Agricultural Engineering Landtechnik

Operation & Maintenance

Conditioning Chambers BO-Series with Humidification CONAQUA®



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1. Intended Use

Conditioning Chambers for Hops Types BO 16 / BO 32 / BO 60 / BO 90 / BO 120 with Humidification CONAQUA $^{\textcircled{R}}$

- Humidification
- Ventilation
- Subsequent drying

The humidification system is intended to be used to condition hops.

Any other use does not correspond to the purpose of the system. Manufacturer and supplier are not liable for damage or injury caused by lack of attention, improper, negligent or wrong use, even if no intent exists.

At the time of their development and manufacturing the conditioning chambers were built in accordance with applicable engineering practices. They are considered to be operationally safe. However, there are hazards associated with the operation of the conditioning chambers if they are not used properly by trained personnel. As a consequence, every person who is assigned to work on or with the conditioning chambers must be properly trained in the state of operation of the equipment and must have read and understood the operator's manual prior to commencing work on or with the conditioning chambers.

A WARNING Risk resulting from improper use

Any use deviating from the use described in this operator's manual is considered improper. WOLF cannot be held liable for any resulting damage or injury. The user/operator carries the risk resulting from improper use. Any improper use, misoperation and abuse can cause life-threatening injuries or death.

WOLF Conditioning Chambers are suitable for

transporting air, which is

- dust-free
- free of toxic substances
- non-aggressive
- non-corrosive
- incombustible

Reprocessing hops to

- cool
- humidify
- dehumidify

As well as the operating parameters specified in the offer and order as well as on the type plates, such as

- medium temperatures
- humidity of air
- potentially explosive atmosphere
- maximum output limit of drives

Variations require prior consultation with or approval by the manufacturer.



2. Saf<u>ety</u>

02.01 General Information

This operator's manual describes the safe and efficient handling of the conditioning chambers. A copy of the operator's manual must be stored near the equipment in a way that allows the user/operator to refer to it at any time. Users / operators must carefully read the operator's manual before commencing work and must be capable of following the instructions and heeding the warnings in the manual. All safety notes, warnings and instructions must strictly be complied with. The local accident prevention guidelines and any applicable state and federal safety laws as well as any other pertinent state and federal laws, regulations and guidelines apply.

The qualified personnel instructed to carry out

- assembly
- commissioning
- operation
- inspection/maintenance
- troubleshooting
- decommissioning

must be instructed to follow the operating manual before starting work.

AWARNING Risks due to modifications

It is strictly prohibited to make any type of modifications to the conditioning chambers. Doing so can lead to serious injury or death. No structural alterations or additions may be performed on the plant. Such alterations or additions void the manufacturer's declaration of conformity and warranty.

WARNING

Failure to observe the operating and maintenance manual can jeopardize persons appointed to do work and can lead to malfunctions in the humidifier and the system. Persons appointed to work on the equipment must have demonstrated technical qualifications to do the job. The accident prevention rules and regulations must be followed at all times. Appointed persons must use the personal protective equipment needed for the task.

The fan and/or the humidifier is only one component of the complete conditioning chamber. The device only fulfils its safety-relevant standard once it has been installed (on-site housing or humidifier, or components of humidifier), after connecting the on-site air ducts.

A WARNING Risk due to unqualified personnel

Only trained expert personnel of legal age without any physical limitations (fully competent persons) are allowed to operate the conditioning chambers. The operators must be instructed annually, before the start of harvest, about accident prevention regulations, the correct operation of the equipment, any possible health hazards, the course of action if there is danger of fire, the operation of fire extinguishing equipment, etc. Each individual who is assigned to do work on or with the equipment must be properly trained in the state of operation and must have read and understood the operator's manual prior to commencing work on or with the equipment.

WARNING

Danger if personal protective equipment is not worn

Persons who monitor, operate, clean, maintain, transport, etc. the conditioning chambers must always wear the necessary personal protective equipment. Protective equipment guards against physical injury and death in hazar-dous areas.



Hazard analysis!

The operator of the conditioning chamber must carry out a risk assessment and take the resulting appropriate work safety measures. In case of ambiguities please contact the responsible state and federal safety authorities.



Risk due to deactivation of safety devices

Do not remove or deactivate safety devices, barriers, limit switches and the like.



Risks due to modifications to the humidifier

It is strictly prohibited to make any type of modifications to the humidifier or its controller.



Risk due to remaining in danger area

Only trained operators are allowed to remain in the vicinity of the conditioning chambers while in operation. All other persons are strictly prohibited from remaining in the danger area. Failure to follow these instructions may result in severe injury or death.

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AWARNING Controls on conveyor belts/ventilation unit:

The conveyor belt must be under control at all times. Check several times a day whether the drive rollers have accumulated dirt and debris and clean them if necessary.

When working, performing inspections or cleaning the $CONAQUA^{(R)}$ device, switch off the power supply and secure it against reconnection.

A WARNING Risk due to accidental reactivation

Unauthorized or unintentional reactivation of the conditioning chambers could result in serious injury or death.

- Secure the conditioning chambers against reactivation.
- Cordon off the danger area and mark it with warning signs.

After the end of working hours, a responsible person must perform an inspection run to check whether there are any unsafe conditions in or around the system.

AWARNING Fire hazard notices:



The conveyor belt(s) usually do/does not generate any fire hazard. Nevertheless, overheating of roller bearings and electrical drive motors can lead to smoldering fires. Regular preventive cleaning of the electric motors is thereby absolutely essential. The textile belt of the conveyor belt (polyethersulfone and PVC coated on both sides) must not be exposed to heat. In a similar manner no hot parts (welding, sparks from grinders, drilling chips, burning cigarette butts, etc.) must end up on the textile belt.

The operator must register the conveyor belt and hops silo in the fire prevention record and take preventive fire protection measures accordingly.

Fire extinguishing equipment:

Place an adequate number of suitable, officially authorized and tested handheld fire extinguishers in the vicinity of the conveyor belt and hops silo in visible locations.

Reference to regulations:

The owners and operators are responsible for knowing and adhering to all applicable laws, regulations, rules, and ordinances regarding accident prevention and occupational safety in industry and agriculture.

WARNING

Work on the conditioning chamber may not be started or conducted until the following functions are given:

- Mains isolator on the switch cabinet and (optional) maintenance switch on the CONAQUA[®] device are switched off and secured with a padlock to prevent accidental restarting,
- Power supply disconnected across all poles,
- The component charge in the frequency converter (option) has dissipated,
- Standstill of rotating parts
- Equipment components cooled down to standard ambient temperature (room temperature)

After completing the work, restart plant as described in >> Chapter Commissioning <<!

WARNING

Only qualified personnel may be instructed to carry out work on electrical components. The regulations of the local electrical supply company and all state and federal laws, regulations, rules and ordinances must be observed.



02.02 Symbols



Warnings Insert

This is the safety alert symbol. It is used to alert you to potential death and physical injury hazards. Youmust strictly obey all safety messages that follow this symbol to avoid injury or death.

Warnings in this operator's manual are marked by signal word boxes. The signal words indicate the level of danger. You must always comply with the warnings and act with care in order to avoid fatal accidents, injury and damage to property:



- **A**WARNING Death or severe injurymay result if the corresponding precautionary measures are not taken.
- A CAUTION Inc

Indicates a potentially dangerous situation that may result in minor to medium-severe injuries if it is not avoided.



Indicates a potentially dangerous situation that may result in property damage if it is not avoided.



You will find the adjoining symbol everywhere in the operating and maintenance manual where grounding is urgently needed.



You will find the adjoining symbol in the operating and maintenance manual in case of crushing hazard.



You will find the adjoining symbol in the operating and maintenance manual in case of danger due to falling.



You will find the adjoining symbol in the operating and maintenance manual in case of danger due to unintentional entry.



You will find the adjoining symbol in the operating and maintenance manual in case of danger due to electrical components.



The adjoining symbol points to information in the operating and maintenance manual where trained personnel must be deployed.



You will find the adjoining symbol in the operating and maintenance manual in case of danger due to noise.



You will find the adjoining symbol in the operating and maintenance manual in case of risk of eye injury.



You will find the adjoining symbol in the operating and maintenance manual in case of risk to respiratory organs.



You will find the adjoining symbol in the operating and maintenance manual in case of risk of head injuries.



The adjoining symbol points to guidelines or cross-references in the operating and maintenance manual that are important for the operation of the machine.



The adjoining symbol refers to information or application tips in the operating and maintenance manual.



The adjoining symbol refers to information in the operating and maintenance manual where PVC is used and particular attention is necessary.



The material is fully recyclable and can therefore be consigned to a recycling scheme.



3. General Information

WOLF conditioning chambers control the moisture content of the dry material (hops) independently in connection with temperature and humidity sensors.

The humidifier and the fan are switched off to increase the humidity of the air passing through the dry material (hops).

The humidity of the dry material is brought into a dependency with the moisture content of the exhaust air.

03.01 Area of Application

Please refer to the order confirmation (especially the technical specifications) and, if applicable, the specifications on the machine's nameplate for the area of application of the delivered system. As a fundamental principle, the conditioning chamber is only suitable for the conditioning (humidifying, drying, smoothing out) of hops.

For instructions on the optimal conditioning of hops, please refer to the crop science brochure from the Bavarian State Research Center for Agriculture (LfL).

4. Regulations for the Operator



In general the instructions listed in clause 1.0 apply. Furthermore, trained and certified personnel must carry out full inspection and maintenance on the mechanical parts of the conditioning chamber once a year. This inspection should adhere to manufacturer's instructions and the current safety requirement standards of the institution(s) for statutory accident insurance and prevention.

Always have a trained and certified technician perform these tasks!

Safety Instructions – Accident Prevention 04.01

WARNING

- The operator of the conditioning chamber is responsible for ensuring that all state-specific accident prevention regulations are noted and followed during operation.
 - Operators may only execute the work expressly assigned to them.
- Any type of repair, cleaning, lubrication (greasing) and the like is prohibited during operation.
- Only the responsible machine operator may start up the conditioning chamber. This person is responsible for ensuring that no one can be injured when the drives start up.
- Operators must receive special instruction:



- a. Make sure that there are no unauthorized persons in the area of the conveyor belt or winder belt.
- b. Note that it is expressly forbidden to reach into the conveyor belt, drive chains, rollers and other rotating machine parts.
- Do not enter the humidification chamber in filling and operating mode. c.

WARNING

We would expressly like to point out again that there is a risk of suffocation in the humidification chambers. For this reason, do not remove safety guards or other shut-off devices or safety devices. The operator of the conditioning chamber must mark the danger zone accordingly. Instruct employees on a continuous basis (at least once daily)!



- The sound level in the vicinity of the conditioning chamber can exceed 70 dB(A). Mark this area accordingly with hearing protection symbols.
- When occupied in the area of the conveyor belt, wear hearing protection as well as other protective equipment such as safety shoes, safety goggles, head protection (helmet), safety clothing, etc. as a precautionary measure.

WARNING

04.02 Protective Measures Taken

The relevant standards (see Declaration of Conformity) were taken into consideration during engineering, design and system execution.

Covers behind which there is a hazard may only be removed only with tools. Before these are removed, shut down the conveyor belt and/or hops silo and secure against restarting.

Risk due to accidental reactivation **WARNING**

Unauthorized or unintentional reactivation of the conditioning chambers could result in serious injury or death.

- Secure the conditioning chambers against reactivation.
- Cordon off the danger area and mark it with warning signs.

Conditioning Chambers BO-Series with Humidification CONAQUA[®]



04.03 Noise



The conditioning chamber is designed according to customer-specific requirements. There is therefore no uniform noise data. During engineering and design, define and implement the necessary measures to satisfy the noise level specifications laid down in the order. The noise level specifications are usually between 70 and 80 dB(A).



Regardless of the noise reduction measures, wear hearing protection when the conveyor belt/hops silo is running!

04.04 Lightning Protection and Grounding

The device, the conveyor belts and all metallic mounted parts must have appropriate lightning protection.

Execution lies within the system operator's scope of responsibility.

5. Storage, Transport

05.01 Receipt of Goods, Transport

Unpack the delivery (parts) in the presence of the carrier and check for completeness and damage using the delivery note.

Report obvious, visible damage to the delivery immediately to the carrier, and log and confirm this on the delivery note (date and signature necessary)!

Report concealed transit damage as soon as it is discovered.

Report the damage immediately to the factory!

The freight carrier's insurer will reject any subsequent complaints.

05.02 Notes on Disposable Packaging



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This packaging is intended for transport only. It was quantitatively reduced to the essential minimum to ensure the undamaged transport and unloading of the high-grade parts. The material is fully recyclable and can therefore be reprocessed.



The recipient of the delivery bears the costs for disposal.

Alternatively, it is also possible to return the packaging material to us. The contracting body of the goods will bear the costs of the return transport. Please note that the packaging material must not be contaminated and must be delivered separately according to groups.

05.03 Storage and Functional Integrity



Remove the plastic film immediately after delivery from any parts packed in plastic film. Plastic film causes condensation to form and so affects oxidation, particularly on hot-dipped material.

All equipment components and parts must be stored so as to rule out the possibility of spoilage, damage due to soiling, condensation, weather conditions and external influence.

Release the tension from the belts on any belt-driven components during storage, delayed commissioning or idle periods (stoppages longer than 3 months). Move and rotate any parts that turn or rotate, such as motors and actuators, once a month.

As a fundamental principle, proceed as follows:

- Remove film
- Cover any openings on the device so that no contamination (dust, insects) can enter..
- Store devices, switch cabinets, drive motors, frequency converters and other electrical components temporarily in a dry and dust-free place protected from the effects of weather.
- Prevent condensation formation on the machine and components, especially in the switch cabinet and terminal boxes
- Ensure the functional integrity of components and mounted parts
- Follow additional maintenance and operating instructions of component manufacturers.
- Protect components and devices from soiling even when assembling the system.
- Protect the switch cabinet (if present) from moisture even during machine downtimes (after a harvest until the next harvest).



05.04 Transport of the Machine, Assemblies and Dismantling Parts to the Building Site

WARNING

When transporting using a forklift, pallet truck or rollers, leave the transport pallets under the device or parts. Make sure that the forks of the forklift are adequate for the entire load range.

Transport the components only in their installation position. They must not be upside down or turned lengthwise, so that the installation parts are not damaged.

WARNING

NOTICE

Risk when transporting the equipment

Suspended loads can tip over or fall. Tipping or falling loads can cause severe injury or death.

- Always move the equipment with great care and caution.
- Never position yourself or anybody else under suspended loads.
- Keep unauthorized persons out of the danger area.
- Ensure the area is well lit.
- Only move loads under supervision.

05.05 Foundation



Correct assembly of the conditioning chamber requires a level horizontal ground. The foundation must undergo structural calculation and be executed accordingly.

05.06 Space Requirement for Operation and Maintenance

There must be appropriate space available for the conditioning chamber. **WARNING**

> If there are no official specifications for maintenance intervals, the required space must be a free distance of 1.0 m from the unit, conveyor belt and conditioning chamber to the adjoining obstacles (wall, partition, etc.). Design the free space in the area of the (chamber) draining rollers so that they can be disassembled and removed in an emergency.

> Make sure that escape routes and maintenance access points are unobstructed when laying supply lines and cables (electrical, compressed air, etc.).



05.07 Equipotential Bonding

- Do not remove pre-assembled equipotential bonding devices.

- To prevent electrostatic charging and electrocution, bypass all electrically non-conductive connection points with equipotential bonding.
- Local equipotential bonding measures must include all metal parts of the conditioning chambers. - The conditioning chamber, switch cabinet and all mounted parts must have lightning protection and must be grounded according to current engineering standards (equipotential bonding/foundation ground terminal).



05.08 Switch Cabinet

The switch cabinet is fabricated according to customer-specific and system-specific requirements and tested internally. Mounted parts are fully operational.

Switch cabinet risks

Ensure that sensitive mounted parts are not exposed to vibrations, moisture or humidity during transport, storage or installation. Install the switch cabinet in an area protected from weather. When doing so make sure that there is a solid and sturdy subgrade for fastening.

The controller (CPU) with the control software was developed by WOLF and is the intellectual property of WOLF. Copyright infringements will be prosecuted.

The software is protected against third-party interference. Disregarding the protection and modifying the controller invalidate any warranty claim and the Declaration of Conformity.



6. Installation

06.01 CONAQUA[®] Humidifier



WARNING

The CONAQUA[®] humidifier was especially developed for the conditioning of hops and is only suitable for this purpose.

Risks due to improper installation

Installation and commissioning may only be performed by personnel especially trained for this purpose. Improper installation and commissioning by unqualified personnel may result in accidents causing death, severe injury and/or damage to property.

- Before installation and commissioning, observe all relevant notes in this owner's manual and comply with them.
- Pay particular attention to the correct and safe positioning of the device on a horizontal, load-bearing foundation.

Depending on its design, the humidifier is delivered as individual components or as a complete machine and must be connected to the ventilation chamber, outdoor air and drying machine (kiln) via ducts.

NOTICE

The device must be aligned in an absolutely horizontal position. Please refer to the adjacent drawing for the WOLF limit of supply. It is imperative that mounted parts 1 - 7 be installed on site. Depending on the water quality, an additional water filter is recommended upstream of position 1.

The devices have the following connected load:

Type	Connection
туре	Output
CONAQUA [®] WK-241/161-BO 32	7.5 kW
CONAQUA [®] WK-351/161-BO 60	11.0 kW
CONAQUA [®] WK-351/161-BO 90	11.0 kW
CONAQUA® WK-351-BO 120	18.5 kW



The supply water must have drinking water quality. Filters must be bought (by the customer) when fed with well water.

06.01.01 Connection of the Water Supply (on site)

NOTICE

Design the fresh water connection pursuant to accepted engineering standards (e.g. DIN 1988, EN 1717, DIN 50930-6). Operating the system using non-potable water such as rainwater, roof run-off water or groundwater is not allowed. Make sure the surface water or waste water drains off unhindered.

Connect a water supply with a flow rate of at least 15 liters per minute and pressure of 1 to 2 bar to the 1/2" female thread connection of the filling hose. Normally 15 mm copper or stainless steel pipes are used.

For operational safety reasons, we recommend the use of stainless steel pipes.

Incorporate the components indicated in the above sketch into the water supply line.

06.01.02 Installation of the Drainage Pipes (on site)

The device has an integral drain and overflow that must be connected to the building's main drain with a copper pipe, non-rusting steel pipes or plastic pipes (at least ND 28 mm). The drain unit must be equipped with a trap of adequate depth according to the operating pressure of the ventilation system.



06.01.03 Handling of Materials in the Humidifier



A WARNING

The honeycomb in the evaporation cassettes should not be cut or crushed since this can cause dust accumulation and malfunctions.

The honeycomb is made of glass fibre and is classified as harmless. However, you must wear protective equipment, such as gloves, protective clothing and goggles, when handling the honeycomb to protect the user from fibres or dust

You must wear respiratory protection if dust occurs while handling.

Damage to the honeycombimpair the performance of the humidifier and then water droplets might be dragged along.

Damage to the honeycombimpair the performance of the humidifier and then water droplets might be dragged along.

The following procedures are to be observed when handling the materials from the evaporation cassettes:

- Eye contact rinse well with water. Seek medical assistance in case of irritation!
- Skin contact wash well with soap and water

06.02 Electrical Connection A DANGER

Risk of death from electrical current

Contact with live components and any exposure to electrical currents possesses a risk of death. Electric components that are switched on can move uncontrollably. Serious injury and death are a result.

- Work on the electrical system may only be performed by authorized qualified electricians.
- Before beginning to work on the electrical system, switch off the electrical power supply and secure it against being switched on.
- Cordon off the danger area and mark it with warning signs.



General Information:

drive elements is observed!

Please refer the electrician performing work to this operating and maintenance manual.

NOTICE

A WARNING

A WARNING

WARNING

Carry out the first operational check only in manual mode! Even a few motor rotations in the opposite direction will cause damage!

When connecting the machine to the power grid, be absolutely sure that the direction of rotation indicated on the

Prior to commissioning the machine, attach all safety devices correctly and lock them with the special key (square key). A specialist company (dealer) must install as well as test and pass (acceptance report) the machine according to safety requirements.

Retighten all screw clamping points of the electrical system during commissioning and maintenance.

06.02.01 Electrical Connection – Standard Motors

Services to be provided by the operator:



Electric motors are equipment with hazardous, live and rotating parts during operation. Physical injury and property damage can therefore be caused in case of incorrect operation, incorrect application or inadequate maintenance.

- For this reason, only electricians may work on electric motors!
- Perform all work on electric motors only in the de-energized state!
- Secure electric motors to prevent accidental restarting and spontaneous startup! •



Follow safety instructions!

Safety instructions

Always use suitable cable fittings that must correspond at least to protection class IP 54. Protect motor terminals from water penetration. There must be no humidity penetration in the area of the terminals (terminal boxes).

Open the terminal box cover only when wiring the connecting cable!



On-site requirements

Electrical supply cable pursuant to applicable state and federal laws, regulations and standards and regulations of the responsible power utility. Execute and confirm professional electrical installation pursuant to applicable state and federal laws and regulations.



- Connection of the power cable must be carried out carefully by an expert.
- Connection of the power cable must be carried out carefully by an expert. •
- Adjust the power cable cross-sections to the rated current of the motors or loads. ٠
- Provide strain relief fittings for the connecting cables.
- Cable entries must correspond to at least protection class IP 54.
- It is essential to connect earth conductors to the marked grounding screw according to VDE 0100.
- Use the original gasket when closing the terminal box.
- Close unneeded entries so that they are dust-proof and watertight (minimum IP 54). •

Adjust the power cable cross-section to the rated current and line length pursuant to applicable state and federal regulations and power utility regulations. Protect the power cable as per regulations. See DIN VDE 0100-708:2010-01 (VDE 0100-708).

- The voltage indicated on the nameplate and in circuit diagrams must be present on the switch cabinet infeed. a. Voltage deviations greater than +/- 6 % lead to malfunctions. Three-phase AC motors can be used in the range of 400 V + 6 % / -10 % in accordance with DIN/EC 38.
- Prior to commissioning, carry out the tests specified in DIN VDE 0100 part 610, DIN VDE 0105, DIN VDE 0800b. 1, DGUV Regulation 3.



Terminal diagram for motor with single speed

(startup necessary via star delta contactor with automatic switching of Y Δ from 3 kW). Make inquiries with the relevant power utility as a precautionary measure.



06.03 Commissioning the Electric Motor



a. Check the direction of rotation b.

- Measure the motor current (ampere):
 - Measuring point a) between fuse and Y Δ switch. > Power consumption must be under the rated current indicated on the nameplate.
 - Measuring point b) between Y Δ switch and motor terminals: > Power consumption must be under the rated current indicated on the nameplate x factor of 0.58.

Install motor protection. C.

The motor must be monitored against inadmissible heating as a result of an overcurrent device with currentdependent delayed tripping in accordance with EN 60947-5-1, VDE 0660-200:2010-04 (e.g. circuit breaker). This must be omnipolar protection.

Set the thermal overcurrent relay:

This must be set to the measured value. In the YA circuit setting downstream of the corresponding measuring point.

NOTICE

Do not use an overloaded motor! Disregarding this will invalidate warranty services. Use the motor only for continuous operation and for standard, not frequently recurring startups and where no significant startup heating takes place.

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06.04 Temperature and Humidity Sensors

The component is to be connected according to the switching documents provided by WOLF.

Please note! The electric installation must only be performed by a certified electrician.

Observe the local electric utility company and all other applicable regulations specific to the device.

Non-compliance with these regulations and operating instructions can cause malfunctions or pose a hazard to persons.

06.05 Drainage Belt - Conveyor Belt

WOLF conveyor belts have been especially developed for the conveyance of hops. The side sealing is unique to WOLF conveyor belts. The canvas runs into a pan. This results in even transport of the harvested material.



The conveyor belts must be installed by trained personnel. Incorrect installation and adjustment can damage the belt. Our trained installation and service engineers can carry out professional installation and commissioning for you.

• During startup of the conveyor belt, center the belt using the tensioning screws (on the infeed and outfeed belt) so that it runs in the middle of the driving and output rollers. Before retightening, first loosen the screws of the roller bearings so that the bearing unit can be moved slightly.

7. Commissioning

07.01 Commissioning the Conveyor Belts

The conveyor belt must be commissioned by trained personnel. Incorrect adjustments can damage the belt. Our trained installation and service engineers can carry out professional commissioning for you.



NOTICE

During startup of the conveyor belt, center the belt using the tensioning screws (on the infeed and outfeed belt) so that it runs in the middle of the driving and output rollers. Before retightening, first loosen the screws of the roller bearings so that the bearing unit can be moved slightly.



Special care must be taken as these adjustments are carried out when the belt is running. Do not wear gloves since there is a risk of being pulled in!





Dry material conveyor belt BOF

Carry out proper fuse protection (DIN VDE 0100-708:2010-01 / VDE 0100-708)

Measure motor current draw (ampere).

- a. Measuring point between fuse and YA-switch: Current consumption must be below the nominal current indicated on the type plate (see Electrical Connection).
- b. Measuring point between Y Δ -switch and motor terminals: Current consumption must be below the nominal current x 0.58 indicated on the type plate (see Electrical Wiring).

NOTICE

Motor protection

Every motor must be protected against improper heating due to overloading using a monitoring device with currentdependent delayed triggering according to DIN EN 60947-3 VDE 0660-107:2012-12 (e.g. circuit breaker). Therefore, a protection of all electric poles is required.



NOTICE

NOTICE

Adjust the thermal overcurrent relay or circuit breaker:

It must be set to the measured value.

For Y Δ -switching: Setting according to measuring point.

If the amperes drawn by the motor are too high despite proper connection of the motor, the existing circuit compression is lower than was indicated in the order. This can be amended by artificially increasing the circuit compression, (adjusting and locking the sliders), changing the V-pulley or partially by adjusting the adjuster V-pulleys (see drive speed correction).

This is performed at the FC for devices with frequency converters.

Overloaded motors may not be put into operation!

No warranty payments can be expected from the manufacturers of the motor. The motors may only be used for continuous operation and only for normal, not frequently repeated start-ups, in which no significant starting temperature rises occur.

07.02.01 Safety Instructions

Fans with electric motors are equipment with hazardous, live and rotating parts during operation. Physical injury or property damage can therefore be caused in the case of incorrect operation, incorrect application or inadequate maintenance.

Any work on the fan and drive motor may only be carried out in the de-energized state and only by qualified persons. Provide a safeguard to prevent unintentional restarting of the drive motor (e.g. with a padlock on the switched-off mains isolator).



07.03 Commissioning Humidifier Module CONAQUA®

Only appropriately qualified and trained technicians may be entrusted with maintenance, repair or decommissioning. The operator is responsible for ensuring that the installation of the device follows all applicable regulations for drinking water supply.



Shut off all fluid and power supply lines to the device before performing maintenance or repair work. Personal protective equipment: Perform work on the device only with personal protective equipment.

07.03.01 Hygiene in the Humidification System

You must observe the technical instructions of the responsible officer for health and safety regarding legionella in water systems. Improper servicing can promote the growth of micro-organisms in water systems, also humidifiers. This includes the bacteria that causes Legionnaire's disease. The system's manufacturer has taken all aspects of the equipment into consideration regarding the Legionnaire's disease and similar illnesses, however, the user must be aware of his own responsibility to reduce the risk of legionellosis.





07.03.02 Functionality of the Evaporation-Humidifier

Passing air through a moist evaporation media is a simple, safe and inexpensive technique to increase the relative air humidity.

The centerpiece is the evaporation cassette installed in the CONAQUA[®] humidifier. Water trickles over the surface of the highly efficient evaporation media, which is impregnated with silver for additional hygiene. The water runs only once through the evaporation bodies and then (excess water) to the drain.

Dry air flows through the honeycombs of the humidified evaporation bodies and absorbs humidity. Non-evaporated water collects in a stainless steel pan on the underside of the module and is drained off. Every modular unit has its own water supply. This means that the units can be controlled individually to regulate moisture precisely.

This humidifying process is very energy efficient compared to humidifying with steam or spray humidifiers.

The air flow upstream from the humidifier must be filtered at least according to the filter standard G4 (EN 779:2012) in order to avoid clogging up the evaporation media.

In hard water regions, we recommend pre-treating the water in order to keep servicing to a minimum.

07.03.03 Checklist Before Commissioning

WARNING

The humidifying device must be operated and serviced as stated in this handbook. Non-compliance can lead to contamination that causes the sometimes fatal Legionnaire's disease.

Before commissioning, you must perform an inspection according to the following checklist:

Switch off the humidifier (mains isolator)

Check the evaporation module

Check whether the evaporation module was installed correctly to all directions and fitted with a cover plate to prevent air leaks. Ensure that there is adequate access space to remove the evaporations cassettes during servicing. Ensure that the unit is securely positioned and has no visible damage.

Installation of control system (switch cabinet)

Ensure that the switch cabinet was installed in a suitable, dry place and that it is connected to the evaporation module. Check the electric connections and compare them to the wiring diagram of the switch cabinet.

Installation of water supply

Check that the water supply was connected to a clean drinking water supply. The operator is responsible for ensuring that his water pipe system complies with the local regulations and ordinances, in particular those for controlling legionella bacteria. The use of water and storage tanks that are supplied with drinking water is only permitted as part of a validated water treatment system. Ensure that the evaporation module is connected to a water supply with a pressure between 1 and 2 bar. Check all seals and connections for leaks.

Installation of the drainage

Ensure that the excess water of the evaporation module can drain away unhindered and that the drainage is connected to the main drain of the building. Check seals and connections.

Distribution pipes Check whether all water distribution pipes between the pump unit and the distribution heads are securely connected.

Power supply

Ensure that the control valves are connected to the suitable power supply. Caution: Check the voltage!

Rinsing the water supply pipes

Check whether the water pipes have been rinsed to remove stagnant water, limescale and foreign objects.

Pressure test

Open the water supply and check the pipes for leaks under pressure.

Fan

Check the fan (vibration damper) has been correctly installed and connected to the power supply.

Air ducts

Check whether all air ducts have been installed with the associated flaps. Inspect the Open/Close flap controller.



07.03.04 Starting up Humidifier Module

- Switch on the machine
- Activate the mains isolator
- Switch on humidification on the touch panel Set the operating parameters on the touch panel.

During operation check that all components are functioning correctly, including flap actuators, temperature and humidity sensors as well as inflow solenoid valves.

Check whether all sections of the evaporation media get wet evenly. Ensure that the system has no leaks. During the commissioning cycle, bubbles or surfactants can temporarily form due to the water contact of media that are used during the production process.

A WARNING

- The plant must be at zero potential when performing function checks.
 - Starting up the system
 - Ensure that all operating parameters have the correct setting.
 - Final checks
 - Check the proper operation of the system. Check the evaporation module for leaks. Ensure that the air passes evenly over the humidifying system.



If the humidifying device is switched off for a longer period of time, or decommissioned, water can remain in the system and lead to bacterial contamination.

That is why the device and all water storage tanks and containers must be completely emptied and dried before de-commissioning. Pay special attention to devices that are subject to frost. Water that remains in the device can cause frost damage to the device and the water installation.

A comprehensive check must be performed before re-commissioning the system in order to ensure its safe operation. Here special attention must be paid to the quality of the water supply.



07.04 Commissioning the Entire System

07.04.01 Pre-Commissioning Inspection

Check the running direction of the chamber and conveyor belts before commissioning!- Likewise the direction of rotation of the fan. Indicate the running direction with arrows.

Before switching on the machine, ensure that no individuals or animals are in the danger zone and can be injured by machine startup.

AWARNING Risk due to remaining in danger area

WARNING

Only trained operators are allowed to remain in the vicinity of the conditioning chambers while in operation. All other persons are strictly prohibited from remaining in the danger area. Failure to follow these instructions may result in severe injury or death.



07.04.02 Switching on the System

Set the red main switch of the plant from 0 to I to start it up.

The system is operated using the touch panel. When the panel is touched the splash screen "Humidify hops" appears.





8. Operating

08.01 Start Display Hops Humidification



The touch panel shows the splash screen Humidify hops.

All settings can be carried out from here.

08.02 Setting Target Values



- Target temperature setting (as per the table from the Bavarian State Research Center for Agriculture (LfL))
- Target humidity setting (as per the table from the Bavarian State Research Center for Agriculture (LfL))
- Fan speed setting (standard value e.g. 75 %)

 \bigcirc When the air amount field is pressed the following display appears.





Limits are projected for "humidify" mode. If the target value is outside these limits, the original value will be recovered and an error message will appear.

08.03 Setting the Box Humidity Monitoring



- Minimum humidity value setting
- Function activation (button illuminates green)
- If the set value of 10 min. is exceeded, the device switches off and a warning message appears.



08.04 Setpoints Selection Guide



 \sim The following table appears as a selection support tool when this button is pressed

CONAQUA° 🏠										
Temperature			rel. h	umidity	in %					
in F°	58%	60%	62%	64%	66%	68%	70%			
61°F	6.6	6.8	7.1	7.3	7.5	7.8	8.0			
64°F	7.5	7.8	8.0	8.3	8.5	8.8	9.0			
68°F	8.4	8.7	9.0	9.3	9.6	9.8	10.1			
70°F	8.9	9.2	9.5	9.8	10.1	10.4	10.7			
71°F	9.4	9.8	10.1	10.4	10.7	11.1	11.4			
73°F	10.0	10.3	10.7	11.0	11.4	11.7	12.1			
75°F	10.6	10.9	11.3	11.7	12.0	12.4	12.8			
79°F	11.8	12.2	12.7	13.1	13.5	13.9	14.3			



By pressing the table, the previous screen appears again "Humidify hops".

WARNING! These values are recommendations and do not represent binding guidelines.

08.05 Turning on the Humidifier

- Before humidification set the "time for humidification"
- Humidification starts when Humidifying is pressed
- is pressed 🗾 🖅

08.06 Turning on the Fan

Humidifying

Time for humidifying 240 Min.

> rest time 240 Min.



- Before humidification set the "time for ventilation"
- Humidification starts when Ventilating is pressed
- CSThe mode stops when when is pressed

08.07 Turning on the Dryer



- Before humidification set the "time for drying"
- Drying is pressed
- is pressed

08.08 Switching the Unit Between °C and °F



- By pressing
- Selection of unit



08.09 Diagram

08.09.01 Standard View



Display of:

- Humidity line (blue)
- Temperature line (red)

Always relates to the current box

08.09.02 Enlarged View



 \sub The graphic is magnified by pressing \blacksquare

08.10 Graphic Display of the CONAQUA^(R)



- blue field is outdoor air
- red field is hot air
- green field is recirculating air

Display of:

- current absolute humidity values (g/kg), temperature (°C/°F), relative humidity (% rH) of the respective sensor
- Position of the actuators in %

08.11 Process Example

1. Select required absolute humidity (g/kg) as per the table from the Bavarian State Research Center for Agriculture (LfL)

- 2. Enter the reading (absolute humidity/temperature) in the controller and adjust the fan
- 3. The standard value for humidification duration is around 240 min.
- 4. Then let the hops rest for 1-2 h (possibly with cover)

5. Humidify or ventilate again for 1 h depending on the weather

- Humidify: if the outside temperature is warm, as otherwise the hops will dry out
- Ventilate: if the outside temperature is cold, as otherwise the hops will become damp



9. Maintenance

09.01

09.01 Humidifier Module

For reasons of hygiene, always empty the water manually if downtime is longer than 2 days. The system is not protected against frost. There must be no water in the system. Proceed as follows after the harvest:

09.01.01 Cleaning, Disinfection and Decalcification

Before beginning to clean and disinfect:

- Perform a hazard analysis. This hazard analysis should also consider the use of protective equipment.
- Coordinate the work with those responsible.
- Enter performed disinfections in the service manual.
- If possible, the disinfection should be performed when nobody is in the building and the humidification chamber is not charged.

Air humidifiers must be cleaned and serviced regularly in order to avoid health hazards.

All surfaces that are disinfected or cleaned must remain in contact with the appropriate concentration of disinfection solution for at least one hour. The disinfection procedure must ensure that the disinfection solutions reaches all areas of the piping without exception.

A disinfection of the humidifying unit is necessary:

- a) When the air is excessively contaminated due to agricultural or industrial exhaust air in the vicinity of the plant.
- b) When the routine monitoring and control system or the hazard analysis indicate the necessity.
- c) At every re-commissioning
- d) When the plant was completely or partly switched off and / or substantially impaired
- e) During or after an outbreak or a presumed outbreak of legionellosis.

09.01.02 Recommended Disinfection Equipment

- Disinfection solution according to the guidelines of the manufacturer (data sheet)
- Disinfection neutralizer (only when required)
- Disinfection solution test kit (to measure the concentration)
- A bucket of clean water
- Braided sleeve hose (to rinse the pipe ends)
- Measuring vessel / syringe
- Clean clothing
- Mixing vessel
- Hazard analysis / test records
- Standard tools
- Personal protective equipment (gloves, glasses, suitable clothing, breathing mask, etc.)

09.01.03 Cleaning and Disinfection Procedure

Step 1. Before starting disinfection work

- Prepare a hazard analysis
- Observe the manufacturer's instruction and safety guidelines
- Ensure that the zone is well ventilated.
- Ensure that the system is switched off and secured against unintentional restarting. .

Step 2. Mixing the disinfectant

Recommended disinfection agents

- Chlorine tabs (chlorine solution 50 ppm) with a contact time of 1 hour
- Hydrogen peroxide 800 mg / m^3 with a contact time of 1/2 hour

It is important to monitor the quality of the water supply to the air humidifier and check it regularly compliant with the hazard analysis of your company. The water filters should be replaced at regular intervals.

• Mix the disinfection solution according to the manufacturer's instructions.



We recommend using a 50 ppm chlorine solutions (0.005 %) with a contact time of 1 hour. For large or heavily contaminated systems, the disinfection process might have to be repeated.

- Calculate the total water volume of the system.
- Depending on the hazard analysis, it might be necessary to clean the high-grade steel basin before disinfecting the system.
- The disinfection solution loses its strength over time, so the process might have to be repeated.

Step 3. Preparation

- Switch off the plant
- Let water drain from stainless steel basin.
- Activate filling valve manually and fill the high-grade steel basin (to the upper level mark).

Step 4. Applying the disinfectant

- Loosen connection of feed hoses.
- Close water outlet of high-grade steel basin
- Place separate pumps in high-grade steel basin and connect with the feed hoses.
- Pour the solution into the high-grade steel basin and mix well.
- Adjust the concentration of the disinfection solution to the manufacturer's guidelines.
- Check the concentration of the disinfection solution every 15 minutes and record the values on the cleaning and disinfection record sheet.
- Adjust the concentration as necessary.

Step 5. Contact time of disinfectant

• Ensure that all surfaces are in contact with the 50 ppm solution for at least 1 hour.

Step 6. Neutralize the disinfectant

- Mix the disinfectant according to the manufacturer's instructions.
- Distribute the neutralizing agent over the evaporation media and in the high-grade steel basin.
- Dilute the disinfectant until a value of under 5 ppm is achieved.

Step 7. Drain the contents of the waste water pipes

- Complete an on-going filling cycle as required.
- Let the liquid flow into the respective drain (depending on hazard analysis).

Rinse tank and high-grade steel basin as required.

- Restart up the system according to section "**05 Commissioning**" of these operating instructions.
- Observe the manufacturer's servicing guidelines and perform the tasks as required.
- Keep the work area clean and dry.

Step 8. Re-commissioning the humidifying system

• See section "07.01 Commissioning the Conveyor Belts" on page 16 in these operating instructions.

09.01.04 Decalcification Procedure

Decalcification of the humidifying system can become necessary under special circumstances. We recommend a routine inspection at least once a year. Decalcify and rinse with clear water.

NOTICE

Do not use any metal objects or a high-pressure cleaner to clean any part of the humidifier.

We recommend the following equipment for decalcification:

- 1. Suitable decalcifiers
- (commercially available industrial decalcifying agents; citric acid e.g. Lubron Clean Tel: +49 (8744) 967-628 2. Neutralizer for decalcifier (as required)
- 3. Two containers of a suitable size to submerge the humidifier cassette completely.





Step 1. See hazard analysis

- See instructions and safety guidelines of the manufacturer of the decalcifier.
- Ensure that the humidifying system is switched off and the work zone is well ventilated.

WARNING

Always use appropriate protective equipment (protective clothing, gloves, goggles) when handling decalcifier solutions.

Step 2. Disassembling the evaporation module

- Switch off or close all electric and water supplies to the humidifier.
- Divide the evaporation unit into individual cassettes.

Step 3. Prepare the decalcifier solution

- Cleaning must be performed outside since dangerous gases can occur.
- Prepare the appropriately concentrated decalcifier solution in a suitable container.

Step 4. Prepare the clean water rinse

- The clean water container must be adequately dimensioned so that the cassettes can be completely submerged.
- Rinse the container with clean, fresh water.

Step 5. Remove furring from the individual cassettes

- Remove loose deposits carefully from the honeycomb surface with a soft brush.
- Dip the cassettes individually into the decalcifier solution.
- Leave each cassette in the solution until the furring has loosened from the surface. The effect of the decalcifier depends on the condition of the material. The procedure described above may have to be repeated to improve the effect. The stainless steel basin may also have to be decalcified.

Step 6. Clean the individual cassettes in water

- Lift the cassettes out of the decalcifier solution one at a time, let the excess solution drip off and then submerge them directly into the prepared container with clean water to rinse them.
- Wash the cassettes carefully until the decalcifier has been removed entirely. The fibres of the humidifier media must not be damaged.

Step 7. Assembling the humidifying module

• Reassemble the individual cassettes to form a cassette block.

Step 8. Rinse the humidifying system to eliminate decalcifier residues

- Before re-starting the humidifier, the cassette block must be thoroughly rinsed several times and the liquid used to rinse them must be drained off to ensure that there is no decalcifier remaining on the cassettes.
- Leave the humidifier switched off and rinse the entire plant at least 5 times by filling and emptying it.

Step 9. Re-commissioning

- Restore the original settings as required and re-commission the unit according to section
 - "05 Commissioning" of these operating instructions.
- Test the correct functioning according to section "05 Commissioning" of these operating instructions.
- Observe the manufacturer's servicing guidelines and perform the tasks as required.
- Keep the work area clean and dry.





09.01.05 Service Guide Humidifier

Please observe that the following service and maintenance tasks listed here can only be a reference and that the service frequency depends on the age of the plant, your use and the water quality.

The prescribed, annual service is absolutely necessary in order to ensure optimum performance and availability.

All humidifiers require a certain effort to "Control Legionella bacteria in water systems".

You procedure for taking samples, performing tests and disinfecting must be based on the details in the operating instructions and on the results of the specific risk analysis. We recommend at least **one** disinfection per year for the evaporation humidifier.

Should you require further assistance or be interested in a quote for regular servicing, please call our customer service at +49 (8452) 99222.

Work to be performed	Annual	service
	Performed on	Performed on
Check the water inlet magnet valve		
Clean the water inlet magnet valve strainer		
Replace the water inlet filter		
Clean the inlet valve strainer		
Check the pump function		
Check all hoses		
Check the pipes of the water distribution head		
Clean the pipes of the water distribution head		
Check the function of the drain valve		
Clean the drain valve		
Clean the pump cage filter in the VA basin		
Clean the valve sets of the stage option (where applicable)		
Clean front section of tanks (basin)		
Replace all feed hoses (as required)		
Check all humidifier cassettes for full saturation		
Test the floater switch for maximum filling level		
Check and fuse all electrical connections		
Check the entire plant for leaks and damage		
Check the level setting of the float valve		
Test the cleaning and rinse cycle (where applicable)		
Clean the entire plant		
Check the air flow at the humidifier media		
Update the maintenance log book		
Disinfect as described in section "09 Maintenance" on page 24.		





09.02 Prefilters

WARNING

Use the specified filter types (G4 short, final pressure 150 Pa). The filters are inserted from the side. Ensure the filter bags are upright during installation.

Check the filters regularly for dust accumulation and remove the dust as a precautionary measure. Install new filters before each harvest season.

Filter change:

Use personal protective equipment (safety goggles, breathing mask, gloves, safety shoes, etc.).

- Open the inspection doors and pull out the bag filters from the side.
- Vacuum the filter compartment.
- When installing filters make sure that they are inserted with the bags upright if possible!

Example: Filter sizes by device type



Close inspection doors again!

09.03 Motor and Fan



09.03.01 Motor

The fan motor does not require any maintenance. Accumulated dust should be removed on a regular basis without using any liquids.

09.03.02 Fan - impeller

This should also be cleaned of any dust and other deposits at the same intervals in order to prevent an unbalance from occurring.

09.03.04 Free-running fan wheel

The fan unit and its drive are maintenance-free. Still it should be cleaned of dust deposits regularly. Check the spring damper on which the entire fan unit is placed on a regular basis. Remove contaminants under or on the vibration dampers.

Conditioning Chambers BO-Series with Humidification CONAQUA®





WARNING

09.04 Temperature and Humidity Sensor

The protection cage of the hygrostat sensor must be removed regularly, cleaned with halogen-hydrocarbon-free and then blown dry with compressed air at a very low pressure of about 0.25 - 0.5 bar.

Important! After each harvest season, the hygrostat must be stored in a clean state, disconnected form the electric plug connection in a dry room until the next season.

09.05 Conveyor Belts

The rollers of the conveyor belts must be checked and cleaned of any deposits (seed cones, cone petals, lupulin).

Switch off the main switch before removing the inspection cover.

The belt run must be inspected during commissioning. The run can be corrected by adjusting the feed and output rollers.

In case of a malfunction or stopping of the belt check:

- belt run
- belt tension
- deposits (cones, cone petals, lupulin)

The maintenance time for subsequent points cannot be determined precisely. Periodic maintenance and cleaning are based on the application and operating time and degree of contamination of the conveyor belt. Always ensure that the device is in good overall condition.

Timely maintenance prevents damage.

09.05.01 Conveyor Belt Maintenance – General

Warrantv Our warranty is voided if damage is caused by incorrect handling and maintenance. Moreover, experience has shown



WARNING

AWARNING

that as products age, greater defects occur due to deficient maintenance.

Only knowledgeable and specialist personnel may carry out examinations of safety devices.

System components should undergo maintenance before each harvest.

Use only food-grade lubricants!

Contact our service department in order to enter into a maintenance contract.

09.05.02 Conveyor Belt Maintenance – Motor

The gear motor requires no maintenance. However, it must undergo regular "dry" cleaning to eliminate dust. Protect the motor from weather by placing a cover over it on site.

09.05.03 Conveyor Belt Maintenance – Chain Drive

Remove contamination from the sprockets and chains. Lubricate the chain using food-grade lubricants after 30 operating hours.

Check the chain tension regularly and retighten.

Before removing the safety devices, switch off the mains isolator and secure it against unauthorized restarting (padlock).

09.05.04 Conveyor Belt Maintenance – Belt Track

Check the belt track regularly and during every maintenance.

Corrections can be made by adjusting the drive and output rollers.



09.05.05 Maintenance Checklist (for Conveyor Belt) – Daily Checks

(Recommendations without guarantee of completeness) This should be amended by the conveyor belt/silo operator pursuant to operational experience and the machine's operating time.

- Check drive motor for dirt accumulation and clean if necessary.
- Check for dirt accumulation on the rollers of the infeed and outfeed belt and clean if necessary.
- Check the belt track (uniform belt guidance on the rolls) and readjust if necessary.
- Check the belt tension and retighten if necessary. This can be done on the infeed and/or the outfeed belt. Before retightening, first loosen the screws of the roller bearings so that the bearing unit can be moved slightly.
- The belts are retightened with the tensioning screws. Then tighten the bearing screws again and lock the tensioning screws into place. Finally, check the belt track (even belt guidance on the rollers).

09.06 Conveyor Belt Malfunctions

In the event of belt malfunctions or standstill, check the following:

- Power connection (fuses, power plug, cable, phase polarity)
- Belt track (centering)
- Belt tension
- Blockage caused by deposits on rollers and lateral guides (hop cone/hop umbels, petals, lupulin)





10. Fault, Cause and Remedy

10.01 Water leaking from Evaporation Module Tank

- Check if the discharge basin is standing level.
- The discharge basin may be damaged. → Inspect the discharge basin for damage or holes.
- The drain is clogged.
- Discharge pipes are damaged or poorly connected. Check pipes for leaks.

10.02 Water Transfer to Airstream

• The air speed over the surface of the humidifier is possibly too high. Compare the measured speed with that specified for the unit.

WARNING

The following limit values (see table) depend on the position of the humidifier, up or downstream from the fan.

Fan position	without alcohol	with separator
downstream from the humidifier:	4.0 m/s	5.0 m/s
upstream from the humidifier:	3.5 m/s	4.5 m/s

- The air speed varies \rightarrow install rectifier surface plate
- The humidifier media is not correctly installed -> Check and correct the installation of the humidifier cassettes
- The water distributing head is damaged or poorly connected → Inspect all pipes and connection for damage → check correct installation of water distributing head
- Check the correct installation of the connection cover.

10.03 Reduced Performance

- The cassette of the humidifier is soiled or damaged \rightarrow Inspect cassette for damage, clean or replace as required.
- The humidifier cassettes are not correctly installed \rightarrow Install humidifier cassettes as prescribed.
- Poor air flow → Check the air flow on the entire surface of the humidifier and check compliance with specification
- Air performance too low \rightarrow Determine air performance and increase as required
- The humidifier media is too dry → Check pump function a Check pressure of water supply → Check if water distribution is calcified.

10.04 Furring on Surface of Humidifier Body

- Excessive concentration of minerals and salts \rightarrow Check and reduce cleaning intervals
- The water quality has changed. See above.



Dirt on the air supply side of the humidifier body indicates that dirt has entered through the outdoor air. > Check the prefilters!





10.05 Furring between Wet and Dry Zones

- 1.Unbalanced water distribution \rightarrow Check pipes of water distribution for clogging and clean as required
- 2.The humidifier media does not get completely wet during normal operations or is completely dry → Check control parameters of the plant

10.06 Water not flowing to Humidifier Module

1. Water line closed \rightarrow Open gate valve

2.Control is set to a value that is too low. \rightarrow Correct value

3.No moisture request \rightarrow Check parameter settings. Control signal generated? 4.Magnet valve faulty \rightarrow Check magnet valve and clean or replace as required

11. Optimal Conditioning

The goal of conditioning is to obtain and maintain optimum quality of the hops. This includes:

- gentle ventilation
- uniform homogenization
- optimal hops humidity
- optimal ventilation time

Numerous tests and intensive measuring series to optimize the drying and conditioning of hops were performed over the past years in the field of hops research in order to realize these objectives.

11.01 Balance of Humidity through circulating Air

The optimum water content for hops fresh from the kiln lies between 9-10 %. The different water contents of the inhomogeneous hops are balanced by aerating it with circulating air. This also affects the moisture balance between the cone and the cone petals.

The duration of the ventilation depends on:

- water content of the dry hops
- uniform drying process
- dumping height in the chamber

The aim is to dry the hops so that the desired water content is reached already after the ventilation process.

Measuring the ventilation air in the fresh air duct is decisive.

There is a connection between the relative humidity of the ventilation air and the water content of the hops.

A relative humidity of 60%-65% of the ventilation air equates to a water content of the hops in the chamber of 9%-10%. This means that the water content of the hops can already be assessed already during the ventilation process with circulating air.

Mixed air for a gentler and more uniform after-treatment.

If the hops it too dry or too moist in the chamber, air with a higher or lower moisture is added to the ventilation circulating air until the mixed air has the desired relative humidity.



Temperature and relative humidity of the aeration air determine the humidity of the hops

Until now the relative humidity of the ventilation air was measured in the fresh air channel.

However, with the same ventilation times and the same relative humidity of the ventilation air, different water contents of the hops were repeatedly achieved after the ventilation process. This is caused by the different temperatures of the ventilation air.

Optimum aeration air has 64°F-75°F and 60%-65% r.H.

A ventilation diagram could be created using many measured values determined in the different conditioning chambers during the 2002 harvest.

Ventilation Diagram for Conditioning Chambers



This shows a connection between the temperature and the relative humidity of the ventilation air and the water content of the hops.

11.02 Controlling the Humidifier Air

The temperature and the relative humidity of the ventilation air is measured in the fresh air channel.

Hall air, outside air or warm air from the kiln are added as required until the desired temperature and relative air humidity of the ventilation air is achieved.

Should the desired air humidity not be achieved with naturally occurring conditions, then the air is automatically humidified with the evaporation humidifier. The humidifier achieves a gentle and uniform after-treatment of the hops that does not depend on the weather.

11.03 Hints on Controlling Ventilation Systems

- The aim is an optimal conditioning to 9-10 % water content
- · Ventilation with circulating air means simultaneous assessment of water content
- Circulating air affects moisture compensation, corrected with mixed air
- Optimal temperature range: 64°F-75°F
- Optimal relative humidity: 60%-65%
- Temperature and relative humidity of the circulating air are not significantly altered, but rather merely corrected! Hall air is a main constituent of the ventilation air!
- Temperature of ventilation air should be the same as the chamber temperature
- Documenting the measured values of the ventilation process in a conditioning protocol is extremely helpful
- If the dry matter (hops) is too dry, raise the relative humidity gradually
- A
- After the ventilation process has been completed, the hops should be stored until it is packed. The resting phase of the ventilated hops until it is pressed is very important!
- If the hops is ventilated at the optimum temperature (64°F–75°F), the stability of the cones regarding losing

petals is much better than at cooler temperatures !

• Desired hops humidity is achieved when INPUT = OUTPUT



12. Decommissioning, Dismantling and Disposal

12.01 Decommissioning the Humidifier

If the humidifier is switched off or taken out of operation for a long period, water can remain in the system and can lead to bacterial contamination.

When decommissioning the humidifier for a longer period, disinfect the pipes according to the directions in this instruction manual.

For this reason, empty and dry the device and all water tanks or containers completely before decommissioning. Pay particular attention here to devices that are exposed to frost. Water that has not been evacuated can cause frost damage on the device and on the water installation.

Before restarting the system, carry out a complete check to ensure safe operation. Pay particular attention to the quality of the water supply. Carefully vent the water pipes supplying the humidification system with water.

12.02 Dismantling and Disassembly



WARNING

Most materials used are fully recyclable and can be consigned to a recycling scheme. Prepare a dismantling plan even before the start of dismantling.

Dismantling must be carried out by qualified persons in compliance with occupational safety law and whilst wearing personal protective equipment.

Before the start of disassembly, de-energize the entire system and the units inside it. Have an expert electrician remove all live connection cables.

Furthermore, have an expert shut off all components that carry media and power. Drain water-filled pipes and components completely.

A DANGER Risk of death from electrical current

Contact with live components and any exposure to electrical currents possesses a risk of death. Electric components that are switched on can move uncontrollably. Serious injury and death are a result.

- Work on the electrical system may only be performed by authorized qualified electricians.
- Before beginning to work on the electrical system, switch off the electrical power supply and secure it against being switched on.

- Cordon off the danger area and mark it with warning signs.

The professional disposal of

- lubricants,
- plastics
- metals

should be carried out by a specialist company!

The system can then be disassembled on site into its individual modules or parts. This should likewise be performed by a specialist company that has expertise in the environmentally responsible disposal of individual parts.

Wear suitable protective equipment and a breathing mask when handling dusty and dirty components!

Disposal:

Our devices (units) use the following materials:

- Housing frame sections:
- Motors:
- Insulating material:Humidification module:
- > mineral wool waste key no. 31416
 - > fiberglass honeycomb; non-rusting stainless steel

> coated and/or galvanized steel/steel plate; stainless steel

All metals can be recycled as special waste.

- Belt strips:
- Sealants:
- Sealing profile:
- Conveyor belts:
- > uncoated natural wood

> cast iron, copper, steel

- > polyurethane waste key no. 55980, 080404
- > mixed rubber profile EPDM; PVC
- > polyether sulfone and PVC coated on both sides
- > wooden slats uncoated natural wood KTO (Pterygota macrocarpa)

All materials can be disposed of via special waste landfill or, depending on their condition (pursuant to current provisions), via the standard construction waste site.



Before disposing of any waste, contact the appropriate community and/or disposal company and discuss the situation!



13. Emergency telephone number (US) 911

The hop-picking machine operator must place the customary emergency telephone number in a visible place in the work area!

Firefiahtina



The conveyor belt and humidifier do not generate any direct fire hazard. The built-in fabric belts can burn off due to external factors. The quantity depends on the length of the conveyor belt.

provide suitable extinguishing devices for firefighting. In the event of fire, de-energize the system/picking machine.

AWARNING In case a fire occurs, place the emergency telephone number in a visible location beside the extinguishing agents and

PVC COMBUSTION CAN RESULT IN POISONOUS DIOXINS.

- The following are suitable extinguishing agents:
- water spray jet
- fire extinguishing foam
- fire extinguishing powder •

Escape/Leakage of Harmful Substances 13.02



AWARNING

In the event of fire, certain amounts of toxic substances can arise due to the combustion of polyethersulfone and PVC. Based on the materials used, these substances are nitrogen oxides, carbon oxides, carbon monoxide and hydrogen chloride.

For this reason, particular prudence is necessary!

In the event of fire, substances can escape from bine residues. The hop-picking machine operator determines the extent to which these are classified as harmful.

Our humidifiers, conditioning chambers and conveyor belts are continuously enhanced. We reserve the right to make structural changes. We would like to expressly point out that there could be deviations in the instruction manual due to the different designs of the conveyor belts and hops silos, frequent structural changes and due to the many special-purpose designs we produce.

If in doubt, please contact us.

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14. Conveyor Belt Inspection Lists

	Drive	roller	Outpu	Output roller Drive motor		motor	Drive chain		
Name	Inspection date	Dirt	Belt track	Dirt	Belt track	Dirt	Fastening	Tension	Lubrication



15. In<u>spection Checklist for CONAQUA®</u>

Name	Inspection date	Fan	Drive motor	V-belts	Prefilter	Dirt	Water pressure	Water intake	Water drain	Valve functions



The latest version of the operating and maintenance instructions can be found at: www.wolf-geisenfeld.de/downloads

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