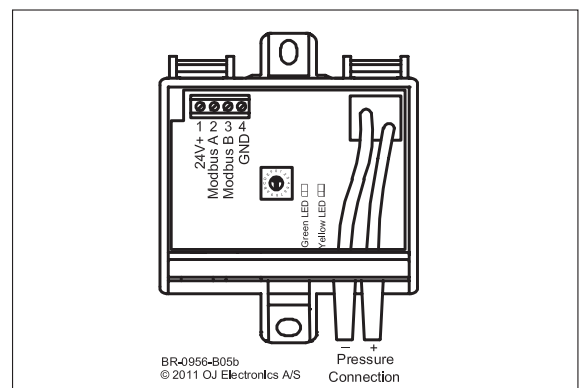


Fig. 6  
Wiring diagram PTH-6201



## 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%rF  
Temp.: -20...+80°C  
Genauigkeit: siehe Diagramm  
Anschlussklemme: Federkraftklemme,  
für Kabelquerschnitt 0,5 ... 1,5mm<sup>2</sup>  
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%rF 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

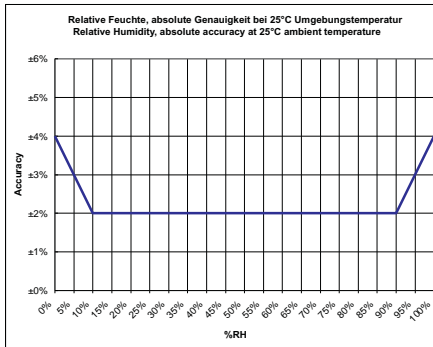
EMC: EN 60730-1: 2009  
Product safety: EN 60730-1: 2009

## 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 ... 1,5mm<sup>2</sup>  
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

**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.

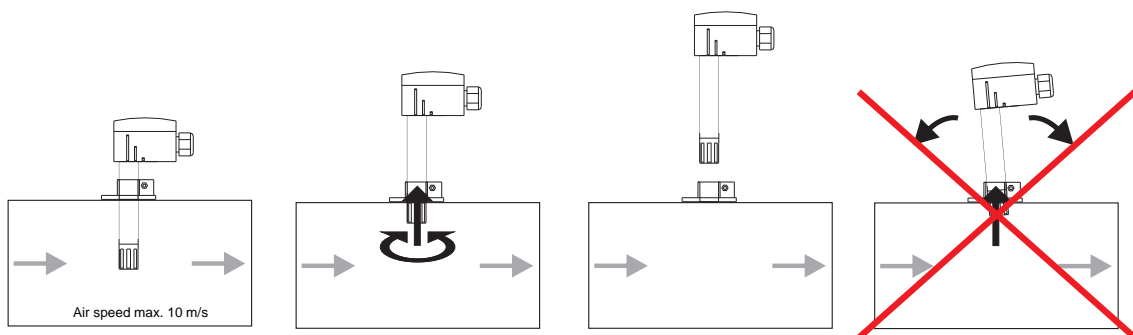
**Elektrischer Anschluss**

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 Messbereichsmitte 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.

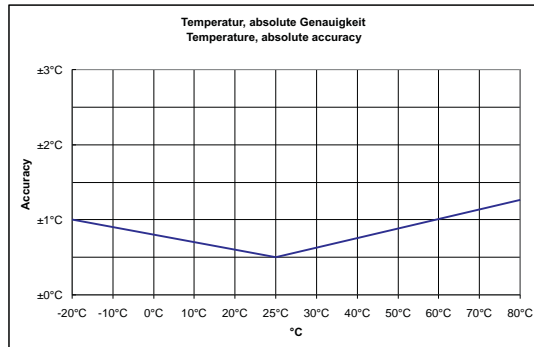
**Montagehinweise**

Der Sensor kann mittels Montageflansch am Lüftungskanal befestigt werden.

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



**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**

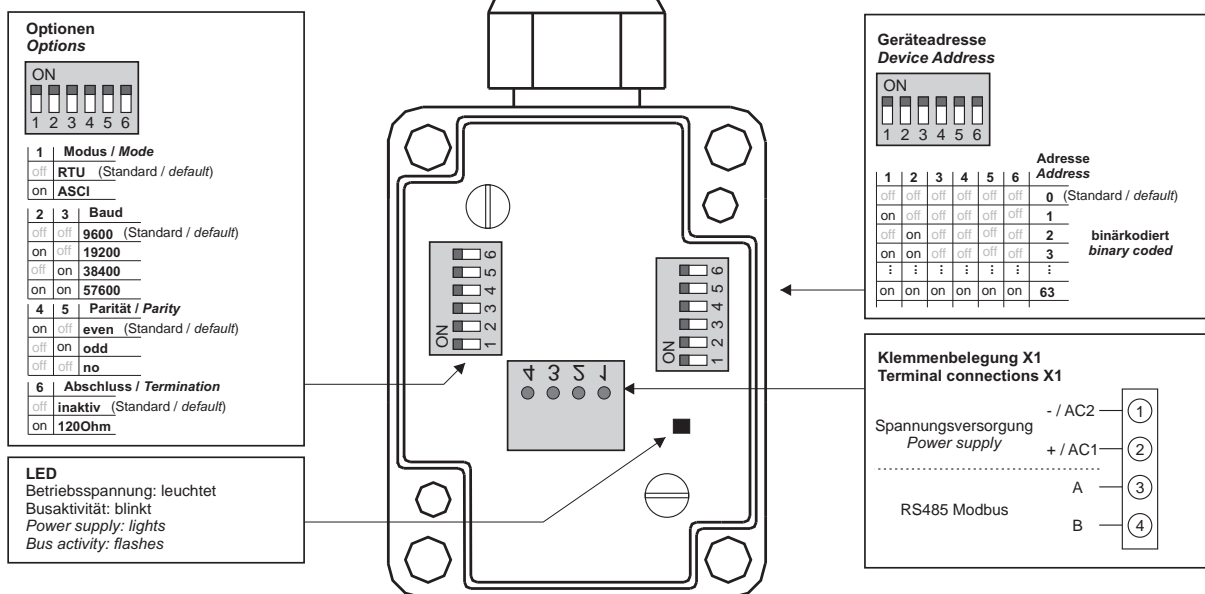
Durch Luftumwälzungen können sich im Laufe der Zeit auf dem Sinterfilter, der die Sensoren schützt, Schmutz und Staubpartikel ansammeln, die die Funktion des Fühlers behindern können. Nach erfolgter Demontage des Filters kann dieser durch Ausblasen mit ölfreier, gefilterter Pressluft, Reinluft, Stickstoff 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 Reglersystem 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-calibration 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**

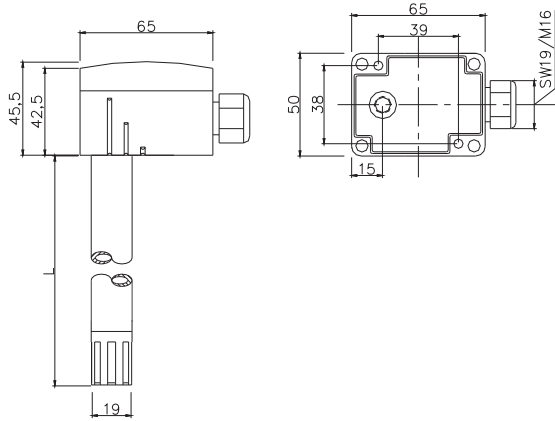
**Terminal Connection Plan**



Seite 4

Page 4

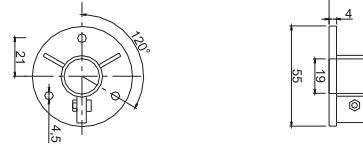
**Abmessungen (mm)**



**Zubehör optional**

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

**Dimensions (mm)**



MF19-PA  
Zubehör optional  
Optional Accessories

**Optional Accessories**

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

B.5 Wiring diagram for Condair ME humidifier

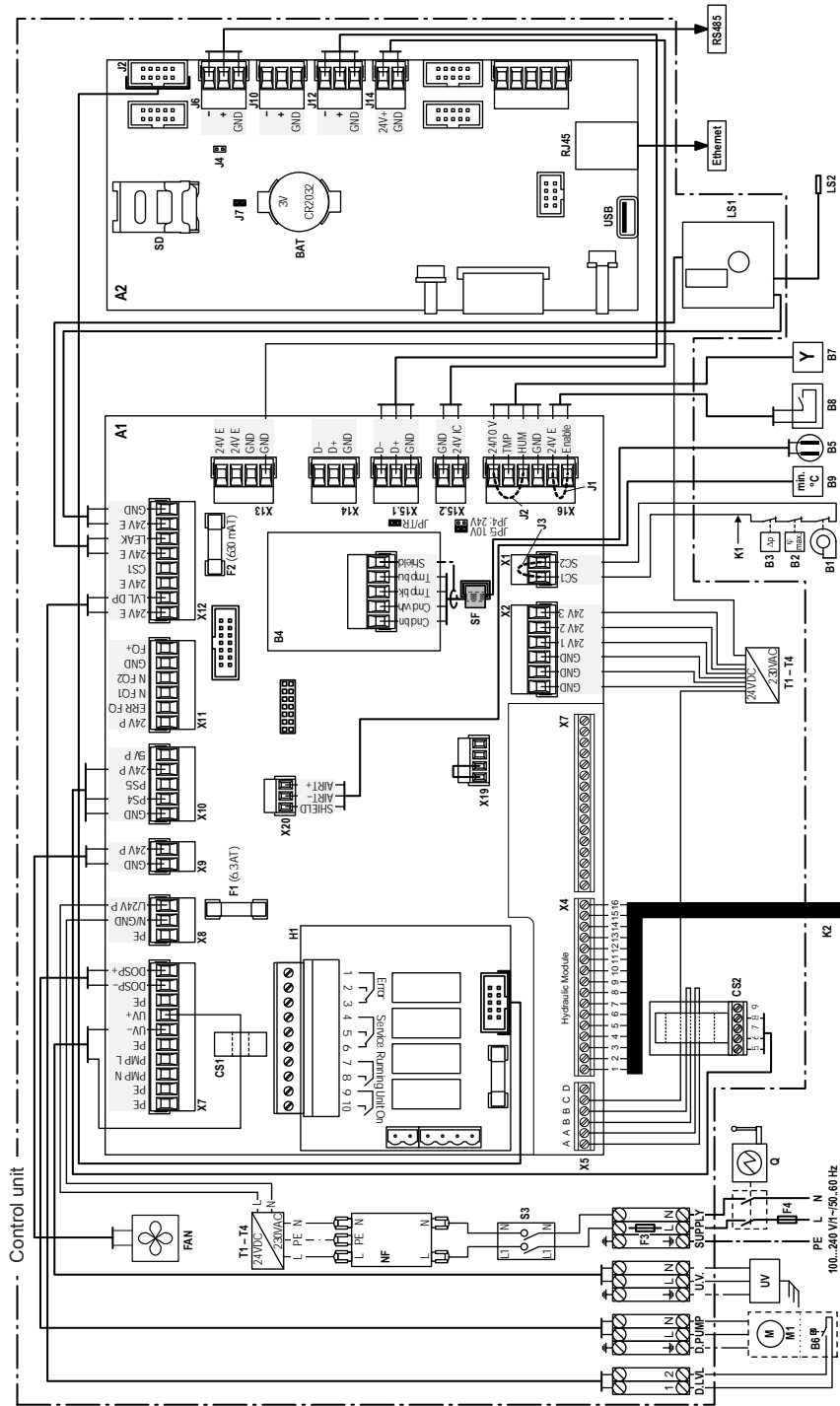
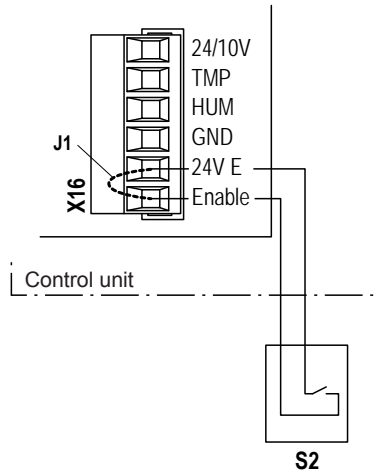


Fig. 35: Wiring diagram Condair ME Control

**Legend wiring diagram Condair ME Control**

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

The art of handling air

TROX GmbH  
Heinrich-Trox-Platz  
47504 Neukirchen-Vluyn, Ger-  
many

Germany  
+49 (0) 2845 202-0  
+49 (0) 2845 202-265  
E-mail: [trox@trox.de](mailto:trox@trox.de)  
[www.trox.de](http://www.trox.de)

© TROX GmbH 2016