OPERATING AND INSTALLATION MANUAL LBE 250AO

COMFORT VENTILATION

General ventilation and air conditioning technology
- VDI 6022, Sheet 1 (01/2018)
- SWKI VA104-01 (01/2019)
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Systematic ventilation.

GENERAL

USERS

SPECIALIST PERSONNEL

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1. Introduction

The LBE 250AO air humidification unit complies with the state of the art. It offers excellent operating safety, user comfort and cost-effectiveness.

In order to operate your air humidification unit safely, properly and economically, read and observe this operating manual carefully.

Use the air humidification unit only when in perfect condition and for its designated use, be aware of safety and any hazards and bear in mind all of the notes and information contained in this manual.

Please always keep the model and serial number (see nameplate on unit) at hand in the case of queries or when ordering spare parts.

If you have further questions, please contact us.

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Please keep this operating manual in a safe place and readily available at all times.
Please contact us if you lose this documentation.

2. General

This chapter contains general information on the LBE 250AO air humidification unit.

READ THIS MANUAL CAREFULLY BEFORE OPERATION.

This manual contains notes and information regarding the safe use, proper installation and operation as well as maintenance of the LBE 250AO air humidification unit. Furthermore, reference this manual during servicing to ensure proper execution of the tasks. Keep this operating manual readily available in a safe place.

Troubleshooting on and access to the air humidification unit may be performed by an installation company (specialist company) only.

Changes reserved:
This manual has been compiled with the utmost care. This does not, however, imply any rights. We constantly strive to improve and optimise our products technically and we reserve the right to modify our apparatus or technical data fully or in part and without prior notification. Your unit may therefore vary slightly from the description in this manual.
Our "General terms and conditions" in their latest version apply.

3. Designated use

The LBE 250AO air humidification unit is intended for installation or retrofitting in combination with a heat pump combi-unit PKOM^{4}A/AK with a maximum air volume flow of 350 m^{3}/h.

This unit is available to the general public and is intended for installation in residential or industrial buildings.

The compact air humidification unit works on the natural evaporation principle and enables constant, optimal humidity levels in the supply air.

In addition, the supply air is kept at a constant temperature thanks to an integrated air heater.

Designated use also includes adherence to our prescribed operating and installation manual. Only qualified personnel may work on and with the unit. Persons transporting or working on the unit must have read and understood the Operating Manual, especially *chapter 4 "Safety"*.

The LBE 250AO air humidification unit is not a ready-to-use product. It must not be put into operation until it has been properly installed and connected to the ventilation system.

The air humidification unit is not suitable for outdoor installation. It may only be installed in appropriate and temperature-controlled indoor spaces.

Changes reserved
It is our constant endeavour to technically improve and optimise our products and we reserve the right to change the design of the units or the technical specifications without prior notice.

3.1 Liability

The LBE 250AO is a compact, automatic unit for the active humidification of the supply air in ventilation systems.

Any other use is deemed improper and may lead to personal injury or damage to the LBE 250AO air humidification unit, for which the manufacturer accepts no liability.

The manufacturer accepts no responsibility for any damage due to:

- non-compliance with the safety, operating and servicing instructions given in this operating and installation manual
- the installation of spare parts that have not been supplied by the manufacturer, the responsibility for the use of such spare parts being fully borne by the system builder/installer
- normal wear and tear

3.2 Warranty

The warranty period starts upon commissioning, and at the latest one month after successful delivery. Warranty details can be found in our "General terms and conditions" in their latest version as well as the merchant conditions of your respective country. The warranty shall be subject to proof of services performed as per our instructions and executed by a licensed installer/specialised company.

Warranty claims shall be limited to material and/or constructional defects occurring during the warranty period. In the event of a warranty claim, the LBE 250AO air humidification unit must not be dismantled without prior written authorisation from the manufacturer. The manufacturer's liability shall be limited to spare parts installed by an installation company approved by the manufacturer.

The warranty shall automatically lapse at the end of the warranty period, following improper operation, if parts other than original manufacturer-supplied parts are installed, or if unauthorised changes or modifications are made to the air humidification unit.

The warranty is voided automatically by failure to comply with the information in this operating and installation manual.

4. Safety

4.1 General

Read this operating and installation manual carefully and observe the safety instructions while you carry out installation, commissioning, servicing or general work on the air humidification unit. Keep the operating and installation manual near the unit for its entire service life.

Always observe the safety regulations, warnings, notes and instructions given in this manual. The specifications given in this document must not be altered. Failure to observe these safety regulations, warnings, notes and instructions may lead to physical injury or damage to the air humidification unit.

The conclusion of a service contract is recommended to ensure that the unit will be checked at regular intervals. Ask your supplier about approved specialised companies/installers in your area.

SYMBOLS USED

The following safety symbols highlight text containing warnings in respect of danger and potential hazards.
Please familiarise yourself with these symbols.

Note!

Attention! Ignoring this warning may lead to injury or threat to life and limb and/or damage to the unit.

Attention – High voltage!
Ignoring this warning may lead to injury or threat to life and limb.

Installation, initial start-up, maintenance and repairs must only be carried out by an authorised specialist company. Over and above this operating and installation manual, local and national regulations and standards shall also apply to the operation of this unit without limitation. Take instruction from your installer on the unit and on its control unit following installation. The air humidification unit may only be used in accordance with the information provided in ***chapter 3 - Intended use***. All safety and danger notices attached to the unit and specified in this description must be observed.

In the event of malfunctioning, switch off the unit immediately and disconnect the power plug. The unit must be appropriately secured against restart. Faults must be remedied immediately. After repairs and maintenance work, qualified personnel must verify that the unit is safe to operate. Attachment or installation of additional parts and components is not permitted. Any modification of the air humidification unit is prohibited. Only original spare parts may be used. Modifications and alterations to the air humidification unit are prohibited and absolve the manufacturer from all warranties and liability.

Damage arising from a failure to comply with the operating and maintenance manual is not covered by the warranty.
This unit is not intended for use by persons, including children, with limited physical, sensory or mental capacities or lacking experience and/or knowledge, unless under supervision or instruction of a person responsible for their safety. Ensure that children do not play with the unit.

After commissioning, the power supply and water supply may not be interrupted for longer than one day after commissioning in order to ensure that hygiene requirements continue to be met.

Switching off the ventilation system
If the PKOM⁴A/AK heat pump combi-unit is taken out of operation for more than one day, the air humidification unit must be switched off at least two hours beforehand. This will dry out the air humidification unit and ensure continued hygienic function.

Working on the device
Installation, commissioning, service and repairs must be carried out by an authorised specialist (specialised heating company/installer). When working on the unit, it must be switched off and secured to prevent switching on. The water supply must be interrupted.

UVC disinfection tube
The unit is fitted with a UVC tube as standard. This may only be replaced with a type as marked on the unit, in its original packaging. The UVC tube may only be replaced by an authorised specialist! Before opening the unit or replacing a UVC tube, the unit must be switched off, and the power plug removed from the socket. Never look at the UVC light source without protection when it is switched on.

4.2 Unit setup – installation

The national and local regulations must be heeded when installing and setting up the unit. The unit may only be installed in compliance with national installation regulations. Installation must be carried out in accordance with the general local building, safety and installation regulations of the relevant community or the water and electricity department and other bodies.

The unit may only be installed in frost-free and dry rooms. The room temperature at the place of installation must be consistently between +5 °C min. and +35 °C max.

The unit is designed for wall mounting and may only be set up on a suitable, load-bearing structure. The unit must not be exposed to vibration of any kind.

Air ducts for the ventilation system which are not installed in heated areas must be appropriately thermally insulated (risk of temperatures dropping below the dew point) in order to avoid any build-up of condensation.

In structures such as windows with poor thermal insulation characteristics or faulty structural design as well as in old buildings, low outdoor temperatures and increased room air humidity in living areas can lead to a build-up of condensation, for example on the window glass. The surface temperature of these components must be above the dew point temperature of the room air (approximately +15 °C at least).

During normal operation, the build-up of germs and mould in the unit is prevented, as the water in the humidification unit is continuously treated and sterilised during operation.

Mounting
The unit is intended for horizontal mounting. It may deviate by a maximum of +/- 1° from the horizontal and must be mounted on a massive, load-bearing wall. The operating weight of the humidification unit must be taken into consideration when suspending the unit in order to prevent any hazard. These tasks may only be carried out by authorised specialists.

Water connections
Water, heating and waste water connections must be set up by qualified personnel. Only the supplied original connecting hoses may be used to connect to the water supply. Ensure that the lines are watertight. The maximum water pressure of the drinking water connection is 0.7 MPa and that of the water heating battery is 1 MPa – these must not be exceeded. The installation of a water stop valve is compulsory.

Water quality
Only drinking water which complies with the Austrian Drinking Water Ordinance may be used for the water supply. The connection to the drinking water pipe must be set up using the connection set supplied. If the chlorine content exceeds 0.1 mg/l, the standard water filter (5 µm) must be replaced with a dual filter (5 µm / carbon). If the iron content of the drinking water exceeds a value of 0.1 mg/l, an iron filter must also be installed in the water supply pipe.

The unit can be used with a maximum water hardness of 26 °dH. If this value is exceeded, the lifespan of the osmosis membrane will be significantly reduced.

Operating the unit
Any work practices that could potentially impair the safety of the unit are prohibited. All warning and protective equipment must be checked regularly to ensure that they function correctly. Safety devices may not be removed or switched off.

Assembling, dismantling, maintaining and repairing the unit
The unit must be switched off when performing maintenance work or repairs. No additional equipment may be added on or installed. In this instance, you should discuss this with the manufacturer.

Electrics/electronics
Work on the electrical system parts may only be carried out by a qualified electrician. The unit must be switched off when performing maintenance work or repairs. Switch off the unit immediately in the event of any fault in the electrical power supply. Only use original fuses with the specified current strength. The electrical equipment of the unit must be checked regularly. Any defects that are found, such as loose connections and scorched cables, must be rectified immediately. The protective measures must be tested (e.g. grounding resistance) after performing any electrical work or repairs.

Requirements of the installation site
The air humidification unit may only be installed in spaces with existing water drainage. Furthermore, safety measures must be provided in the space that automatically shut off the water supply to the air humidification unit securely in the event of a leak. The air humidification unit is an IP20 protection class design.

5. Transport and storage

To prevent potential damage during transport due to external applied forces, the humidification unit must be handled with care. If transported manually, ensure that necessary human lifting and carrying forces are reasonable.
The unit may not be transported using the connection cable. Avoid blows and impacts.

5.1 Dimensions and weight

	LBE 250AO
Dimensions of the packaged unit (W x H x D)	800 x 460 x 420 mm
Weight of the packaged unit without optional accessories	approx. 28 kg

5.2 Packaging

The safety labels on the box must be observed. Pay attention to and check for any damage to the packaging or to the unit upon delivery. Complaints or damage must be reported immediately.

5.3 Storage

The unit must be stored in its packaging in a dry, dust-free space protected from frost.

5.4 Check for completeness

Make sure that when the unit is delivered:

- The type and serial number on the nameplate correspond to those on the order and delivery documents.
- The equipment (including any optional accessories) is complete.
- All parts are in perfect condition.

Note: Any transport damage and/or missing parts must be reported immediately in writing to the forwarder or supplier.

5.5 Scope of delivery

The delivery includes:

- The air humidification unit
- Operating and installation manual
- Accessories: Water connection set *(see chapter 12.6)*

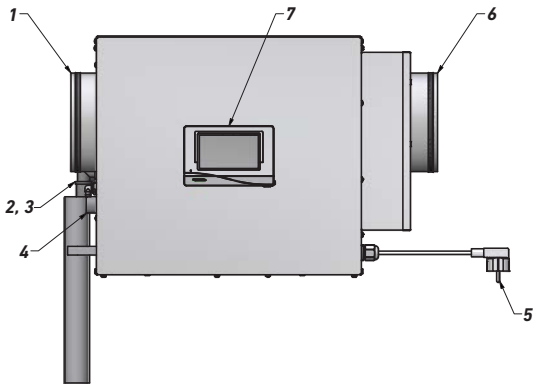
5.6 Disposal

Dispose of the packaging material and protective packaging in an environmentally-friendly manner and in accordance with local regulations e.g. recycling of wooden pallets or cardboard packages.

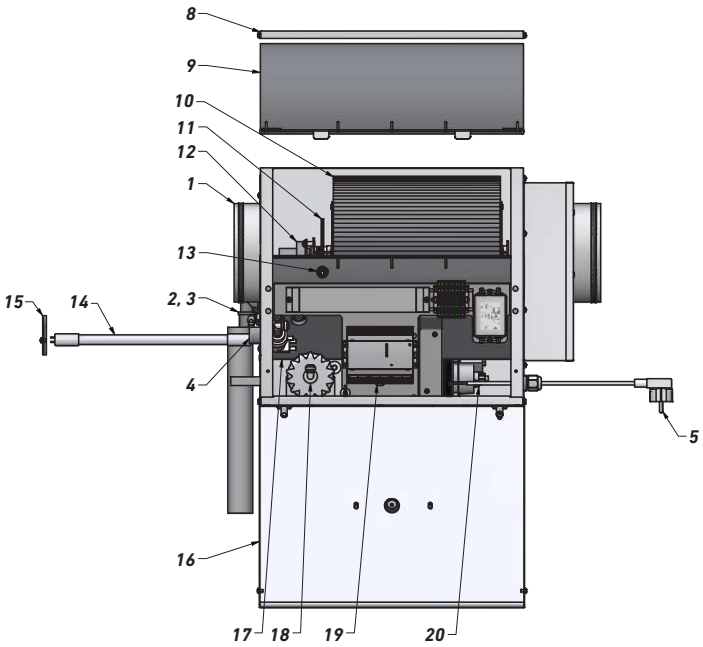
Equipment that is no longer functional must be disassembled by a specialised firm and properly disposed of at a suitable facility. The waste electrical and electronic equipment ordinance (EAG-VO) applies. This ordinance provides for the implementation of community law, Directive 2002/95/EC (RoHS) and Directive 2002/96/EC (the WEEE directive).

6. Device structure

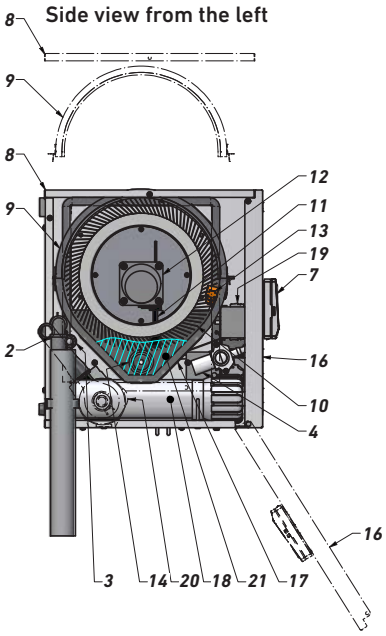
View from the front



Maintenance view from the front

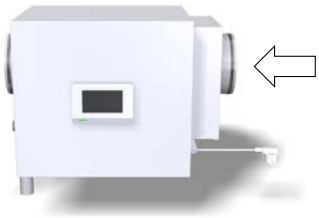


Side view from the left



1 Air discharge
2 Water drain
3 Osmosis drain
4 Water inlet valve
5 Mains power plug
6 Air intake
7 Control panel
8 Maintenance cover
9 Maintenance cover - water tray
10 Rotating blade evaporator
11 Float switch
12 Drive motor
13 Water inlet
14 UVC tube for sterilisation
15 Maintenance cover - UVC tube
16 Front flap
17 Water tray
18 Reverse osmosis unit
19 Control electronics
20 Drainage pump
21 Water

7. Versions

Versions	Air intake - left	Air intake - right
Item no.	08LBE250ALO	08LBE250ARO
		

8. Functional description

8.1 Working principle

The air humidification unit is operated in conjunction with the PKOM⁴A/AK heat pump combi-unit. It is installed directly downstream of the unit in the supply air duct.

The air humidification unit works on the principle of natural evaporation. When it enters the air humidification unit, the supply air flows over specially coated rotor blades, that are wetted with water. This water is absorbed into the air via evaporation (adiabatic humidification) and the absolute humidity of the air increases. The evaporation process simultaneously causes the air temperature to drop; the relative humidity of the air increases.

The unit may not be used for cooling purposes. The temperature control is regulated by the PKOM⁴A/AK heat pump combi-unit by means of a duct heater installed downstream of the humidification unit. The adjustable absolute humidity is between 4.5 and 11.5 g/m^3. Humidification output is selected using four preset levels. Whether these target values are actually reached is always dependent on the circumstances under which the air enters the air humidification unit.

The unit operates automatically, and the air humidity in the unit is monitored electronically. This prevents any over-humidification of the supply air.

The LBE 250AO humidification unit is dimensioned for a maximum operating air volume flow of 350 m^3/h.

Note:
The air humidification unit may not be operated with higher air volume flows than given in this operating manual. If the maximum operating volume flow is exceeded, individual drops of water may we carried along at the outlet of the air humidification unit. This can allow water to enter the supply air duct!

The humidifier tray is fed with drinking water from the central water supply. In order to minimise deposits on the rotating blades and in the water tray during operation, the air humidification unit is fitted with a reverse osmosis unit as standard. The reverse osmosis unit is installed in the water inlet pipe between the solenoid valve and the water tray. A pre-filter unit in the form of a water filter, which must be installed (externally) in the water inlet pipe during installation, is included in the scope of supply.

Depending on evaporation performance, there may be a maximum of 2.5 litres of water in the humidifier tray. Evaporated water is replaced with fresh water on an ongoing basis. In addition, the water is completely renewed once a day for hygiene reasons. The maximum water fill level is limited using a float switch. Any overflow from the tray is also prevented by means of a safety overflow.

In humidification mode, the water in the tray is continuously irradiated with UVC light and disinfected. The UVC tube completely illuminates the water tray and the evaporation surfaces. For safety reasons, the UVC tube is operated with a ballast unit with integrated error detection. If the UVC tube fails or has reached its maximum operating time, the water in the LBE 250A/LBE 500A is pumped out and an error message is issued.

8.2 Reverse osmosis

The water pressure in the drinking water pipe enables the operation of the reverse osmosis unit. The raw water (drinking water) is pushed through a semipermeable osmosis membrane. The clean water passes through this membrane (but it cannot pass back) and then into the humidifier tray. The residual water with all of the substances dissolved in the water (e.g. nitrates, nitrites, germs, lime, etc.) flow into the drain. Residual water is always drained away during the filling process.

8.3 UVC disinfection

The water in the humidifier tray is disinfected using UVC radiation, killing germs and bacteria and preventing their growth. The advantage of UVC disinfection is that it is not a chemical process, and is harmless to health (it cannot produce ozone!). The irradiation occurs only in an enclosed space with a radiation output of 4.3 watts at a wavelength of 253.7 nm.

During maintenance and repair work, never look at the UVC light source without protection when it is switched on! Only operate the UVC tube in a closed, undamaged housing.

8.4 Standby mode

The air humidification unit is in Standby mode. If the set absolute air humidity is undercut by more than 2 g/m^3, the air humidification unit is switched on, provided that release has been approved.

8.5 Start phase for active air humidification / switch-on sequence

The drainage pump first switches on to completely pump out any water that may still be in the humidifier tray. Fresh water is then simultaneously let into the humidifier tray, the UVC tube is switched on and the rotor is activated.

8.6 Active air humidification / regular operation

During active air humidification, humidity and temperature are controlled at the same time:

8.6.1 HUMIDITY CONTROL

Air humidity is controlled by means of the water level in the humidifier tray and thus via the water-wetted part of the rotor blade surfaces. When the water level rises, the blades of the rotor are immersed deeper in the water, thereby increasing the surfaces of the rotor blades which are wetted with water. The air flowing over these absorbs humidity from the wet blade surfaces by evaporation.

8.6.2 EVAPORATION PERFORMANCE

Evaporation performance is always dependent on the air intake conditions. Very dry and warm air can absorb more humidity than already saturated or cold air. The maximum possible evaporation in typical winter weather conditions is around 7 g/m^3. This means, for example, that dry air with an inlet state of **18 °C** can be brought to an outlet state of 25 °C with 60% RH.

This corresponds to a maximum possible evaporation capacity for the LBE 250AO of around 1.8 l/h.

8.7 Controlled shutdown / switch-off sequence

A controlled shutdown is initiated by the control system if for example an error message is detected, the air humidification unit switches from Operating mode to Standby mode or the unit is switched off. At this point, the water in the humidifier tray is first of all completely pumped out, and the rotor blades continue to rotate for approximately 20 minutes. The UVC tube remains in operation during the stopping time.

8.8 Daily water change

The water in the humidifier tray is completely replaced every 24 hours for hygiene reasons. The operator is free to set the time for this (the default setting is 3 pm) and can set this in the "Settings" menu item.

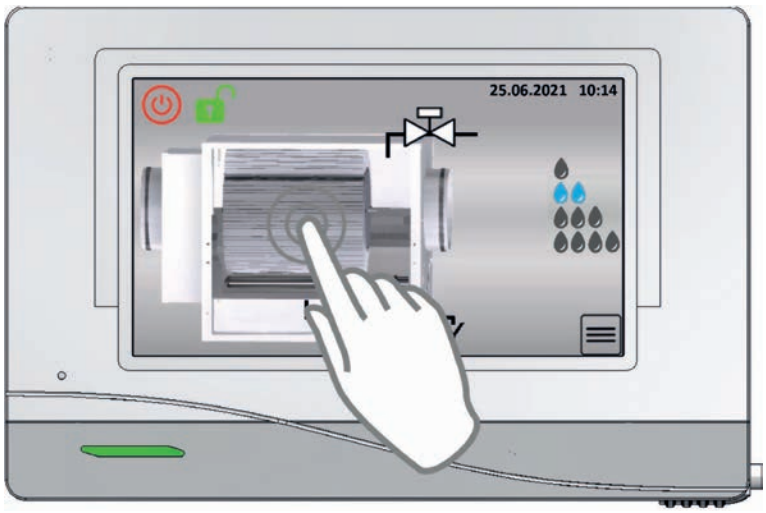
9. Regulation and control

The unit is delivered pre-programmed. Once installation is complete and all air, water and electrical connections have been set up *(see chapter 12)*, information on water hardness must be entered (see commissioning), after which the unit is ready for use.

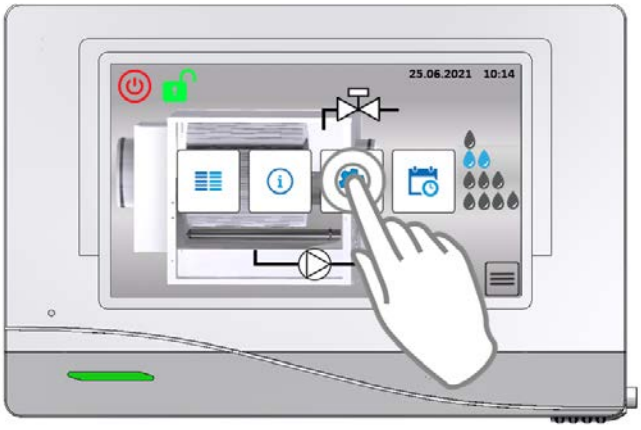
9.1 Control unit (display) / basic settings

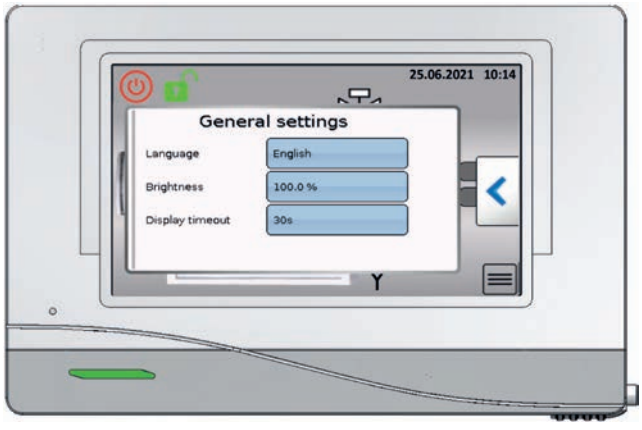
The LBE 250AO air humidification unit comes with a 4.3" touchscreen display. Operation using the touchscreen display is simple and intuitive.

Tap briefly on the display to interrupt the idle state; the main screen is displayed.



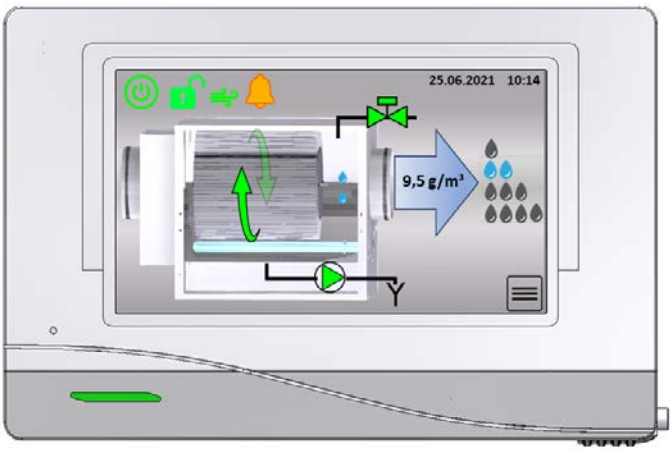
Pressing again on the display screen for around five seconds opens a sub-menu where basic settings can be set. In the sub-menu, you can choose from different languages, display brightness levels and display timeout times (= time after which the display switches back to the idle state due to inactivity) for operation.





9.2 Main screen (Home)

The main screen (Home) displays all important operating information at a glance.



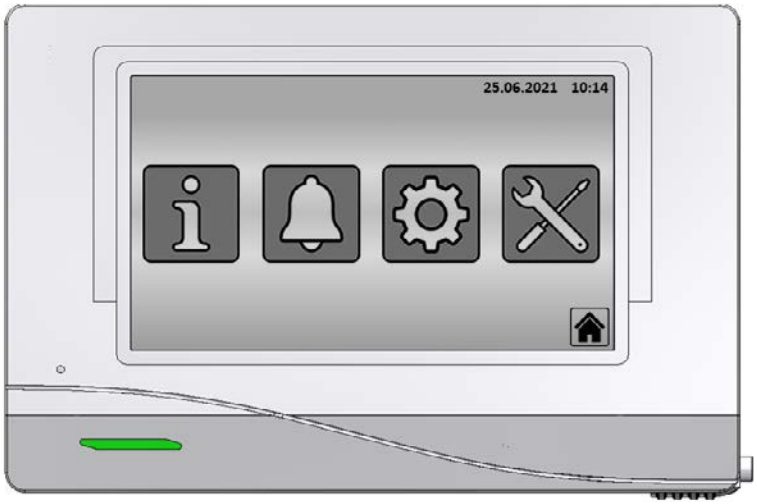
Meaning of the icons

	Air humidification "Off"	The air humidification unit is locked manually and can be unlocked by pressing this button.
	Air humidification "Standby"	The air humidification unit is in Standby mode. If the set relative air humidity is undercut by more than 5%, the air humidification unit is switched on, provided that release has been approved.
	Air humidification "On"	The air humidification unit is in Operating mode, meaning that the unit has been released, and there is a control deviation. The air humidification unit adjusts the air humidity and the air temperature according to the set values. If the measured air humidity is within approx. 2% of the set air humidity and the water valve only opens sporadically within a 12-hour period, the air humidification unit switches to Standby mode.
	Air humidification released External: digital input or Modbus Internal: volume flow	Depending on the configuration, a unit can be released either solely via airflow detection or additionally via a digital release contact or release via Modbus.
	Air humidification not released External: digital input not closed or Modbus release disabled Internal: no volume flow detected	
	Airflow present	The flow sensor integrated at the outlet of the air humidification unit automatically detects any present air volume flow. This is always a precondition for unit release.
	No airflow present	
	Message active	This message is displayed when there are faults or warnings. Tapping on the icon will take you to the main message screen.
		Display of the set humidification level. Tapping will take you to the settings, where you can set the target humidity by selecting any of four humidification levels.
1 ≈ 4,5 - 6,0 g/m³ 2 ≈ 6,0 - 7,5 g/m³ 3 ≈ 7,5 - 9,0 g/m³ 4 ≈ 9,0 - 11,5 g/m³		1 - Minimum humidification (~ 4.5 - 6.0 g/m³) 2 - Moderate humidification (~ 6.0 - 7.5 g/m³) 3 - High humidification (~ 7.5 - 9.0 g/m³) 4 - Maximum humidification (~ 9.0 - 11.5 g/m³)

		The blue arrow indicates a flow of air through the air humidification unit. Display of the current measured absolute air humidity at the outlet of the air humidification unit.
25/06/2021	**10:14**	Date / time: Can be modified simply by tapping. Summer time can be enabled/disabled. In the event of any extended interruption in the power supply, the Settings should be checked and updated if necessary.
	Water valve on	Displays the current status of the water valve. In Humidification mode, the humidifier tray is continuously filled with fresh drinking water.
	Water valve off	
	Drainage pump on	Displays the current status of the drainage pump. This is active in every start sequence, switch-off sequence, switch to Standby mode as well as in Humidification mode, if the water level in the humidifier tray is too high.
	Drainage pump off	
	UVC tube on	Displays the current status of the UVC tube. This is always switched on when air humidification is active and during the switch-off sequence.
	UVC tube off	
	Rotor running	Displays the current operating state of the rotor. This is running in Humidification mode and during the switch-off sequence.
	Heater on	Displays the current operating state of the heating battery. This is only operational when humidification is active.

9.3 Main menu

Pressing the ☰ button on the main screen takes you to the main menu of the control unit. You can then access the individual sub-menu items.



Operating values and unit information

Messages

Settings

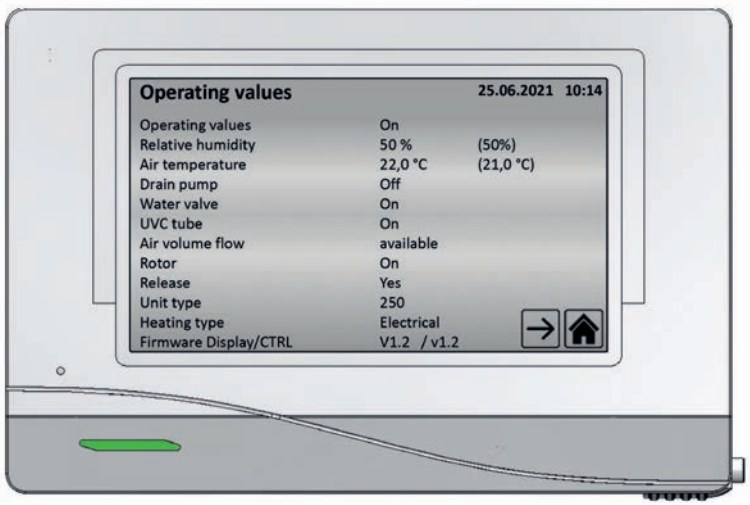
Service / maintenance

The ⌂ button returns you to the main screen.

9.4 Operating values and unit information

This menu item displays the relevant current operating values and unit information.
The values in brackets show the currently set target values.

Pressing the arrow key → displays the operating times for the individual consumable and maintenance parts.



Note! Observing the maximum operating times is essential to ensuring the lengthy and trouble-free operation of your air humidification unit. Replace the UVC tube, water filter and osmosis filter regularly and within the recommended time intervals.

9.4.1 MAXIMUM OPERATING TIMES

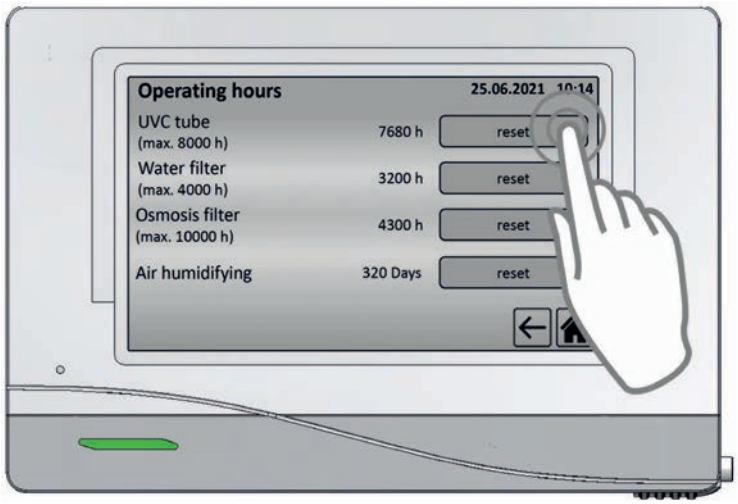
When the maximum recommended operating times are reached, the respective components must be replaced and the corresponding operating hour counters must be reset.

Attention! Only use original replacement parts for repairs and replacements.

9.4.2 UVC TUBE OPERATING TIME

Attention! The UVC tube has a guaranteed radiation performance of at least **85%** over a period of **8000 operating hours**. Never reset the hour counter without inserting a new UVC tube! Reduced radiation performance can lead to insufficient UVC water sterilisation *(see chapter 8.3)*

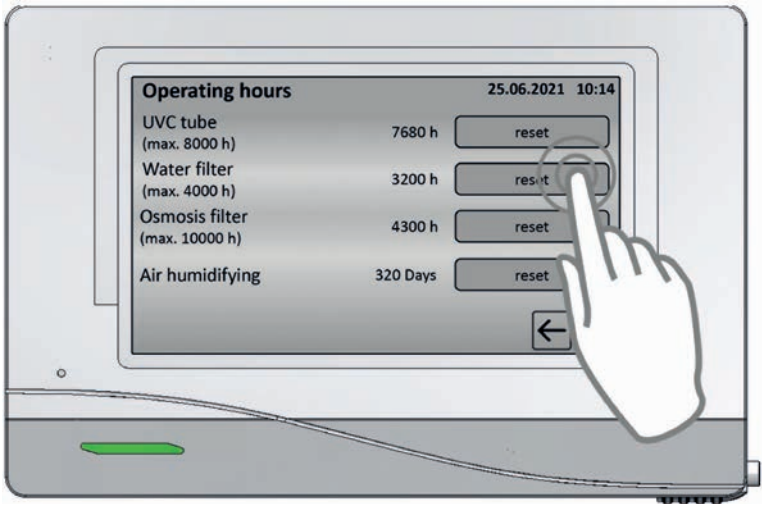
Instructions for replacing the UVC tube *(see chapter 16.1)*



9.4.3 WATER FILTER OPERATING TIME

For operating safety and hygiene reasons, the water filter should be replaced once the maximum recommended operating time is reached, and at the latest every 2 years.

Instructions for replacing the water filter *(see chapter 16.3)*

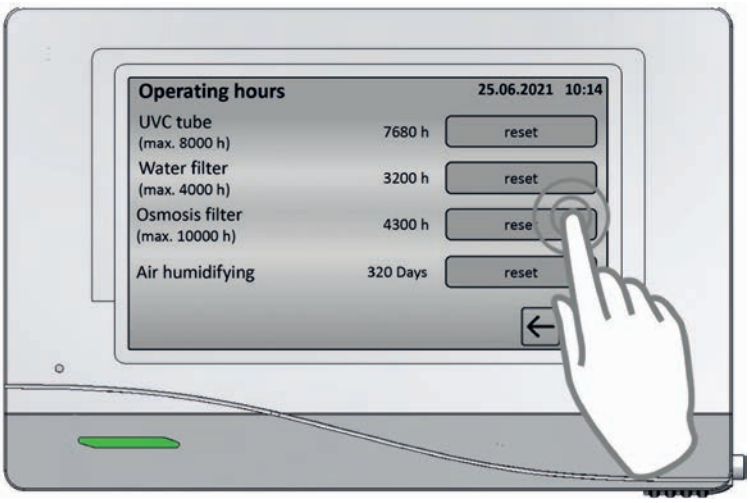


9.4.4 OSMOSIS FILTER OPERATING TIME

Over time, the osmosis membrane becomes clogged with small particles that hinder the flow of clean water. For operating safety and hygiene reasons, the osmosis filter should be replaced once the maximum recommended operating time is reached, and at the latest every 2 years.

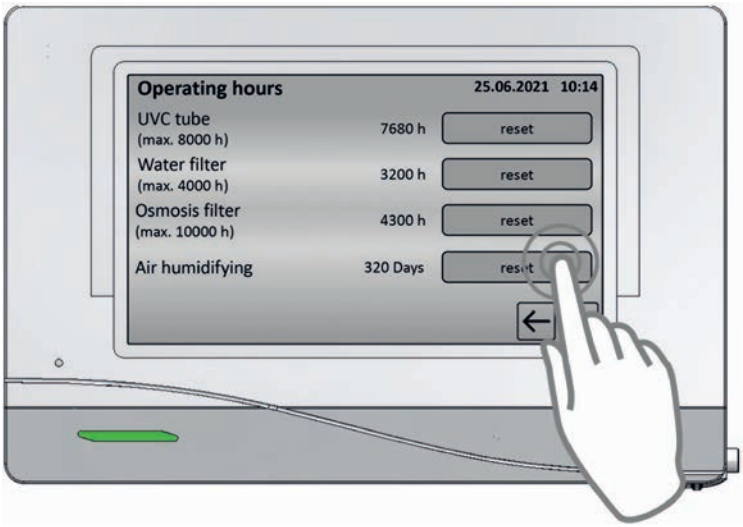
The rotating blades and humidifier tray should also be cleaned when replacing the osmosis filter.

Maintenance instructions *(see chapter 16.2)*



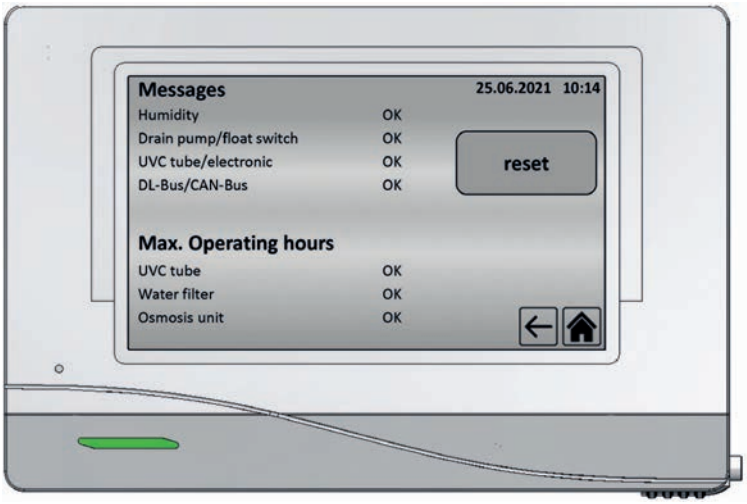
9.4.5 AIR HUMIDIFIER OPERATING TIME

The total time during which the air humidification unit has provided active humidification is counted in hours and displayed in days. This time can be reset as required, if for example significant repair and maintenance is performed.



9.5 Messages

The main message screen displays the status of the individual consumable and maintenance parts.
In trouble-free, regular operation, the status is marked OK.

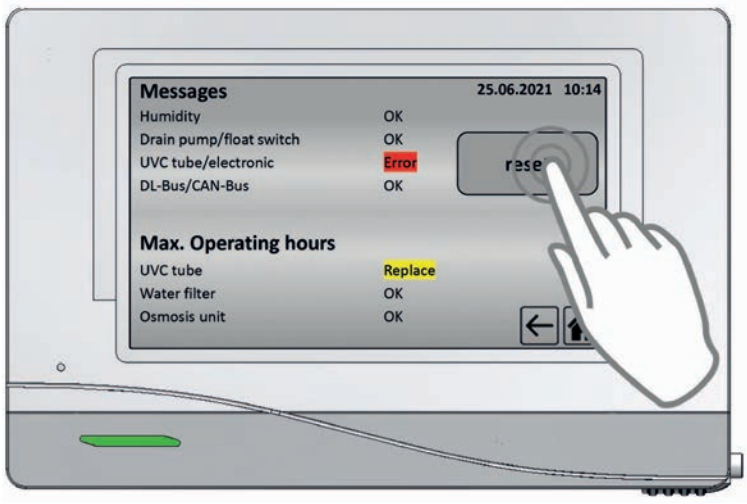


9.5.1 FAULT MESSAGES

If the control system detects a fault, a red message is displayed and the air humidification unit performs a controlled shutdown *(for controlled shutdowns, see chapter 8.7)*. This also applies when the maximum operating time of the UVC tube is reached.

To be able to return the air humidification unit to service, a fault must first be corrected and the error message must then be reset.

For detailed description of faults, *see chapter 14*.



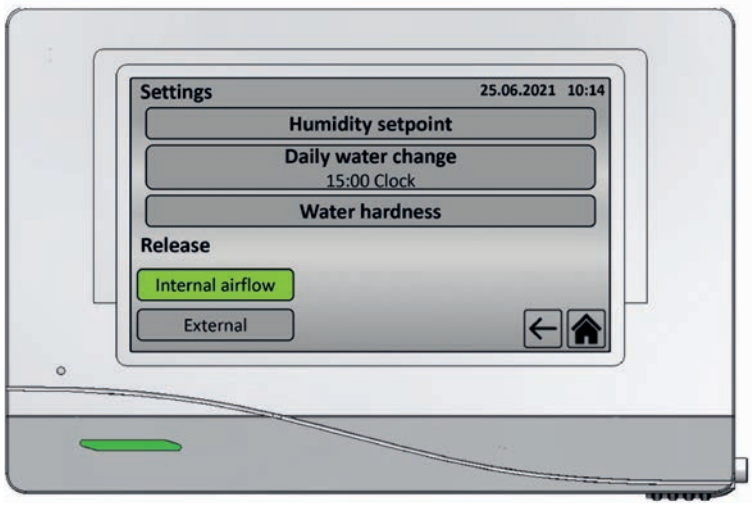
9.5.2 OPERATING TIME WARNING MESSAGE

If the water filter or osmosis filter reaches its maximum operating time, a red warning message is displayed and the component must be replaced.
Before the maximum operating time is reached, a yellow warning message will be displayed indicating that the respective component must be replaced "soon".

The air humidification unit will continue to operate in the event of these warning messages.

9.6 Settings

In this menu item, the operator can set the most important settings for operating the air humidification system.



9.6.1 TARGET AIR HUMIDITY

The target humidity value can be selected from four humidification levels.
1 - Minimum humidification (~ 4.5 - 6.0 g/m^3)
2 - Moderate humidification (~ 6.0 - 7.5 g/m^3)
3 - High humidification (~ 7.5 - 9.0 g/m^3)
4 - Maximum humidification (~ 9.0 - 11.5 g/m^3)

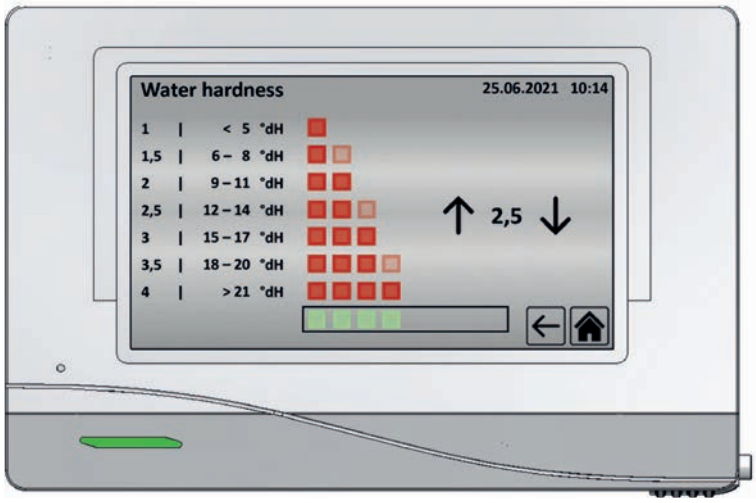
The humidification that can actually be achieved is dependent on the state of the air at the inlet *(see chapter 8.6.2)*.

9.6.2 DAILY WATER CHANGE

The time for the daily water change *(see chapter 8.8)* can be set here.

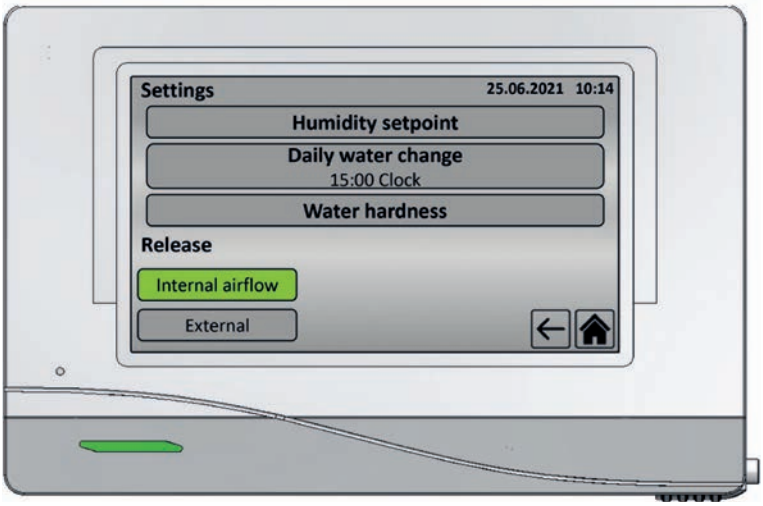
9.6.3 WATER HARDNESS

The water hardness can be input in this menu item. This primarily has an impact on the maximum operating time of the osmosis filter. The water hardness is determined using the test strips provided. This must be immersed in the drinking water for 2 seconds, and will give a test result after 1 minute. Then, compare this with the scale shown on the display and set the corresponding value using the arrow keys.

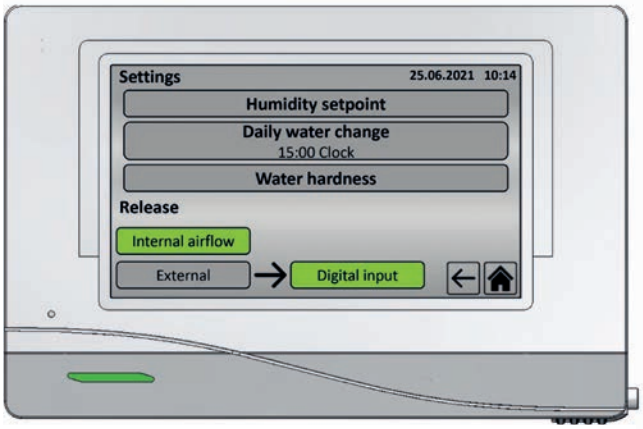


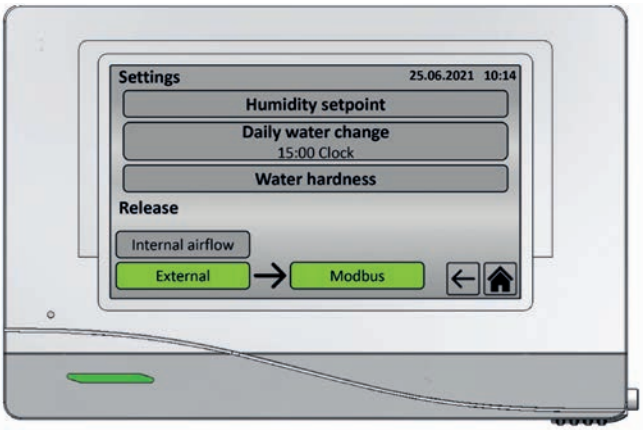
9.6.4 RELEASE

The unit release can be configured in this menu item. Release via automatic air flow detection is preset at the factory.



Alternatively, the unit can also be released using an additional external command. You can choose between a digital input signal or external Modbus connection *(see Electrical connections in chapter 13)*.



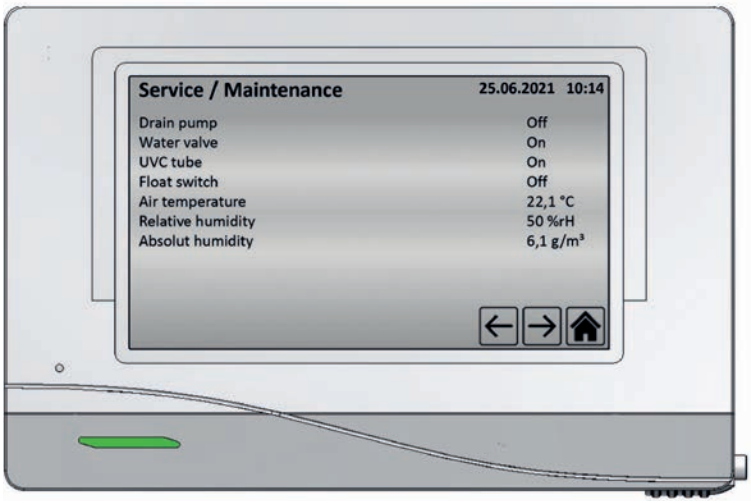


Note! An airflow must always be present and detected by the external sensor for Humidification mode.

9.7 Service / maintenance

To access the service and maintenance menu, you will first need to enter the specialist password.

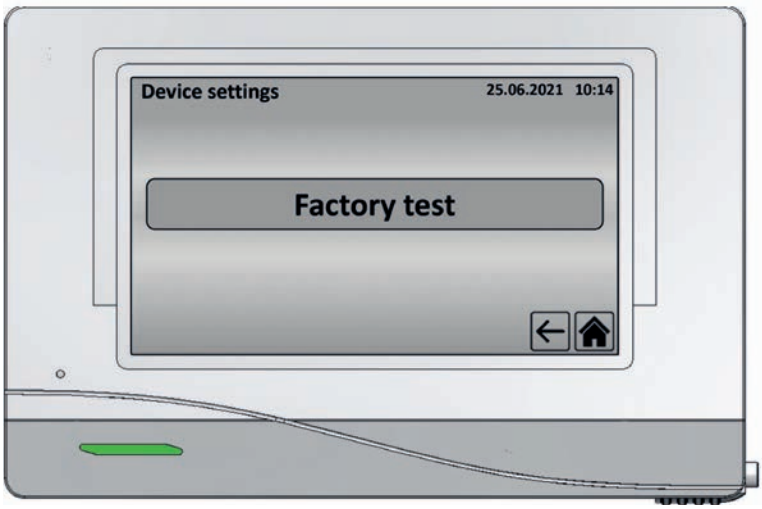
The menu overview shows the operating states of the various installed components, as well as the measured air conditions.

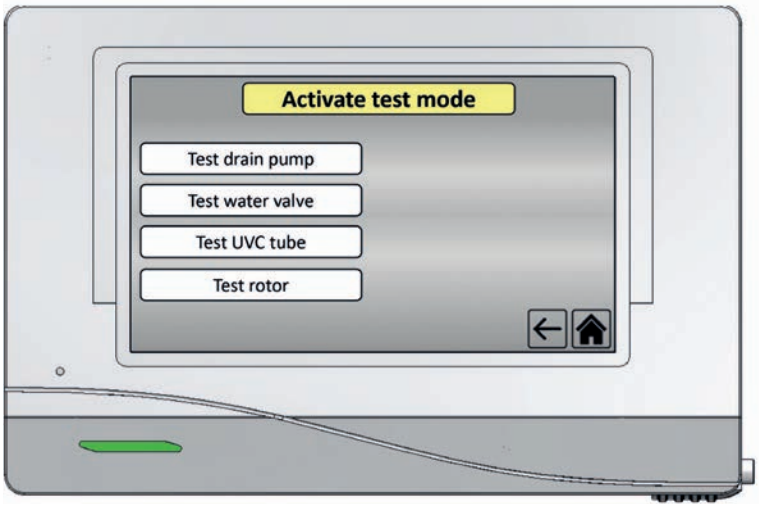


Press the arrow key → to display the unit's settings.

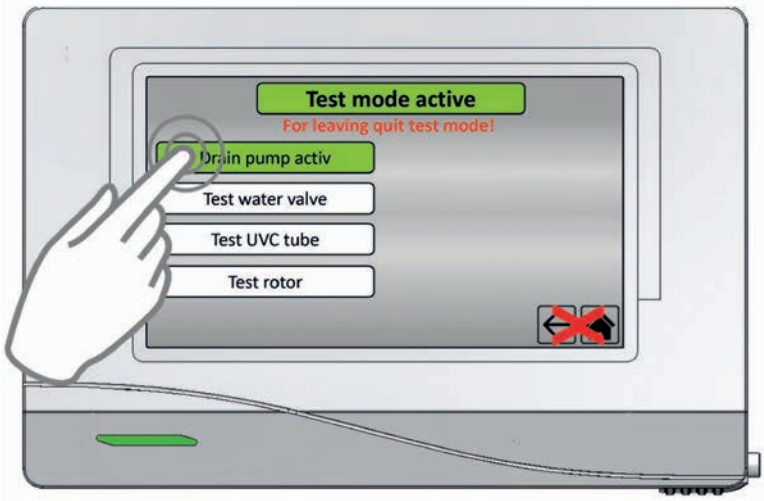
9.8 Test mode

The functionality of the different electrical components can be checked in the Factory test menu item. To do this, the air humidification unit must first be in the "Off" operating mode, after which Test mode can be activated.





The components can be enabled by selecting them for a maximum of 10 seconds. Operation can be stopped immediately by pressing them again.



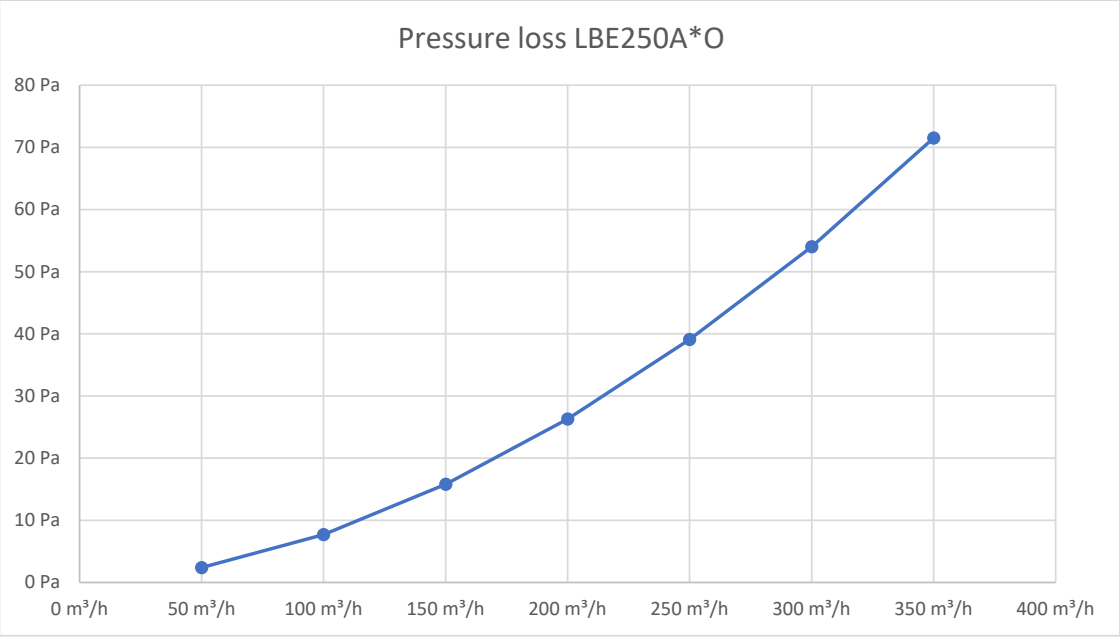
To exit Test mode, this must first be disabled.

10. Technical specifications

UNIT TYPE	LBE 250AO
Air volume flow [m^3/h]	max. 350
Air humidity, adjustable [g/m^3]	1 - Minimum humidification (~ 4.5 - 6.0 g/m^3) 2 - Moderate humidification (~ 6.0 - 7.5 g/m^3) 3 - High humidification (~ 7.5 - 9.0 g/m^3) 4 - Maximum humidification (~ 9.0 - 11.5 g/m^3)
Air temperature, adjustable [°C]	15 to 25
Evaporation performance [l/h]	max. 2.5
Tray capacity [l]	max. 2.5
Pressure loss [Pa]	see diagram
Mains connection [V/Hz]	1~230/50
Power consumption [W]	max. 100
Air connection [mm]	ø 160
Water connection [inches]	ø ¾
Waste flow connection [mm]	ø 40
Siphon	provided on site
Water inlet pressure [MPa]	min/max. 0.35/0.7
Water temperature [°C]	min/max. 8/30
Weight (without/with water) [kg]	25/28
Class of protection [IP]	20
Installation type	Wall mounting

10.1 Pressure loss characteristics

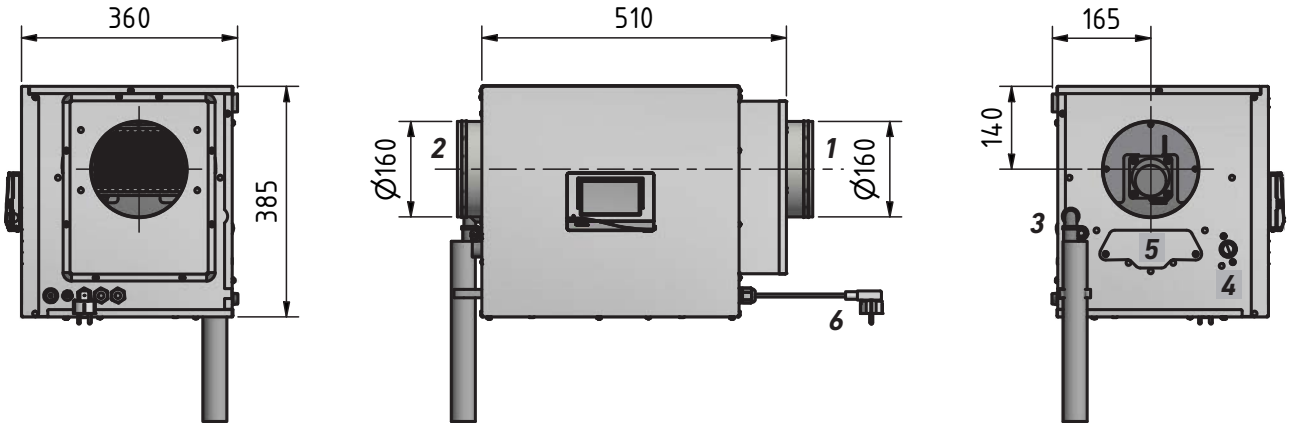
The diagram below shows the pressure loss of the unit.



11. Layout sketch

Wall-mounted LBE 250ARO air humidification unit (LBE 250ALO mirrored)

(Dimensions: W x H x D = 510 x 385 x 360 mm)



1 Air inlet (supply air from ventilation device) ø 160 mm
2 Air discharge (supply air in the living area) ø 160 mm
3 Drain (water drain) ø 40/50 mm
4 Water supply (drinking water connection) ¾"
5 UVC tube (cover for UVC tube replacement)
6 Mains connection 230 V / 50 Hz

12. Mounting

12.1 Requirements for installing the unit

The national and local regulations must be heeded when installing and setting up the unit. The unit may only be installed in compliance with national installation regulations.

The unit may only be installed in a dry, frost-free space. The temperature in the installation area must be between +5 °C and max. +35 °C. The unit is intended for horizontal mounting. It may deviate by a maximum of +/- 1° from the horizontal and must be mounted on a massive, load-bearing wall. The operating weight of the humidification unit must be taken into consideration when suspending the unit. The unit must not be exposed to vibration of any kind.

The air humidification unit may only be installed in spaces with existing water drainage.

Safety measures must be provided in the installation space which automatically and securely shut off the water supply to the air humidification unit in the event of an uncontrolled water leak (e.g. a water block).

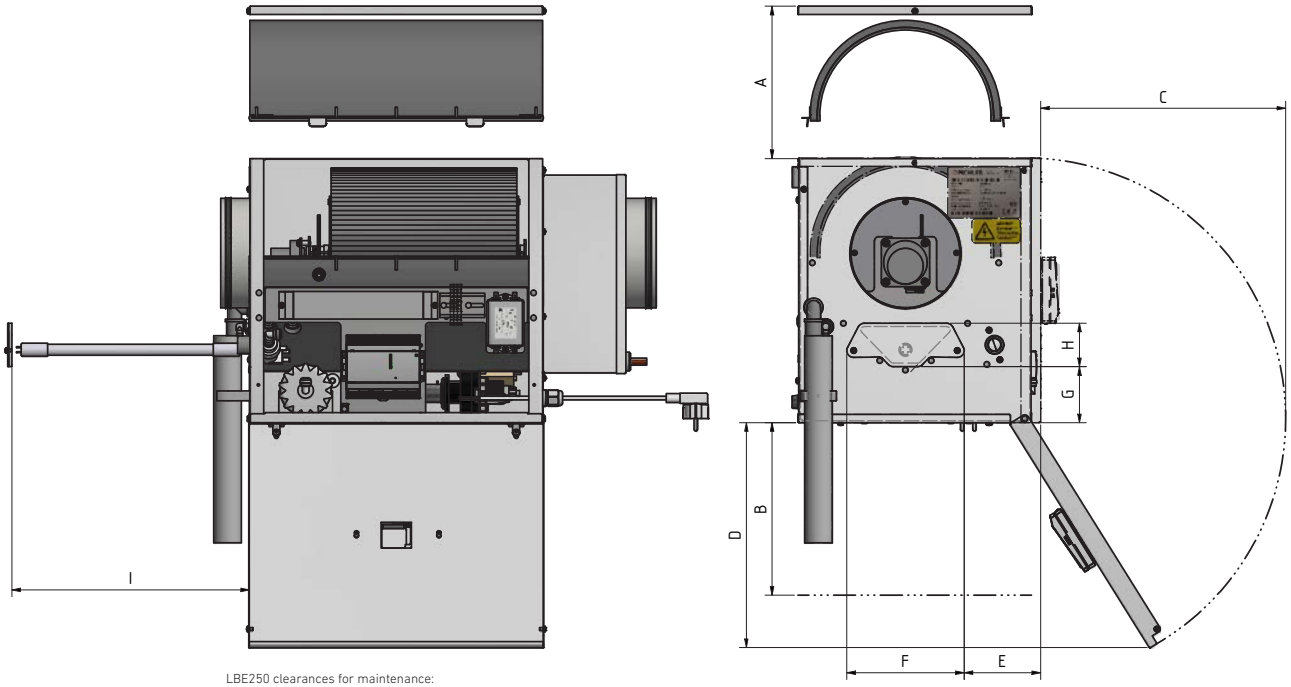
Air ducts for the ventilation system which are not installed in heated areas must be appropriately thermally insulated in order to avoid any build-up of condensation if the temperature drops below the dew point.

The place where the humidification unit is installed must be easily accessible for maintenance and repair work. The stipulated clearances for maintenance around the unit must be strictly adhered to.

Any damage caused by a failure to observe these instructions is not covered by the warranty!

12.2 Minimum clearances to be observed

The minimum clearances around the unit must be taken into consideration during installation in order to allow necessary maintenance work.



LBE250 clearances for maintenance:
A... 200 mm above
B... 250 mm below
C... 360 mm in front of the front flap
D... 330 mm below the front flap
E... 110 mm UV tube maintenance - front
F... 170 mm UV tube maintenance - length
G... 80 mm UV tube maintenance - floor

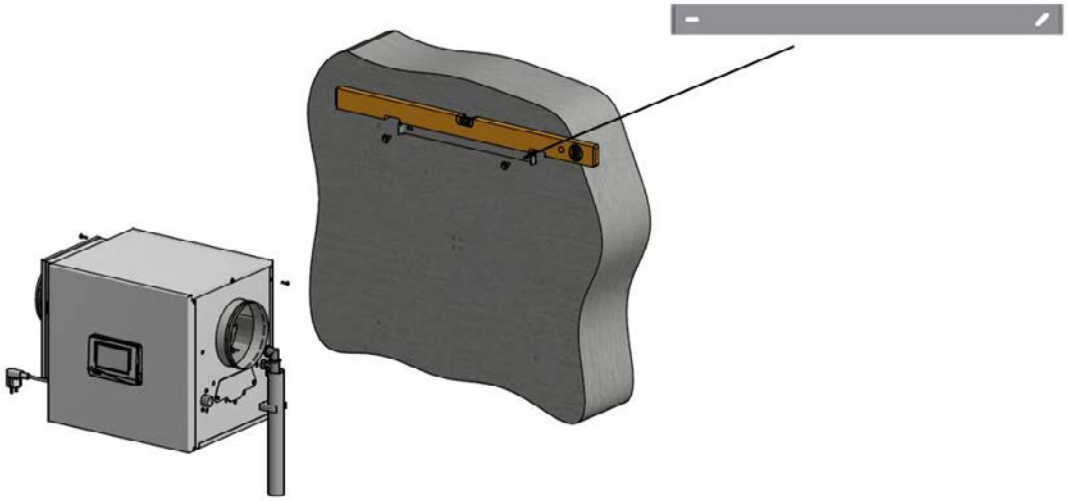
12.3 Installing the air humidification unit

The air humidification unit is installed in the supply air duct downstream of the PKOM⁴A/AK heat pump combi-unit.

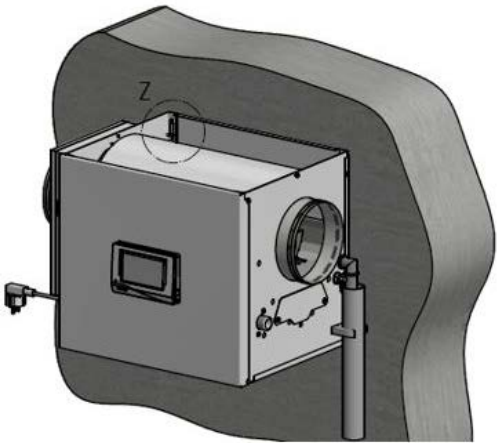
Illustration: Installation diagram for right-handed versions

The silencer must be installed downstream of the air humidification unit in order to dampen any operating noise.

The supplied mounting bracket must first of all be mounted horizontally (max. +/- 1° deviation) on a massive, load-bearing wall.



Then, the air humidification unit is suspended and secured onto the wall mounting bracket with the two side locking screws to prevent any unintentional falls.



Detail Z

12.4 Versetzen der Temperaturfühler

When installing the air humidification unit LBE250AO, the temperature sensor (T1), which is installed in the supply air connection of the PKOM⁴A/AK, must be disconnected and a new temperature sensor (T1) placed after the LBE250AO. In addition, a temperature sensor (T9) is placed after the duct heating register and connected according to the scheme on the PCB.

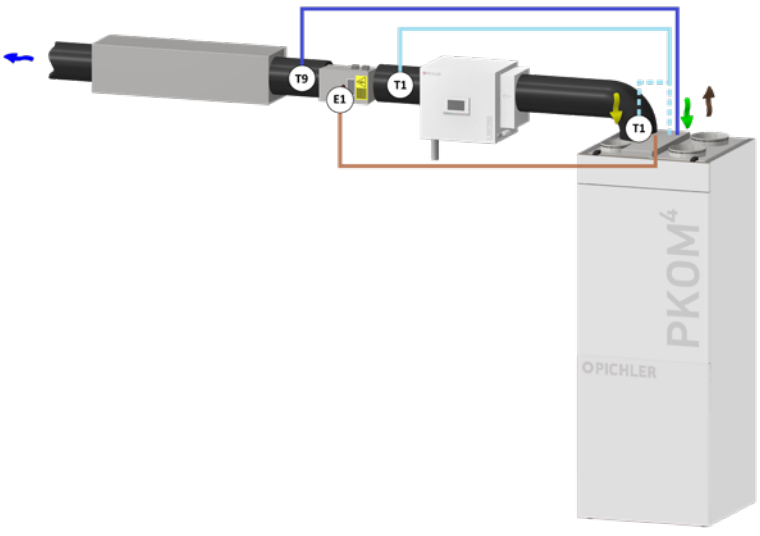
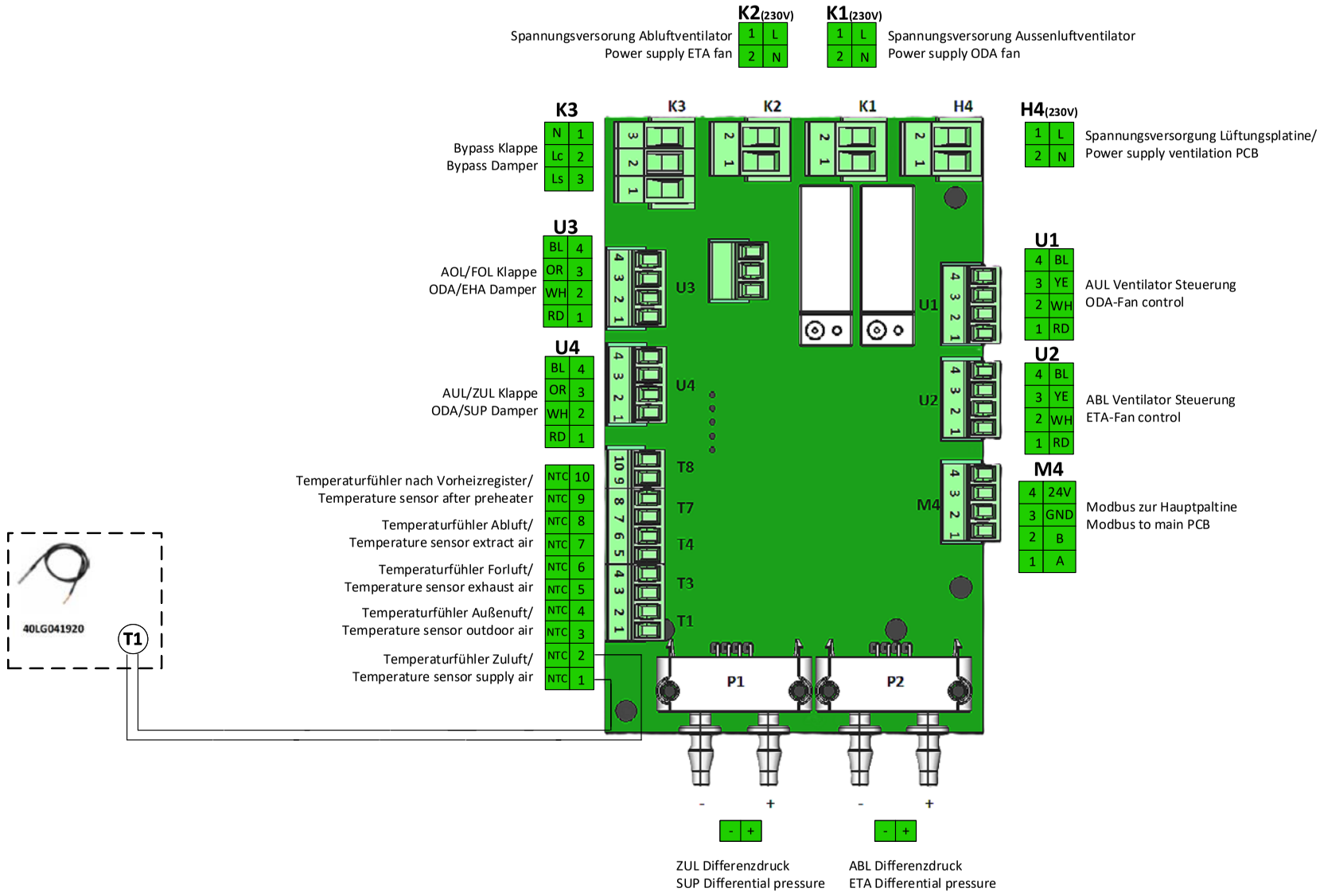
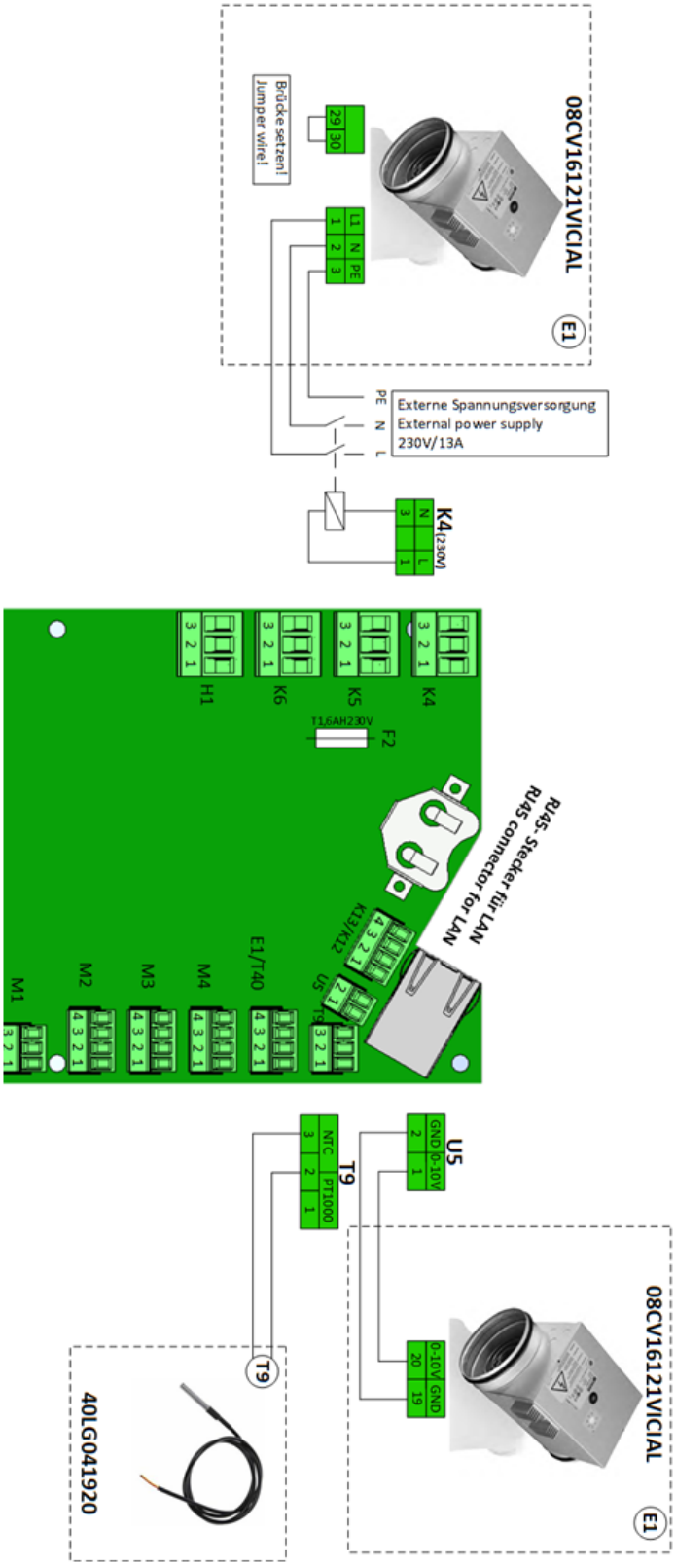


Illustration: overview for right-handed versions


K2(230V)
1 L
2 N
Spannungsversorgung Abluftventilator
Power supply ETA fan
K1(230V)
1 L
2 N
Spannungsversorgung Aussenluftventilator
Power supply ODA fan
K3
N 1
Lc 2
Ls 3
Bypass Klappe
Bypass Damper
U3
BL 4
OR 3
WH 2
RD 1
AOL/FOL Klappe
ODA/EHA Damper
U4
BL 4
OR 3
WH 2
RD 1
AUL/ZUL Klappe
ODA/SUP Damper
NTC 10
NTC 9
NTC 8
NTC 7
NTC 6
NTC 5
NTC 4
NTC 3
NTC 2
NTC 1
Temperaturfühler nach Vorheizregister/
Temperature sensor after preheater
Temperaturfühler Abluft/
Temperature sensor extract air
Temperaturfühler Forluft/
Temperature sensor exhaust air
Temperaturfühler Außenuft/
Temperature sensor outdoor air
Temperaturfühler Zuluft/
Temperature sensor supply air
40LG041920
T1
K3
K2
K1
H4
U3
U4
U1
U2
M4
T8
T7
T4
T3
T1
P1
P2
H4(230V)
1 L
2 N
Spannungsversorgung Lüftungsplatine/
Power supply ventilation PCB
U1
4 BL
3 YE
2 WH
1 RD
AUL Ventilator Steuerung
ODA-Fan control
U2
4 BL
3 YE
2 WH
1 RD
ABL Ventilator Steuerung
ETA-Fan control
M4
4 24V
3 GND
2 B
1 A
Modbus zur Hauptpaltine
Modbus to main PCB
- + - +
- +
- +
ZUL Differenzdruck
SUP Differential pressure
ABL Differenzdruck
ETA Differential pressure

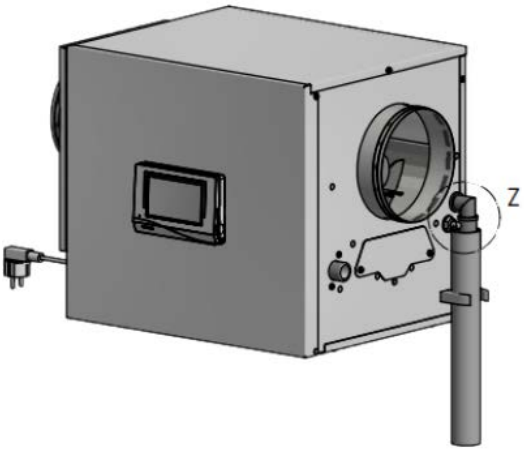

08CV16121VICIAL
E1
Brücke setzen!
Jumper wire!
29
30
L1
N
PE
1
2
3
Externe Spannungsversorgung
External power supply
230V/13A
PE
N
L
K4 (230V)
N
L
3
1
H1
K6
K5
K4
T1.6AH230V
F2
RJ45- Stecker für LAN
RJ45 connector for LAN
K3/K2
E1/T40
Q5
M1
M2
M3
M4
T9
NTC
PT1000
U5
GND
0-10V
0-10V
GND
20
19
08CV16121VICIAL
E1
T9
40LG041920

12.5 Air line connections

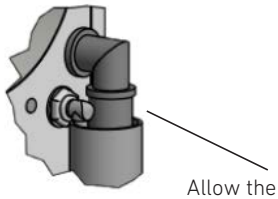
When installing the air line connections, ensure that no metal shavings enter the air humidification unit (these can cause corrosion spots in the water tray). The air ducts must be thoroughly cleaned after installation work is completed.

12.6 Waste water connection

The two waste water connections (1x from the reverse osmosis unit and 1x from the drainage pump) must protrude freely approximately 3 cm into the supplied waste water connection pipe (HT tube, DN 40 mm).
An odour trap (siphon) must be provided on site.



Detail Z



Allow the two waste water connections to penetrate freely approximately 3 cm into the waste water connection pipe.

Hoses may not be directly connected to the drain.

The contents of the tray, 2.5 litres of water, are pumped out in approximately 10 seconds.

12.7 Drinking water connection

Only drinking water which complies with the Austrian Drinking Water Ordinance may be used for the water supply. Only the supplied original connecting hoses may be used to connect to the water supply. The minimum and maximum operating pressures of 0.35 MPa and 0.7 MPa as well as minimum and maximum water temperatures of 8 °C and 30 °C may not be undercut or exceeded.

If the chlorine content exceeds 0.1 mg/l, the standard water filter (5 µm) must be replaced with a dual filter (5 µm / carbon).

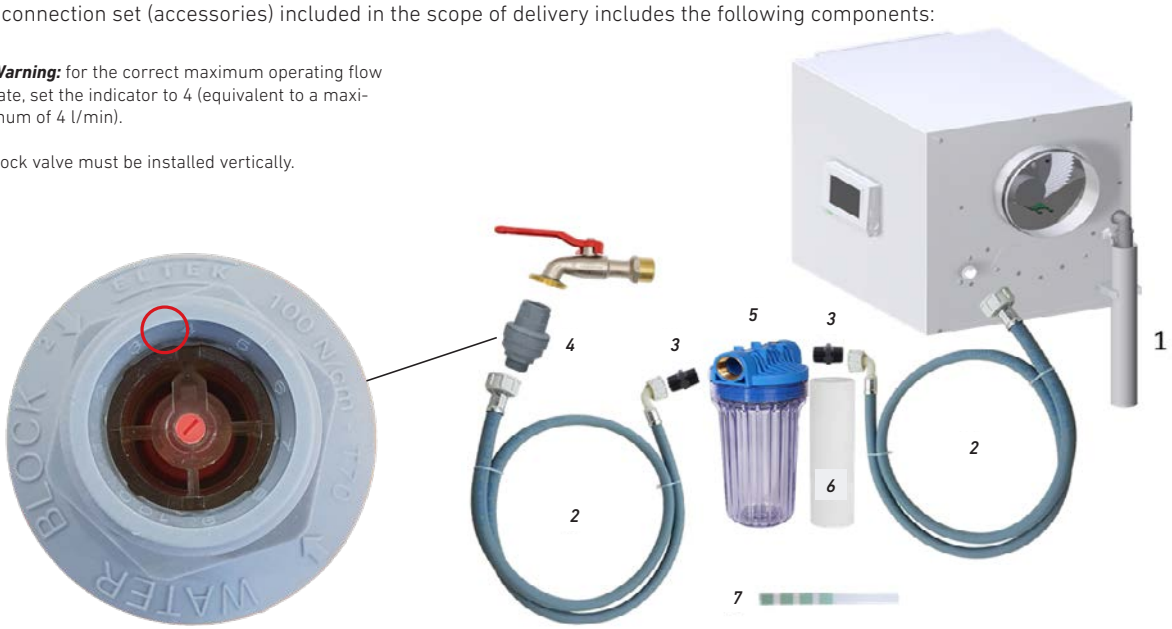
If the iron content of the water exceeds a value of 0.1 mg/l, an iron filter must also be installed in the water supply line upstream of the fine filter. The unit is designed to operate with a maximum water hardness of 26 °dH.

Exceeding the limit values given above significantly reduces the lifespan of the osmosis membrane!

The water connection set (accessories) included in the scope of delivery includes the following components:

Warning: for the correct maximum operating flow rate, set the indicator to 4 (equivalent to a maximum of 4 l/min).

The water block valve must be installed vertically.



1 1 x waste water connection, HT tube DN 40 type
2 2 x connecting hoses, 1.5 m, ¾" each
3 2 x plastic screw connections ¾"
4 1 x water block ½" to ¾"
5 1 x filter housing
6 1 x water filter
7 1 x test strip for determining the water hardness

Water block function

In the event of a major fault (a loose hose connection, broken water filter housing, etc.), the water block closes automatically if a sufficiently large drop in pressure is detected. This can prevent an uncontrolled escape of water. To restore functionality:

1. Turn off the water tap.
2. Remove the hose.
3. Unscrew the water block.
4. Press the red button on the outlet side of the valve.

A water block does not provide 100% protection against water damage. The watertightness of the connection must therefore be checked regularly.

12.8 Removing the shipping restraints

Once all of the connections (air, water and electrical) have been set up, the cover must be unscrewed and the shipping restraints removed.

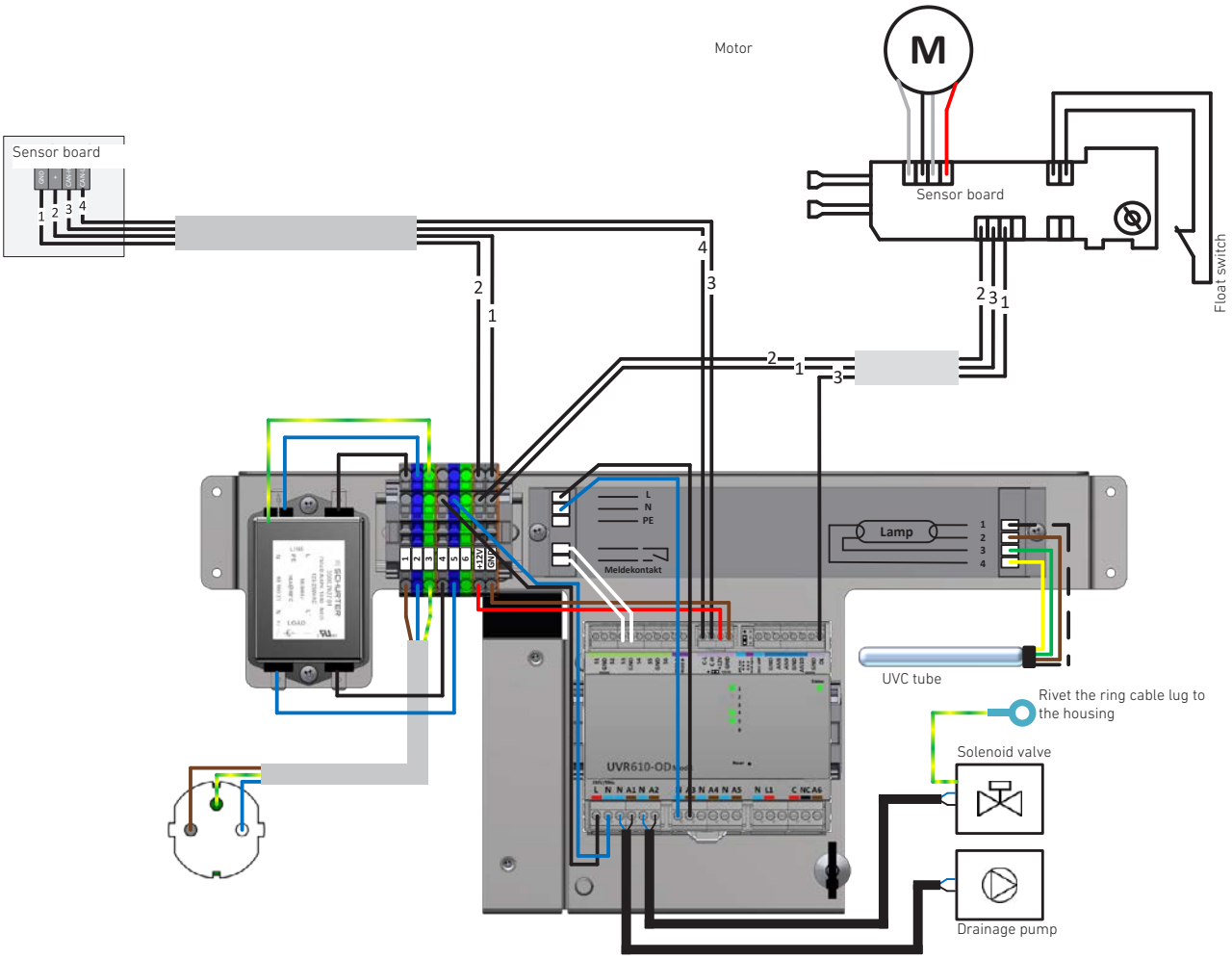
13. Electrical connection

The air humidification unit is delivered with a mains power plug and is already ready to operate.

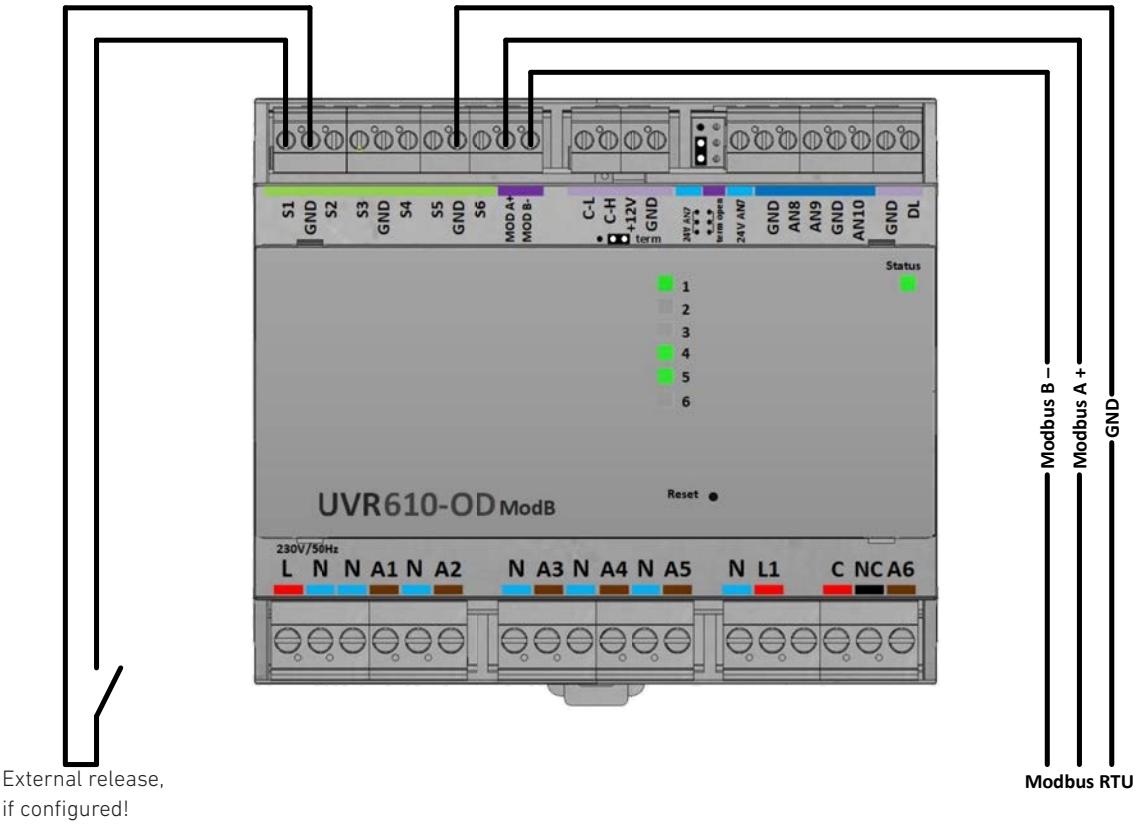
The safety instructions *in chapter 4* must be observed for all electrical work. Electrical connections and work on electrical components may only be carried out by authorised electricians.

The relevant national and local regulations and standards must be complied with during assembly and electrical installation.

Wiring diagram (factory)



13.1 External connection (release / Modbus)



13.1.1 MODBUS CONNECTION

ATTENTION: Modbus settings are only changeable with the service password!		
Mode:	RTU	Default
Baudrate	1200, 4800, 9600, 19200, 38400, 57600, 115200	19200
Start bit	1	1
Data bits	8	8
Stop bit	1 stop bit at Even or Odd / **2 stop bits at "None"**	1
Parity	None, Even, Odd	Even
Address	Modbus address (1-247)	31

Modbus target values		**Modbus Read/Write Holding register (4x)**				
Name	**Description**	**Address**	**Min.**	**Max.**	**Decimal points**	**Data type**
Target humidity	Target relative air humidity (%RH)	2	40	60	0	signed

Modbus release		**Modbus coil status register (5x)**				
Name	**Description**	**Address**	**Min.**	**Max.**	**Decimal points**	**Data type**
Release via Modbus	Release (0=locked; 1=released)	6	0	1	0	bit

Modbus data points		**Read input register (3x)**		
Name	**Description**	**Address**	**Decimal points**	**Data type**
T_Zuluft	Current air temperature (°C)	0	1	unsigned
rF_Zuluft	Current relative humidity (%)	2	1	signed
aF_Zuluft	Current absolute humidity (g/m^3)	4	1	unsigned
Taupunkt_Zuluft	Dew point (°C)	6	1	signed
Schwimmerschalter	Float switch (0=inactive; 1=active)	4	0	bit
Luftstrommessung	Air volume flow detection (<1800 air volume flow detected)	10	0	signed
Wasserventil	Water valve (0=off; 1=on)	9	0	bit
UVC_Vorschaltgerät	UVC ballast (0= off; 1=on)	10	0	bit
Ablaufpumpe	Drain pump (0= off; 1=on)	11	0	bit
Motor_Rotor	Motor rotor (0=off; 1=on)	12	0	bit
Heizung_EIN				
UVC_Lampe_DEFEKT	UVC tube error (0=No; 1=Yes)	29	0	bit
UVC_Lebensdauer_Ende	UVC tube maximum operating hours (0=No; 1=Yes)	30	0	bit
Ablaufpumpe_DEFEKT	Error: Drain pump (0=No; 1=Yes)	31	0	bit
Feuchte_zu_hoch	Error: Relative humidity too high for more than 4 hours (0=No; 1=Yes)	32	0	bit
Feuchte_zu_niedrig	Error: Relative humidity too low for more than 6 hours (0=No; 1=Yes)	33	0	bit
Osmosefilter_wechseln	Osmosis filter maximum operating hours reached (0=No; 1=Yes)	34	0	bit
Betriebsstatus	Operating status (0= off; 1=on; 2=standby)	12	0	unsigned
Summenstörmeldung	Collective error message (0=No; 1=Yes)	35	0	bit
Bus-Fehler	Bus error (0=No; 1=Yes)	36	0	bit
Betriebsstunden_Wasserfilter	Operating hours water filter (0 - 10000 h)	78	0	unsigned
Betriebsstunden_UVC-Röhre	Operating hours UVC tube (0 - 10000 h)	80	0	unsigned
Betriebsstunden_Wasserfilter	Operating hours osmosis filter (0 - 10000 h)	82	0	unsigned
Betriebsstunden_aktive_Feuchteregelung	Operating hours of active air humidification (0 - 10000 days)	84	0	unsigned
Solltemperatur (°C)	Temperature setpoint (°C)	88	0	unsigned
Sollfeuchte (%)	Humidity setpoint (Level 1-4)	90	0	unsigned

14. Error messages and max. operating times

Error message	Description	Possible causes
Humidity too low	When humidity control is active, the air humidity at the outlet of the air humidification unit is at least 2 g/m^3 below the set target value for a period of 6 hours.	Water filter clogged. Osmosis filter clogged. Water supply interrupted. Water valve faulty (permanently closed). Switching output A2 (water valve) faulty. Rotor does not turn. Sensor board faulty. Air volume flow rate is too high.
Humidity too high	When humidity control is active, the air humidity at the outlet of the air humidification unit is at least 2 g/m^3 above the set target value for a period of 4 hours.	Water valve faulty (permanently open). Switching output A2 (water valve) faulty Sensor board faulty.
Drainage pump/float switch	Float switch permanently triggered for longer than one hour.	Float switch faulty/stuck. Float switch not connected. Drainage pump faulty. Switching output A1 (drainage pump) faulty. Sensor board faulty.
UVC tube/electronics	UVC ballast unit fault reporting contact open for 10 s.	UVC tube faulty. UVC tube not correctly connected. UVC ballast unit faulty. Switching output A3 (UVC ballast unit) faulty.
DL bus/CAN bus	No bus communication between controller and sensor board.	DL bus cable faulty / damaged. DL bus cable not correctly connected. Sensor board faulty.

Max. operating times	Description	Possible causes
UVC tube	The UVC tube has reached its maximum recommended operating time. Preliminary warning and warning according to operating hours.	Maximum recommended operating time soon or already reached.
Water filter	The water filter has reached its maximum recommended operating time. Preliminary warning and warning according to operating hours.	Maximum recommended operating time soon or already reached.
Osmosis filter	The osmosis filter has reached its maximum recommended operating time. Preliminary warning and warning according to operating hours.	Maximum recommended operating time soon or already reached.

15. FAQ

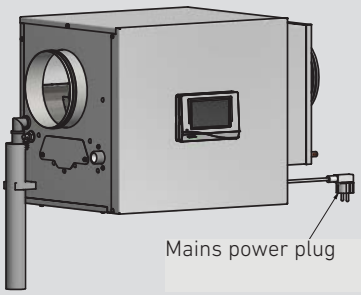
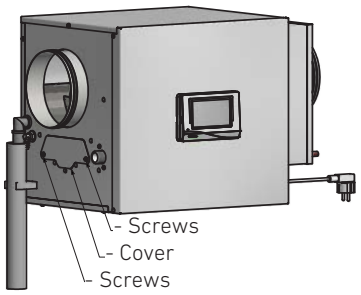
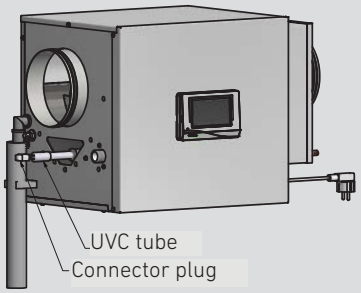
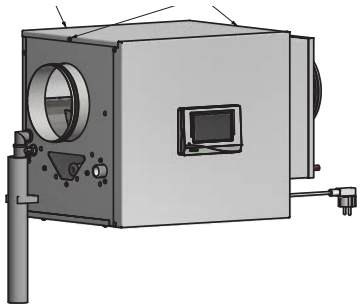
FAQ	Answer
How accurate is the air humidification unit's humidity sensor?	The accuracy of the humidity sensor is subject to tolerances and is typically between +/- 2% to +/- 3.5% within a 10 – 90% RH measurement range.

16. Maintenance (professional)

16.1 UVC tube replacement

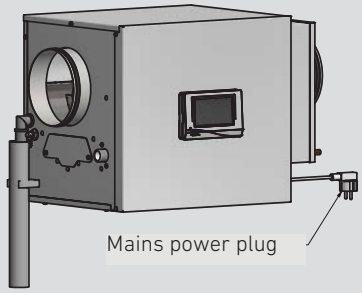
Attention! The UVC tube should only be replaced by qualified personnel.
The following tasks must be performed when the message "UVC – end of lifespan reached" is displayed:

Only original replacement parts may be used *(see chapter 16)*.

	**Before opening the unit, unplug it at the mains and secure it against being switched back on.** **Never look into the UVC tube without protection when it is switched on!**
	Loosen the two screws on the cover and remove the cover. *Sharp sheet metal edges (risk of injury).*
	Pull out the UVC tube with 5 cm rubber grommet, remove the connector plug and dispose of the UVC tube in an environmentally friendly manner.
	Insert a new UVC tube into the immersion tube, connect the connector plug and re-seal the immersion tube tightly with the rubber grommet. Finally, replace the cover and restore the power supply. *Sharp sheet metal edges (risk of injury).*
	Resetting the UVC tube operating time *(See chapter 9.4.2)*

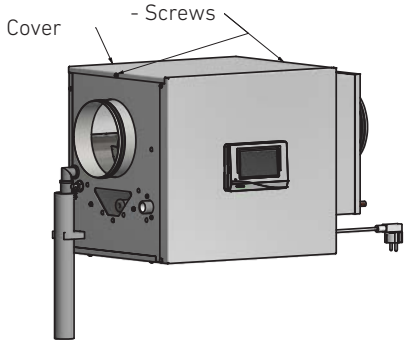
16.2 Maintaining the reverse osmosis unit and rotor blades

Only original replacement parts may be used *(see chapter 16)*.

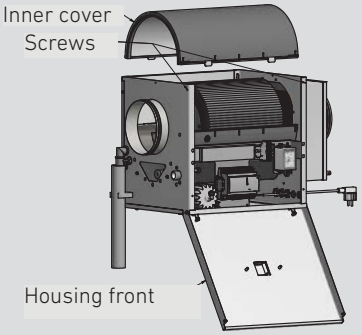


Before opening the unit, unplug it at the mains and secure it against being switched back on.

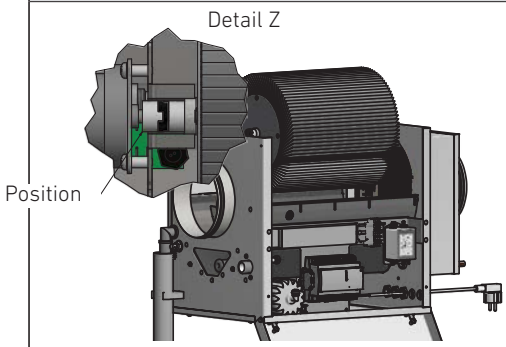
Never look into the UVC tube without protection when it is switched on!



Remove the two screws on the unit cover and lift off the cover.



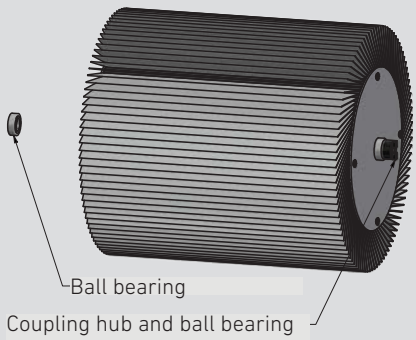
Fold down the front of the housing and lift off the rotor cover.



Move the rotor into a position in which the coupling hub is vertical – see Detail Z.

Lift the rotor carefully upwards.

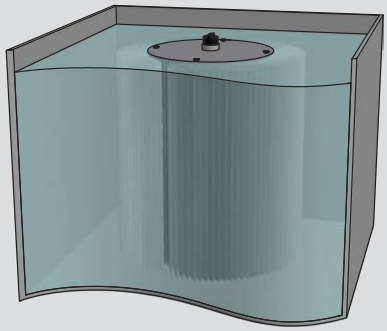
Only handle the rotor with gloves, as the blades have sharp edges (risk of injury).



Cleaning the rotor blades

Remove the ball bearing from the rotor shaft and store it safely for the duration of the cleaning.

Place the rotor with the blades in the vertical position and the coupling hub facing upward in a large container.

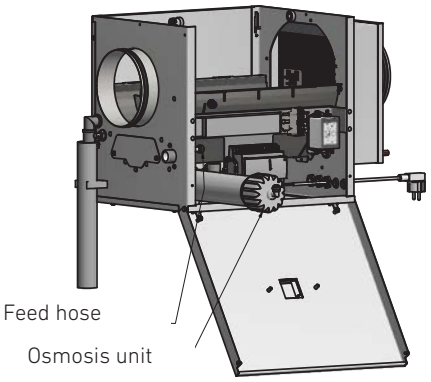


Add cleaning agent to the container and fill with warm water until the blades are completely covered.

Use biodegradable cleaning agents only!
Observe the safety instructions!

The coupling hub and the ball bearing must not be covered with water.

Depending on how dirty the blades are, we recommend keeping the rotor blades in the cleaning solution for between 3 and 6 hours. Then, rinse the rotor blades with warm water.



Replacing the osmosis membrane

Water may escape from the osmosis unit during this step!

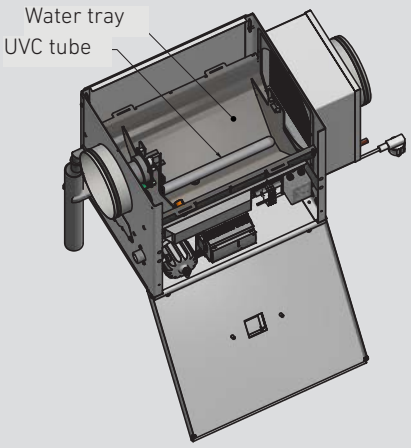
Two black plastic hoses are connected to the osmosis unit. One of the hoses (the feed hose) leads from the water valve to the osmosis unit and the other leads from the osmosis unit to the tray opening.

The feed hose must first of all be disconnected from the osmosis unit. To do this, push the clamping ring on the valve connector backwards and pull out the hose at the same time.

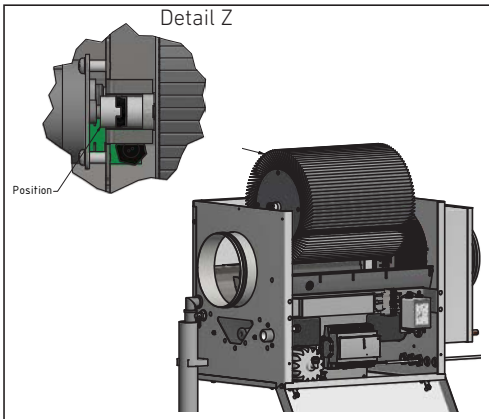
Then, unscrew the cover of the osmosis unit and pull the osmosis membrane out of the housing.

After replacing the osmosis membrane, screw the cover back on and insert the hoses into the valve connector.

Use tensile force to check that the hoses are firmly connected and watertight!



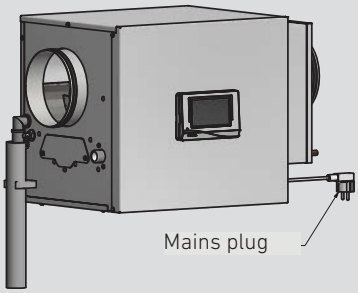
Clean the water tray of the air humidifier with a damp cloth.



Replace the ball bearing on the rotor shaft and carefully insert the rotor into the unit.

When doing so, make sure that the coupling hub is vertical – see Detail Z.

Only handle the rotor with gloves, as the blades have sharp edges (risk of injury).



Reassemble the unit and restore the power supply.

Reset the operating time of the osmosis filter
(See chapter 9.4.4)

16.3 Maintaining the water filter

The water filter in the water supply line must be replaced periodically. The filter replacement is indicated automatically by the humidification unit when it displays a message. Only original replacement parts may be used *(see chapter 17)*.

1) Switch off the humidification unit.
2) Interrupt the water supply to the filter unit.
3) Position a container beneath the filter housing (water may escape).
4) Unscrew the filter housing.
5) Remove and renew the filter.
6) Close the filter housing and restore the water supply.

Reset the operating time of the water filter
(see chapter 17).

16.4 Service table

SERVICE TABLE

In order to document maintenance work, this table must be completed after each task.

System commissioned by:	Date

No.	Maintenance work (e.g. filter change)	Performed by (signature)	Date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

17. Accessories and spare parts

Only original replacement parts may be installed and used for replacement and repairs.

AIR HUMIDIFICATION UNIT REPLACEMENT PARTS

Item	Description	Article number
Water filter cartridge	Polypropylene fleece 5 µm	40E0003A
Water filter housing incl. filter cartridge	¾" connection	40B0062B
Water hardness test strips	Sotin hardness indicator sticks	40I0028A
UVC tube	TUV 16W 4P-SE	40I0023A
Osmosis membrane	(LBE 250Ax1)	40C0029C
Cleaning agent	Sotin 212	40I0014A

18. Firmware updates

To update the firmware, functional data and functional overview, please download the latest version from the Internet using the QR code below and follow the instructions.

19. Hygiene certificate

Ruhr District Institute of Hygiene

Institute for Environmental Hygiene And Toxicology Director: Dr. Thomas-Benjamin Seiler

Client: Verein zur Bekämpfung der Volkskrankheiten im Ruhrkohlengebiet e.V (Association for Combating Common Diseases in the Ruhr Coal District)

Hygiene Institute ■ Post box 10 12 55 ■ 45812 Gelsenkirchen

Visitor/delivery address:
Rotthauser Str. 2 1, 45879 Gelsenkirchen

Head office (0209) 9242-0
Fax (0209) 9242-222
Website www.hyg.de

Our reference: W-351037-21-JRoll
Contacts: Dipl.-Ing. (FH) S. Horn
B. Zeidler

Gelsenkirchen, 15/10/2021

Test certificate

for Hygiene - Conformity testing to the design requirements of selected regulations

Test centre:	Hygiene Institut des Ruhrgebiets - Institut für Umwelthygiene und Toxikologie - Rotthauser Straße 21 45879 Gelsenkirchen
Test object:	Air humidification unit model “LBE 250A” / “LBE 500A”
Manufacturer:	J.Pichler Lufttechnik Gesellschaft m. b. H. Karlweg 5 A-9021 Klagenfurt
Testing basis:	S VDI 6022, Sheet 1 (01/2018) S SWKI VA104-01 (01/2019) S VDI 3803, Sheet 1 (05/2020) S ÖNORM H 6021 (08/2016)
Validity period:	5 years 10/2021 - 10/2026
Expert assessment:	W-351037-21-JRoll

In summary, it can be stated that the tested air humidification unit model “LBE 250A” / “LBE 500A”, as shown in Report W-351037-21-JRoll, complies with the requirements of the aforementioned regulation.

(B. Zeidler)
Head, Hygienic Building Technology Department

(J. Rolle B. Eng.)
Specialist, Hygienic Building Technology Department

Issued on 15/10/2021, Gelsenkirchen

The hygiene-related requirements of the aforementioned regulation were tested as part of the hygiene conformance test. The requirements of other regulations to which the aforementioned regulation refers were not tested. Furthermore, the hygiene conformance test does not include any toxicological or sensory tests of the materials used.

Client: Verein zur Bekämpfung der Volkskrankheiten im Ruhrkohlengebiet e.V., Register of Associations: **VR 519** Gelsenkirchen District Court, VAT ID: **DE125018356 Board of directors:** Prof. Dr. Jürgen Kretschmann (Chairman), Dr. Emanuel Grün, Dr. Dirk Waider, Joachim Löchte, Dr. Thomas-Benjamin Seiler (Managing Director)

20. EG-Konformitätserklärung / EC Declaration of Conformity

Hersteller/Manufacturer:	J. Pichler Gesellschaft m. b. H.
Anschrift/Address:	Karlweg 5 9021 Klagenfurt am Wörthersee Österreich / Austria
Bezeichnung/Product description:	LBE 250AO
Ausführungen/Type:	LBE 250ARO / LBE 250ALO

Die bezeichneten Produkte stimmen in der von uns in Verkehr gebrachten Ausführung mit den Vorschriften folgender europäischen Richtlinien überein:
The products described above in the form as delivered are in conformity with the provisions of the following European Directives:

2014/35/EU Zur Harmonisierung der Rechtsvorschriften der Mitgliedsstaaten über die Bereitstellung elektrischer Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen auf dem Markt
On the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits

2014/30/EG Zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit
On the harmonisation of the laws of the Member States relating to electromagnetic compatibility

Die Konformität mit den Richtlinien wird nachgewiesen durch die Einhaltung folgender Normen und Verordnungen:
Conformity to the Directives is assured through the application of the following standards and regulations:

ÖVE / ÖNORM EN 60335-1:2020-09-01
ÖVE / ÖNORM EN 60335-2-88:2003-11-01
ÖVE / ÖNORM EN 62233:2009-01-01
ÖVE / ÖNORM EN 55014-1:2018-09-01
ÖVE / ÖNORM EN 55014-2:2016-02-01
ÖVE / ÖNORM EN 61000-3-2:2019
ÖVE / ÖNORM EN 61000-3-3:2013 + A1:2019
ÖVE / ÖNORM EN 61000-6-1:2019
ÖVE / ÖNORM EN 61000-6-3:2007+A1:2011

Eine vom Lieferzustand abweichende Veränderung des Gerätes führt zum Verlust der Konformität.
Product modifications after delivery may result in a loss of conformity.

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusicherung von Eigenschaften. The safety information in the product documentation supplied must be observed.
This declaration certifies conformity with the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail.

J. Pichler Gesellschaft m. B. H. **Klagenfurt am Wörthersee, 01 October 2021**

klimaaktiv Partner

PASSIVHAUS Austria

Mitglied NETZWERK PASSIVHAUS www.passivhaus.at

Responsible for the content: J. Pichler Gesellschaft m.b.H. |
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PICHLER

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Gesellschaft m.b.H.

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