

# INSTALLATION – OPERATING - MAINTENANCE

## AHU Swegon SILVER M



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These instructions are oriented to the current state of technology at the time of their issuance. (Subject to modification)

## 1. General

### 1.1. Intended utilisation

The equipment delivered by Huber & Ranner GmbH may be used only for the conditioning of air. This applies to air filters, heaters, coolers, humidifiers, dehumidifiers and conveyors. Any other usage is specifically prohibited by Huber & Ranner GmbH.



The continuous observance of the existing installation, operating, service and maintenance instructions is also considered integral to intended utilisation!

### Technical data

Technical specifications can be determined from the equipment cards.

For technical related questions, please contact our customer service department.

Telephone: 0049(0)8531 / 705-45

Fax: 0049(0)8531 / 705-21

Email: kundendienst@huber-ranner.com

### 1.2. Hazards



**The equipment should not be opened or accessed during operation!**

All rotating parts should be allowed to first come to a standstill.

#### Mechanical hazards

- Crushing injury to the hands on the suction-side doors
- Blowing open of doors with a pressure-side configuration
- Faulty damper switching (over or under pressure) can lead to destruction of equipment components.
- The crushing of fingers when the air regulator and shut-off dampers are moved.
- Never put hands in the vicinity of rotating parts, such as ventilators, drive belts, WRG-rotors, etc.
- Loose or non-clinging pieces of clothing in the vicinity of the suction openings and drive belts can lead to life threatening injuries!

#### Hazards due to electrical energy

- Danger of short circuiting when connecting electrical components.
- Due to high voltage and strong amperage, work should be carried out only in a potential-free state.
- Due to static charge on the housing, proper grounding should be observed.
- All cables should be inspected for installation damage prior to commissioning
- Explosion hazard when conveying an explosive atmosphere (see Chapter 8: Ex-protection)

#### Hazard due to vibrations

Every operation has a critical turning speed range.

When operating in its range of resonance, the ventilator unit can experience mechanical damage.

The range of resonance for turning speed regulated drives is to be determined during commissioning, bridged over and recorded.

#### Hazard due to operating media/materials

- **Refrigerant from direct evaporator or condenser may not be allowed to leak into the environment.**
- In the event of fire, poisonous gases and smoke (flammable materials) can result, which must not be inhaled.
- Avoid bodily contact with brine when cleaning, filling or emptying. Danger of poisoning and injury! Observe manufacturer's information.
- Compressor oil can provoke allergic reactions if contacted or swallowed. Avoid bodily contact
- When cleaning the equipment, care must be taken, that dust from the filters or components is not inhaled, as allergens, fungi and bacteria may be contained therein.



#### Hazard due to thermal influences

- Burn hazard from pipelines.
- Dangerous operating media include the electrical heater, vapour humidifier and hot water.
- Freeze-burn hazard from cold parts (e.g. cold water lines, refrigerant lines) and cold components (e.g. cooler, suction chamber)

## 2. Safety

### 2.1. Safety regulations

The climate control unit has been manufactured according to the latest state of technology and approved safety related regulations. None-the-less, hazard to life and limb of the user or a third party, degradation of the equipment and other material assets can arise due to improper utilisation or utilisation, for which the unit was not intended.

The unit may be operated only in a technically faultless condition for its intended purpose, with an awareness towards safety and potential hazards. Faults, which can diminish operational safety, must be immediately rectified.



Installation work and commissioning may be carried out exclusively by trained specialist personnel. The manufacturer's warranty no longer applies if servicing is not properly carried out. Fundamental to the warranty is also the completion of a service contract with a qualified specialist company and its verification by means of protocol documentation.

The pressure devices built into the equipment are subject to recurring inspection by a qualified specialist company for air conditioning technology in accordance with the Industrial safety regulations (BetrSichV).



The operating Instructions must be read carefully prior to installation and commissioning by installers, commissioning and operating personal. Only through adherence to these operating instructions can mistakes be avoided and fault-free operation be achieved.

If arbitrary or unauthorised modifications or alterations are undertaken on the equipment, the manufacturer's warranty is no longer valid.

The equipment is part of an air conditioning system and may be operated only after installation of the entire system.

### 2.2. Markings and their use



This symbol indicates an immediate danger. Failure to follow these instructions can result in injury to persons or damage to the equipment.



"Environmental symbol" identifies the points, which could result in a charge for the environmental pollution.

### 2.3. Safety instructions

In order to avoid overheating damage to the system, the steam heat exchanger should be operated only with the ventilator running. When using the temperature limiter, it must be observed that the temperature monitor is adjusted ca. 5K lower than the safety temperature limiter.

The allowable pressure level for the heat exchanger and associated piping may not be exceeded.

Accessibility to safety relevant components must be guaranteed over the entire serviceable life.

The electrical connection, as well as the servicing of electrical components, may be carried out only by an electrician specialist. The stipulations of VDE 100/DIN 57100 are especially applicable. In conjunction with the initial connection and subsequent inspections, the electrical connection bolts must be re-tightened.

Special regulations, such as building oversight guidelines for fire protection regulations related to air conditioning systems, are compulsorily prescribed and, for this reason, must absolutely be adhered to.



Refrigerant (odourless and tasteless) suppresses atmospheric oxygen and can lead to asphyxiation. In the event of a refrigerant leak, the machine room should be accessed only with heavy duty breathing protection equipment.

When disposing of refrigerant, environmental protection regulations should be observed.



**When the equipment is functioning in an explosion hazard atmosphere, please observe Chapter 8!**

### 3. Transport and storage

Component sections or modules (few sections assembled as a single module) of AHU are supplied on wooden blocks and wrapped with foil covering. Do not remove foil covering before assembly works start. Check the packaging for damages immediately at the delivery as well as delivery completeness according to project specification and transport slips.



AHUs, component sections or modules may be moved or transported around the site or to assembly place only with suitable transport tooling by qualified personnel.

If AHUs are going to be stored on site before assembling them in place, they should be protected against weather conditions, moisture, dust and damage. All of the casing openings must be protected by foil, to protect them from contamination.

Please note that the protective foil which touches directly galvanized sheets, due to condensation can cause permanent damage within one day on a galvanized surface (white corrosion). If possible, avoid foil for covering AHU's.

#### 3.1. Site transport



All delivered AHUs have individual labelling according to order specification.

Assembled component modules have to be transported in normal working position. Do not transport modules tilted, upside down or stacked on top of each other.

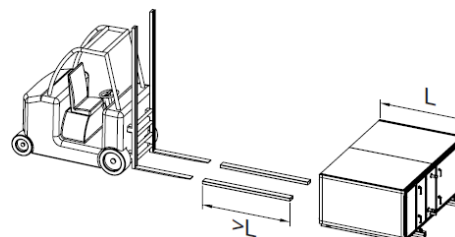
Before you move or lift single section or complete AHU check its weight first and make sure if planned transport method is proper.

Use following transport methods for AHUs:

#### Method 1

##### Transport with forklift.

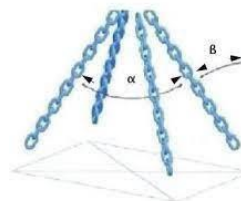
AHU stands on wooden blocks. Before lifting AHU make sure the forks are longer than width of the unit.



#### Method 2

##### Transportation with eyebolts

- maximum suspension angle -  $\beta=60^\circ$  ( $\alpha=120^\circ$ )
- maximum weight of transportation section – 1700 kg



#### Method 3

##### Transportation with traverse and eyebolts

- maximum weight of transportation section – 2500 kg



NOTE: While transporting unit using traverse, eyebolts may only be subjected to vertical loads.

#### NOTE: BEFORE EACH DELIVERY TRANSPORT METHOD MUST BE AGREED WITH AHUs SUPPLIER

During AHU transportation with a crane all safety rules must be obeyed. Only those cranes, load attachment devices, rigging, etc. may be used for the transport of AHUs components, which are suitable and approved. The lift rig must not be able to damage the unit. Lifting from the transport vehicle or the ground must be undertaken slowly and carefully. Jerking movement must be avoided.

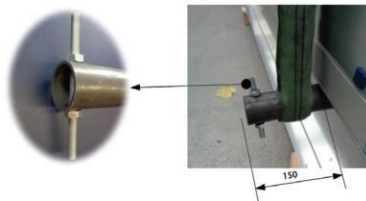
**Method 4****– Transportation with base frame eyes and traverse only UB frame**

- maximum weight of transportation section
- 8000 kg – <5000 kg "standard option"
- 5000 kg - 8000 kg "heavy option" "

**Method 5****Transportation with base frame openings using transport pipes and traverse**

- only unit sections without eyebolts

Transport pipe length = unit width + 300 mm (150 mm each side) – maximum section weight – **2500 kg**

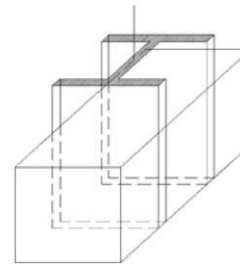


To transport the modules use pipes with appropriate marking, dedicated to transport the particular module.  
Transport pipes must be placed in correct base frame openings.  
Transport pipes are included in delivery.

**Method 6****Only when no transport eyebolts or transport pipes are not available**

Transportation with lifting straps – for transport sections without base frame using traverse and non-slip mat.

- maximum weight of transportation section – **3500 kg**



Modules where transport with non-slip mat is needed will be properly marked.

For each transportation modules 4 non-slip mats pieces of 0,5 m long are supplied. Non-slip mats have to properly disposed after use.

Make sure that load is balanced when transporting with lifting straps (centre of balance), avoiding moving of the load or tilting.

Before lifting the unit on place make a pre-lift on around 50 cm to check centre of balance, correct lifting elements attachment and stability of load.

On customer request it is possible to mark centre of balance on each individual transportation section or module.

Marking centre of balance is charged extra and has to be specified at the order.

**NOTE: BEFORE EACH DELIVERY TRANSPORT METHOD MUST BE AGREED WITH AHUs SUPPLIER**

During AHU transportation with a crane all safety rules must be obeyed. Only those cranes, load attachment devices, rigging, etc. may be used for the transport of AHUs components, which are suitable and approved. The lift rig must not be able to damage the unit. Lifting from the transport vehicle or the ground must be undertaken slowly and carefully. Jerking movement must be avoided.

## 4. Installation

### 4.1. Foundation / Base frame

Before positioning the housing module, the foundation and base frame must be checked for stability and a secure seating of all threaded connections. The support surface must be flat. Tolerance to the horizontal max. 0.5%. Deflection of steel construction max. 1/1000 of the beam length. Irregularities can result in door-twisting, leading to possible leaks and surface abrasion. The support surface must be level, in order that draining of the heat exchanger and tanks are warranted.

Prior to positioning, the foundation and base frame must be cleaned and free of ice.

Position the equipment on a level and secure foundation. Irregularities must be compensated for with appropriate base supports.

The foundation surface should correspond to the equipment size. If a strip foundation (concrete or steel beam) is used, the equipment must be supported on the outer equipment frame. The minimum support width is 55mm. In the case of strip foundations from a device width of 2.0 m, cross beams or longitudinal beams are also required at the start and end of the device and at the component separation points. Supporting point spacing between the equipment and the foundation should be maintained to a max. 1.2 m in length and width, while a max. equipment floor loading of 100 kg/m<sup>2</sup> should be heeded.

When determining the height of the foundation, the required siphon height must be considered.



Freedom of movement of the doors, removability of assembly elements and the fault-free sealing of assembly connections depends upon exact alignment of the assembly.

Equipment must be protected against construction dust and contaminants, as well as damage until commissioning!

When equipment pieces are standing next to each other, their foundation must also be supported at the midsection!

### 4.2. Equipment installation

Accessibility for repair and service work must be warranted. In addition, the pivot range of the doors must be kept clear; there must not be any obstacles, such as cable or pipes, installed in front of removable panels. The unit must be precisely aligned horizontally and vertically with shims.

The equipment must be aligned horizontally and vertically by means of base supports.

The dirt and soiling arising during transport, setup and installation (especially drilling chips) must be removed as soon as possible. We also recommend cleaning the interior prior to commissioning.

#### External installation

If a roof connecting frame is available, one should ensure that it is insulated since condensation may occur.

**The climate control unit in its weatherproof design is not a replacement for a roof!**

**Roof framing and weatherproof equipment are not a substitute for roofing!**



External component impact points are to be caulked with the durable elastic and weather resistant sealing compound as provided. For roof units (weather resistant model), an additional tin roof, rain covering will be provided.

Assembly of the rain covering will be carried out at the factory. Larger pieces of equipment will be only pre-assembled, but must be bolted together and weather stripped on-site.



Weather stripping will be carried out as follows:

Tape the sealing strip to the rain roof flange, caulk the durable elastic sealing compound and cover with the loose profiles as delivered. The covering profile is to be subsequently bolted to the rain roof flange.

If the paint finish is damaged during installation, this must be touched up.

Depending on the wind load, the air conditioner is safe and structure-borne noise is decoupled when connected to the substructure.

### 4.3. Structure-borne noise insulation

The equipment is to be installed, insulated from structure-borne noise.

#### Regarding the foundation

In order to obtain structure-borne noise and vibration insulation, the appropriate base supports (e.g. elastomeric stripping) must be laid between the equipment base frame and the foundation, whereby the manufacturer's information is to be observed. In general, the equipment base should be supported under the face sides and component attachment points and, if the component length is greater than ca. 1.2 m, under the longitudinal side, as well.

#### Regarding ducting

The equipment is to be installed, decoupled, to the ducting system.



The decoupled ducting attachments for hygienic equipment must not reveal any grooves or depressions.

### 4.4. Potential equalisation / Grounding

All non-conducting electrical attachment points must be bridged over with a potential equalisation, e.g. flexible attachments, ventilator motor unit. The entire assembly is to be grounded. Sufficient lightning protection must be provided for outdoor installation.

### 4.5. Frost protection

Frost protection capillary tubing must be evenly stretched over the entire exchanger surface at the air outlet.

Care must be taken so that frost protection capillary tubing is not buckled or damaged.





#### 4.6. Equipment attachment

Installation material is provided. This is found in the marked equipment modules.

In order to connect the equipment components, the following tasks are to be carried out:

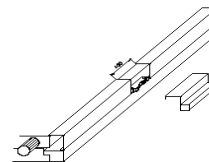
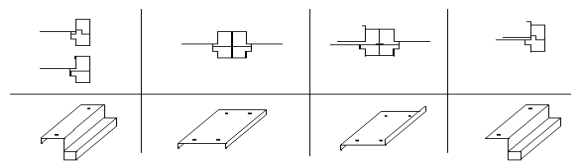
- Self-adhesive sealant is to be attached per section point to the profile frames in two circular tracks on the equipment component.



- Winch the equipment components together until they are positioned exactly together
- **Do not pull the equipment components together with the attachment bolts. Deformation hazard!**
- The bolts can then be secured. The equipment components are to be connected with the prescribed equipment corner angles.



- For larger equipment depth, the modules should be connected with additional centring threaded connections.
- The supplied pan connector (see diagram) must be installed on site with unit widths between 2000 and 3000mm.



- For large pieces of equipment, the square tubing should be additionally secured with connecting clamps



- The section points of the outer equipment components are to be subsequently sealed with the sealing compound as provided.

#### 4.7. Ventilator installation / removal

Dismantling tracks with individual designs can be delivered as accessories for the installation and removal of the motor or ventilator, respectively.

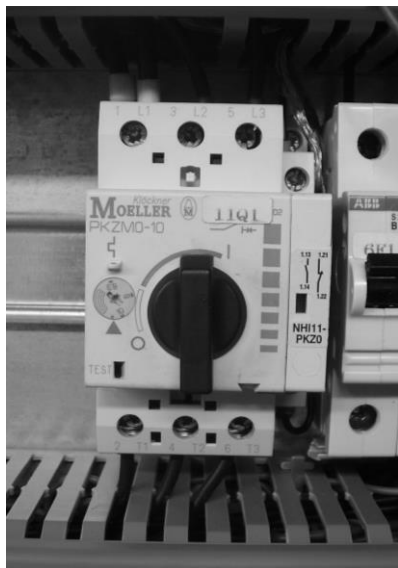
For this, the motor will be transported by means of a trolley. The drive motor can be placed on a lift wagon, for example, in front of the unit.



#### 4.8. Motor protection

Motors are to be protected from overload in accordance with DIN EN 60204 / DIN VDE 0113.

A motor protection switch is prescribed and should be adjusted to the rated motor current value (see type data plate). A higher value is not permitted!



Motors with a built in PTC thermostat detector are to be protected via a PTC thermostat actuation device.

Generally, motors with a rated current up to 3 kW can be switched on directly (observe performance limitations from the responsible energy supplier). For larger motors, a star-delta-start or soft-start is prescribed.

On-site safety precautions are to be taken to prevent overload, short circuit, over or under current and excessively high ambient temperatures.

Special care must be taken when connecting motors, especially on equipment, for which the motors are outfitted with two turning speed levels. Connections must be made in accordance with the specifications on the type data plate and the connection plan on the inside of the motor terminal box.

Protection fuses and automatic circuit breakers are not sufficient for motor protection. The manufacturer's warranty no longer applies to damage caused by insufficient motor protection.

#### 4.9. Electrical connection

All electrical work must be performed exclusively by qualified specialist personnel with unit power disconnected and protected against be switched back on.



All electrical connections are to be made in accordance with valid international, national and local regulations and guidelines, as well as manufacturer's instructions.

In order to prevent damage, the connection diagram in the terminal box must be respected.

Watertight sealing must be ensured when making electrical connections. Connections from below or watertight threaded connections (minimum protection type IP65) should have a sufficient cable radius.

All electrical terminal connections (switching cabinet, frequency converter, motor, etc.) should be checked for secure seating and re-tightened if necessary (see also DIN 46200).

All electrical cables, which run throughout the housing, must be affixed and prevented from being damaged.

In order to prevent overheating of the fan heater, the after-run time of the fan must be observed. This should be adjusted between 6 and 8 minutes, depending on the size.

#### 4.10. Pocket type filter

Pocket type filters are to be secured with fastening devices in the mounting frame. For this, an air tight seating around the mounting frame must be ensured.

Use the directions as provided with the filter for installing the pocket type filter or channels, respectively, in the mounting frame. For assembly, it must be observed that the pocket type filter is in its correct position and that the filter surface will not pinch or clamp.



**Damage or pressure marks on the filter surface are to be avoided without fail, as otherwise the filter can rip during operation and the filter category is no longer warranted.**

Removable filters are to be installed sideways in the existing insert tracks. It must be heeded that a seal is installed between the filters.



The continuous monitoring and cleaning of the filter is of great importance and must be especially heeded, as a contaminated filter will reduce air performance and, over a lengthy downtime, represents an increased hygienic risk.

#### 4.11. Heat exchanger connection

The heat exchanger is to be connected only in counter current flow, as otherwise its performance can no longer be guaranteed.

Feed and return flow lines must be connected in such a manner that no oscillation transfer and thermal stresses can occur.

Connections are to be made respective the „Feed line“, „Return line“ markings. Prior to making a connection, check sign positioning with respect to the drawing and its function.

Flanges, connections and feed/return line shut-offs are to be arranged in such a manner that the air filter can be removed without excessive dismantling work.

A fault-free air bleeding and draining of the air heater and pipelines is to be ensured by the user on-site.



When tightening the on site threaded connections on the heat exchanger adapters, a pipe wrench should be used to carefully apply a counter force, as the inner pipe may otherwise be twisted and damaged.

In the event of frost hazard, the heat exchanger is to be protected against freezing.

It must be assumed that residual water will remain in the heat exchanger following normal drainage. For safety reasons, the heat exchanger must additionally be purged with compressed air (freezing hazard!).

#### 4.12. Droplet separator

The detachable cover should be removed for installing or de-installing the droplet separator.

Droplet separator cartridges are hung on the upper slide rail and the lower guide rail and pushed into, or pulled out of the unit, respectively.

When installing the cartridges, the air flow direction arrow should be observed.



#### 4.13. Steam heater connection

A safe condensate drainage must be continually ensured.

Controllability in partial load operation requires individual steam registers to be outfitted with its own condensation drain.

#### 4.14. Refrigerant line connection

The guidelines from the chapter, Heat exchanger connection, should be observed.



Before connection, check whether the factory filled evaporator gas is still present.

The maximum operating parameters (pressure, temperature, etc.) may not exceed allowable factory specifications.

Because the pipeline system in use has a relatively small diameter, it must be assumed that residual refrigerant will remain in the heat exchanger following normal drainage. For safety reasons, the heat exchanger must additionally be purged with compressed air.



The siphon height should be accurately determined, dependent upon the pressure head.

Every siphon must empty freely over a collector line funnel.

#### 4.15. Air duct connection



The air duct connection should be tension-free by means of elastic supports. Under no circumstances may the elastic support installation length represent the stretched length.

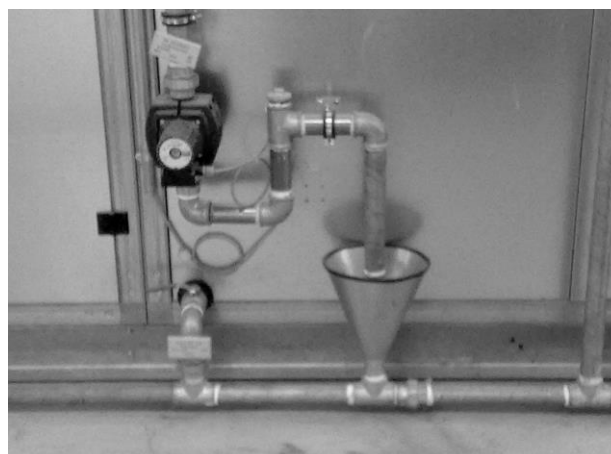
Air duct connection can also be accomplished with decoupled profile frames.

During assembly, the grounding, the protective earth conductor system and the potential equalisation must be professionally installed.

#### 4.16. Drainage line connection

In every situation where water build-up can occur during operation, a siphon is to be installed in the immediate vicinity of the device in order to ensure fault-free water drainage, to prevent odour build-up and to avoid leaks or leak air intake from the condensation drain. This applies to both the suction and the pressure sides.

We recommend using a ball siphon on the suction side and a normal siphon (ball removed) on the pressure side.



Horizontal drainage lines must have a sufficient diameter and slope gradient, as well as ventilation and bleed properties for fault-free water drainage.

Other drain lines (e.g. cleaning tanks) are to be outfitted with individual stop valves if these are connected to the drainage system.

The drainage lines should not be joined in front of the siphon or stop valve.

Assembly and layout should be in accordance with the enclosed siphon installation instructions.

#### **4.17. Gas surface burner**

The regulations and manufacturer's guidelines applicable to burners and gas connections must be observed.

When installing the equipment, possible requirements from the certifying authorities, all local regulations, as well as all demands from the national equivalent to the DVWG and the technical regulations for gas installation (TRGI) must be adhered to precisely.

#### **4.18. Direct lighted heat exchanger**

The burner must be secured to the prescribed burner attachment plate.

The flame tube length for oil or gas burners must be adapted to the warm air generator burner chamber in such a manner that the flame exits the flame tube only after it is inside the burner chamber.

The heat exchanger must be built in with a natural incline towards the condensation drain.

The regulations and manufacturer's guidelines applicable to the burner, condensation drain, fresh air supply and chimney must be observed.

Condensate must never remain in the heat register and must drain freely at all times. Therefore, the condensate drain line must also be connected.

The safety temperature limiter must be installed 50 cm to 100 cm downstream from the fan heater in the flow direction.

## 5. Commissioning, Service & Maintenance

### 5.1. Housing / Equipment

#### General



Before opening the doors, the ventilator must be switched off, the electrical power source disconnected and the system allowed to come to a standstill (minimum 2 minute waiting period).

The pertinent directives and local regulations are applicable to the electrical installation.

As a matter of principle, the accident prevention regulations must be observed!

A functional inspection of safety measures should be regularly carried out at the rated air volume!

The primary equipment operator is responsible to allow only those persons to work on the equipment, who are familiar with the fundamental regulations of occupational safety and accident prevention, as well as these operating, service and maintenance instructions, and who have been instructed in the handling of the ventilator.

**These operating instructions are to be permanently maintained at the on-site location of the air conditioning unit deployment.**

#### Commissioning

In order to put the system into service, the equipment must be completely assembled with all media lines connected and all electrical components properly cabled.

Close drain valves during operation.

Prior to switching on the system, an inspection of the protective earth conductor must be carried out.

A functional inspection and performance measurement must be carried out with a written protocol being established.

#### Maintenance

- All equipment chambers should be checked for contamination and damage, and the chambers cleaned accordingly.
- Check the processes in free run-out.
- Check doors for leak-tightness and latches for freedom of movement.
- Check duct connection attachments for leak-tightness.



After completing service and maintenance work, all points applicable to commissioning when switching on the machine must be adhered to.

### 5.2. Ventilator

#### Commissioning

Prior to commissioning the ventilators, the following prerequisites must be fulfilled:

- Connection to the ducting system in place
- Discharge air and supply air lines open
- Ducting system and equipment chamber free of foreign objects and contaminants
- Fan wheel checked for freedom of movement by manual spin-up
- Transport protection has been removed



- All inspection doors are closed
- V-belt tension checked
- The max. speed must be set according to the nameplate on the drive
- After installation of the motor and impeller, the overlap dimension of nozzle and impeller must be adjusted correctly; otherwise there will be a reduction in output. Refer to the manufacturer's documentation for the overlap dimension based on the make, model and size or contact Huber & Ranner.

After completion, a test run is to be carried out to check performance and direction of motor rotation.

Check ventilator turning direction against the directional arrow on the housing by briefly switching on the system. In the event of an incorrect direction of travel, electrical polarity on the motor must be changed while observing safety regulations.

After obtaining ventilator operating turning speed, immediately measure the power input from all three phases with doors closed.



The measured values must not exceed the rated values (hence, the motor rated performance) depicted on the type data plate. Shut off the unit immediately if an over-current situation exists. If a dissimilar phase current exists, check the motor connection.

The manufacturer's specifications for maximum motor-ambient temperature should be observed.

Any combination of frequency converter, motor and fan can vibrate at one or multiple frequencies. These vibrations must be determined during the commissioning process and suppressed with the frequency converter.

### Maintenance

- The ventilator should be cleaned as necessary in order to prevent an out-of-balance condition.
- Check the bearing and re-lubricate as necessary. Re-lubrication deadlines must be respected!
- Check the vibration damper for function.
- Check attachment bolts and re-tighten as necessary.
- If problems are detected (noises), check ventilator and motor bearings.
- If problems are detected (vibrations), check the ventilator running wheel without the v-belt for out-of-balance condition (the running wheel must come to a rest in any position).

### Removal from service

For lengthy periods of downtime, the ventilator should be turned 1x per month in order to prevent one-sided loading of the bearing. For periods of downtime longer than 3 months, the v-belt should be removed in order to prevent spot-loading of the bearing.

Prior to re-commissioning bearings with a re-lubrication adapter, remove the old grease and re-lubricate. The directives of the ventilator manufacturer must be observed.

## 5.3. Belt drive (ventilator)

### Commissioning

Prior to commissioning, check for correct tension and alignment.

Subsequent to commissioning, the v-belt drive should be run under load. After ca. 30–60 minutes, the tensioning device should be readjusted.

The v-belt must neither be too taut nor too loosely adjusted, as this can reduce the operating life of the motor and ventilator bearings.

### **Flat belts**

A direct start-up must be avoided for flat belts. The belt can run off of the drive due to sudden application of force.



### **Stretching of flat belts**

Two thin measurement markings are located on the upper side of the belt. The belt should be tensioned until the rated value of the measurement marking gap is obtained (2% belt stretch).

The drive must be turned several times in order to check the tension once again.



It must be heeded that the belt tension is checked after the first 100 operating hours, and re-tensioned as necessary.



It must be heeded that the belt tension is checked after the first 50 operating hours, and re-tensioned as necessary.

### Maintenance

- Check the belt drive for contaminants, damage and wear
- Check for secure attachment of the complete drive
- Replace only complete belt sets
- Check protection equipment for function
- Adjust alignment of the motor and ventilator plates
- Check belt tension and re-tension as necessary

## 5.4. Sound attenuator

### Commissioning

Check the baffle for contaminants and damage.

### Maintenance

- Check the baffle for contaminants and damage and carefully; clean or repair with the proper tooling as necessary



**Do not damage the surface.**

## 5.5. Filter unit

### General



Sufficient air filtering and regular filter changes will reduce the dust content in the air and prevent contamination of the equipment and ducting system. Excessive filter service usage degrades the air quality due to odours. Moisture penetration of the filter must be avoided for hygienic reasons.

The filter should be checked at regular intervals and replaced as necessary, dependent upon operating conditions. As a rule, if the manufacturer's prescribed pressure differential is exceeded, the filter should be replaced. When replacing the filter, the leak-tightness around the filter adapter frame should be checked.



Damage or pressure marks on the filter surface are to be avoided without fail, as otherwise the filter can rip during operation.

Filter category	recommended final pressure differential
G1–G4	150 Pa
F5–F7	200 Pa
F8–F9	300 Pa

Filter resistance can be determined by means of a differential pressure measurement using an inclined-tube manometer, or electronic manometer.

The pocket type filter is not reclaimable. When the final resistance is reached, the pocket type filter must be replaced with a new one.

Replacement of individual filter elements is allowable only in case of damage to the individual elements, and as long as the previous replacement was no longer than 6 months back.

When replacing the filter insert, a breathing protection mask with P3 filter should be worn and the local environmental protection regulations observed.



Dust laden filters pose an increased health risk.

Filters must be stored in a dry, dust-free environment. A filter should no longer be used upon expiration of its minimum shelf life.

### Commissioning

Filter inserts are secured in the mounting frame with tensioned fastening clamps. Filter inserts elements must not be pinched or clamped. Check the filter insert for an air-tight seat in the mounting frame.

Prior to commissioning, the filter units must be checked for damage.

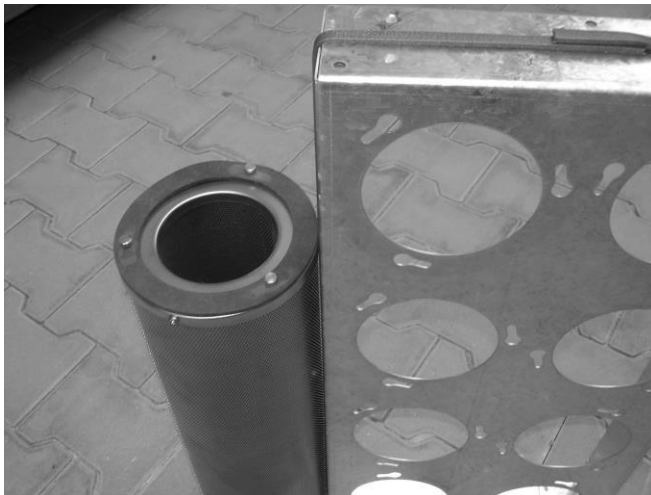
### Maintenance

- Check pocket type filters and frames for contaminants and damage
- Check filter seat for leak-tightness and visually inspect for damage
- Replace filter inserts with noticeable dust contamination, odours or leakage.
- Replace filter inserts when the recommended final resistance is reached
- Replace, at the latest, the 1st filter level after 12 months and the 2nd filter level after 24 months.



### Activated carbon filter

The cartridge is secured with a bayonet fitting. When replacing the filter, remove the cartridge by turning it out of the frame.



In order to ensure a fault-free functioning of the filter cartridge, an odour check following filtering should be carried out. If necessary, the cartridge should be replaced.

### Special filters

Special filters are serviced in accordance with the manufacturer's service instructions.

## 5.6. Heat exchanger

### General

In order to avoid freezing of the heat exchanger, an air-side, water-side or condensate-side frost protection should be installed, dependent upon the model.

In order to achieve an optimal temperature stratification and/or to prevent potential freezing of units with multiple heat exchangers, use of the piping in the Tichelmann system is recommended. If this is not feasible, the hydraulic compensation must take place with a regulating/shut-off valve. The compensation must be carried out on site by the system operator.



Do not use high-pressure water or high-pressure steam to clean the heat exchanger. The lamella-fins can be damaged (exception is the steel-galvanised heat exchanger with reinforced lamella-fins).

A still unavoidable amount of residual Stanzoil, left over from the production process, will be present during the initial weeks of operation.

Clean the heat exchanger while installed or, if it cannot be accessed, it can be removed for cleaning. Removed contaminants must not be allowed to seep into surrounding component parts. Contaminants and dirty water should be carefully removed.

Use water only if the chamber or flooring can collect the water and direct it away.

When cleaning copper or aluminium lamella-fins, compressed air is used by carefully blowing against the direction of air flow.

The surface of the lamella-fin packets are cleaned with a brush (not metal) or a vacuum cleaner. Hard or pointed cleaning utensils may not be used.

### Commissioning

The on-site piping is to be carefully cleaned prior to connection of the heat exchanger.

Check to ensure the proper connection of the feed/return lines. Give heed to counter current flow.

When the system is being filled, the heat exchanger is to be carefully bled once it has reached the highest point of the system. An improperly bled heat exchanger can form air pockets, which can lead to a reduction in performance.

Check shut-offs and other fixtures for proper installation.

For filling, the following work is to be carried out:

- All shut-offs and regulating devices should be fully opened
- Open the prescribed bleeding devices, as long as automatic bleeding devices are not provided.
- The system should be slowly filled from its lowest point.
- Gradually close the bleed valves at the various height levels, as soon as air-free water is discharged.
- Switch on the primary and secondary pumps, check the turning direction and operate the system for a longer period of time.
- Drive the regulating valve to the converse position (three-way valve)
- Follow up control by re-opening the bleed valve
- Check system for leak-tightness

## Frost protection

Frost protection is assured by means of a frost protection sensor, which must be adjusted depending upon the percentage of glycol in the media.

Percentage of glycol	Setting value for ethylene-glycol	Setting value for propylene-glycol
20 %	-11 °C	-7 °C
30 %	-18 °C	-12 °C
40 %	-25 °C	-19 °C

The complete frost protection switching (e.g. mixing valve, circulation pump, louver damper ventilator, heating supply) is to be checked for function with available frost protection thermostats. If the temperature near the unit can drop below 5°C, the frost protection sensor must be installed inside or the exterior frost protection capillary must be insulated.

The warm water supply to the heat exchanger must be assured even after switching off of the RAC equipment.



**Damage, which is the result of frost impact, is not covered as part of our warranty responsibility.**

## Maintenance

- Allow the heat exchanger to cool down to the ambient temperature
- Check lamella-fins for contaminants and clean as necessary
- Check lamella-fins and piping for damage and comb out possible bent or warped fins.
- Check heat exchanger leak-tightness
- Check feed/return lines for function
- Check frost protection for function (thermostat by means of coolant spray)
- Clean the condensation drain at the cooling radiator, check the siphon for function and clean at the beginning of the cold period, then refill

## Removal from service

The heat exchanger must be completely emptied for longer periods of standstill, especially with a freezing hazard. For this, first remove the bleed air valve screw, then the drain plug. Subsequently blow out each heat exchanger with compressed air for a complete purging, as a residual amount of media can remain in the heat exchanger following a free drainage.

## 5.7. Droplet separator

### General

The droplet separator will bring its full effectiveness only after a run-in period of ca. 4 weeks.

The droplet separator is to be cleaned by rinsing with water as necessary. With large amounts of contamination, cleaning can be done with a steam jet-spray unit.

An excessively contaminated and calcified droplet separator with a plugged drip-mould can lead to a droplet run-off and increased pressure loss.



The droplet separator, possibly located downstream from, and on the air-outlet-side of the air cooler, as a rule contains lamella-fins made of PPTV, which are temperature resistant up to +95°C. Droplet separators are required only if the limiting speed will be exceeded and a specific condensate volume is present.

When cleaning the droplet separator, remove the cartridges and lamella-fins (remove bio-film).



**During installation, heed air flow direction.**

### Commissioning

Check the droplet separator installation direction. The drip-mould must indicate a direction opposite the air flow.

### Maintenance

- Check the droplet separator and condensate tank for contamination and damage; clean if necessary.

## 5.8. Cooling system

### General

Because the cooling components in the RAC equipment have very differing designs, it is not possible in this context to provide a detailed description of the work related to commissioning, service and maintenance. The individual operating instructions must be observed.



Bodily contact with refrigerant must be avoided, as freezing of the skin and limbs or damage to the eye retina can result. Equipment for personal protection against the effects of refrigerant must be used in accordance with regulations comparable to German VBG 20 (protective glasses, gloves, etc.)!

Modifications to the system may be carried out only by authorised specialist personnel.

The loose filter dryer included in the delivery may be opened only by the cooling system commissioning personnel and it must be installed immediately, as air humidity can damage the filter dryer.

### Commissioning

Commissioning may be carried out only by a qualified cooling and refrigeration specialist company.



### Maintenance

Depending on the operating mode and filling quantity, maintenance should be carried out under a maintenance contract at least once a year by a qualified specialist refrigeration company in accordance with VDMA 24186, and in accordance with F-Gas Regulation (EU) 517/2014, preferably before the start of the cooling period. In addition to the service and inspection work, further information from the component manufacturer must also be observed.

According to the F-Gas Regulation (EU) 517/2014, the prescribed intervals for leak tests depend on the type of refrigerant and the refrigerant filling quantity.



The system filling quantity is converted to a CO<sub>2</sub> equivalent:

Refrigerant filling quantity (t) \* GWP = CO<sub>2</sub> equivalent of the system

Global Warming Potential:

R134a = 1.430 t/kg

R407c = 1.774 t/kg

CO <sub>2</sub> equivalent	Frequency of control checks
from 5 t	annually
from 50 t	semi-annually
from 500 t	quarterly

### Inspection work

The checks or work tasks listed below can be carried out by the operator.

- Clean lamella-fin surfaces in order to avoid excessive condensation pressures. Contaminated surfaces lead to performance loss. Do not damage piping or lamella-fins.
- Check the compressor oil level. The oil should cover at least half of the viewing glass with the compressor switched off
- Check and clean condensation drain. Be aware of unusual odours or operating conditions.

## 5.9. Spray humidifier

### General



Switch on the pump only if the scrubber filled with water in order to prevent damage to the slip-ring seal.

In order to warrant protection against a dry running condition, the pump must switch off when the water level falls below 20mm above the suction line.

Pull the floating switch cable in or out as appropriate.



The water quality must be hygienically faultless (germ-free).

The conductivity of the water must lie within the limits as set by the manufacturer.

It must also be ensured that the condensate cannot return to the drinking water network.

The conductivity of the water must be within the limit values specified by the manufacturer.



The float valve must be set so that the fresh water supply shuts off at a maximum water level 10 to 20mm below the overflow nozzle.



UV-radiation can be suitable for a continual air disinfection.

Chemical disinfection media (biocide) should be used only when its harmlessness to health in operational concentrations can be verified.

When using additives, it must be ensured that foam is not produced when mixed with water.

### Commissioning

Commissioning tasks are to be carried out in the following order:

- Clean any foreign objects from the spray humidifier tank
- Check the spray humidifier for proper condition as well as possible visible damage (transport and installation damage).
- Check the nozzle support tubing and nozzles for firm seating and direction (with or opposed to airstream)
- Inspect spray humidifier pump screen
- Fill water level to 20mm above suction pipe.
- Set dry running condition protection.
- Fill the system to ca. 10–20mm below the overflow nozzle
- Set the float valve (slide the float element and adjust the lever).
- Start equipment operation, initially on the air-side, then switch on the spray humidifier.
- Check the pump turning direction.
- Set the pump motor over current actuator to rated current, measure the power input and record in the protocol
- Check all pipe connections for leak-tightness and re-tighten as necessary.
- Check the float valve for function.
- Set blow-down device
- Set possible biocide additives
- Operate the spray humidifier for ca. 2–3 hours and check for function and leak-tightness

Subsequent to commissioning and within the first 700 operating hours, a weekly germ-count should be made of the circulation water and, as necessary, measures should be taken to improve the water quality.

### Maintenance

- Decalcification of entire spray humidifier
- Switch off the ventilator system, add in the lime solvent to the circulation water and operate the circulation pump until the lime is dissolved. Subsequently, thoroughly rinse and neutralise the entire spray humidifier and clean the strainer.
- Decalcification of the humidifier nozzles and nozzle fittings, under no circumstances may the nozzle bore holes be cleaned with hard objects.
- Clean the droplet separator and flow straightener with water (max. 50°C) or with a thinned formic acid, decalcify and thoroughly rinse with water or clean with a steam jet-spray unit
- Check the water quality
- Check float valve
- Clean and refill the integrated siphon
- The tank, pump and fixtures are to be emptied when operation has ceased
- Check the spray humidifier pump for fault-free running and water discharge.

## 5.10. Louver dampers

### Commissioning

If multiple dampers are coupled with one another, the connecting rods should be checked for proper seating and freedom of movement.

If drive is accomplished by means of a servo-motor, the rods are to be adjusted so that a rotation angle of 90° is warranted and the louvers will reach their end position when closing.



The louver damper positioner can be mounted on the interior, as well as on the exterior of the housing. It should be mounted on the interior of those units designed for outside use, or protected against moisture.

During commissioning, the louvers must be driven to all required operating positions. The respective louver position must correspond to the control drive (end-switch setting).

### Maintenance

- Check the louver dampers for contaminants and damage. Where geared drives are used, special attention should be given to clean toothings.
- Check mechanical function
- Damper positioning motors are to be checked and possibly re-adjusted for proper mounting and the correct end-positioning
- Freedom of movement and leak-tightness of the dampers will be determined after decoupling the positioning drive.

## 5.11. Rotation heat exchanger

### General

The drive motor is easily accessible via the removable covering panels and quick release fasteners.

In order to avoid damage when cleaning, an air or water jet-spray should be directed at the storage mass only at right angles.

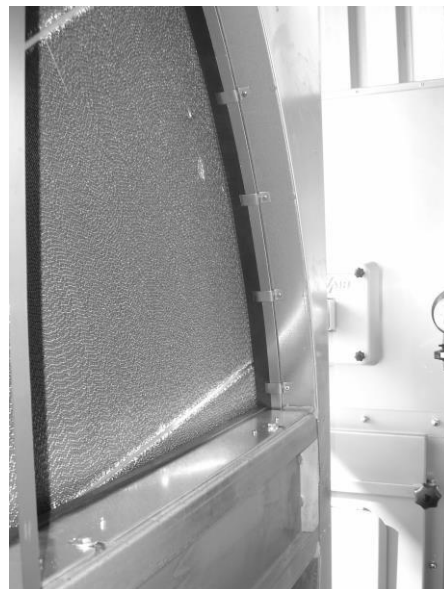
If the power supply has not been interrupted on all phases, a danger of crushing or abrasion exists due to the possibility of a sudden rotor start-up via an automatic cleaning process or and automatic re-start following a power failure.



### Commissioning

Prior to commissioning, it must be ensured that no objects are allowed to block the free movement of the rotor. Remove foreign objects and contaminants.

Check sealing strips for contact pressure. These must be pushed in as close as possible to the storage mass, whereby a direct rubbing contact under operating pressure conditions must be avoided.



As a matter of course, rotor mounting will be aligned at the factory. Re-alignment may be necessary, however, depending upon the installation conditions. In this regard, please observe the manufacturer's operating instructions.

Because the v-belt is subject to a natural stretching, v-belt tension should be regularly checked, especially within the first 400 operating hours.



Open inspection access panel on the marked rotor corner and check to determine if the belt is being held sufficiently taut via the tensioning device. The drive belt is tensioned via the belt take-up hanger or, if necessary, does the v-belt need to be shortened:

- Open hinge latch
- Shorten continuous v-belt as necessary
- Re-close hinge latch
- Close inspection access panel

Bring drive motor into service. With regard to the rotor regulating device, please observe the manufacturer's operating instructions. Check the prescribed rotor turning speed (e.g. 10 R/min at 10 V positioning signal).

Check the rotors turning direction (arrow) and change motor electrical polarity as necessary. With a built-in rinse zone, the storage mass must turn from the discharged air above the rinse chamber to the supply air.

### Maintenance

Under normal operating conditions, bearings and geared motors (operating life packing) require no service or maintenance.

- Check the rotation surface for air-side contamination and damage.
- Application oriented cleaning (e.g. usage of compressed air or grease-dissolving cleaning agents)
- Check sealing strips for contamination, foreign objects and contact pressure; replace if necessary
- Check rotor bearing play, out-of-balance and lateral trueness
- Check drive elements
- Check minimum and maximum turning speed
- Check through the range of control
- Check turning direction
- Check motor bearing
- Check electrical connections
- Check gear mechanism leak-tightness
- Check v-belts
- Check regulating device control display function
- Check water drain and siphon for function and clean as necessary

### Removal from service

For longer periods of standstill (e.g. summer), the equipment should be put into operation every 4 weeks under normal ambient conditions in order to preserve the self-cleaning rotor.



## 5.12. Plate heat exchanger

### General

Condensate drainage via the siphon is excluded when a plate heat exchanger with droplet separator on the exhaust air-side is in use.

Commissioning, service and maintenance work is to be carried out on the bypass dampers according to guidelines found in the chapter, Louver dampers.

### Commissioning

Check the plate heat exchanger for foreign objects and contamination; clean as necessary

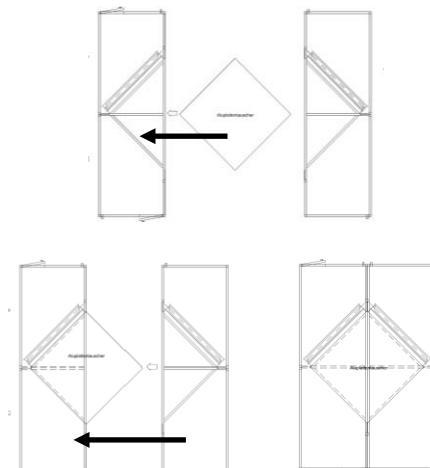
### Maintenance

- Check the plate heat exchanger and, possibly, the droplet separator for contamination and damage; clean if necessary.
- Remove any dry dust and fibre material at the exchanger intake with a vacuum cleaner
- Clean the condensation drain, check the siphon and refill as necessary
- Remove oil and grease residue from kitchen discharge air with hot water and grease-dissolving cleaning agents
- Clean with compressed air or a high-pressure cleaner (only water, without additives); carefully collect and remove contaminated water.

### Installation instructions

A suitable forklift truck or crane with the appropriate loading beam is to be used for safe loading and unloading of the components. For crane transport the two-part transport bracket can be used. When lifting the components, one should make sure that the edges are not damaged. Please observe the manufacturer's installation manual in detail.

If the module is delivered in more than one unit, after installation of the first half, the plate heat exchanger is to be incorporated into it and attached there. Dismantle transport stiffeners beforehand. Then push and mount the second half of the device module.

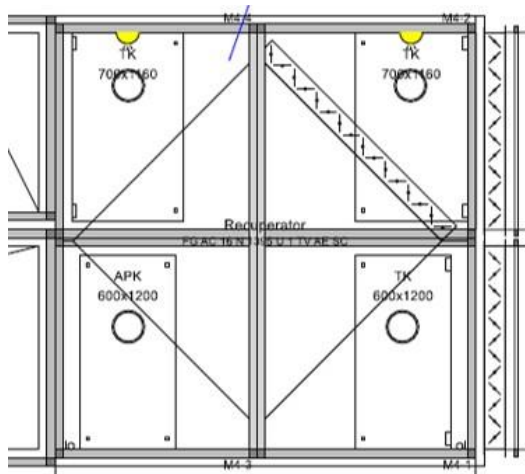




Do not use the pre-installed device connectors to pull the modules together! If they are overloaded, they could be torn out or deform the device.

Once the parts of the device have been connected, recheck the position of the heat exchanger and if necessary readjust it. Once installation is complete, seal the joints of the device rods and the corners.

If the plate heat exchanger is installed via the operating or rear side or module ceiling, the corresponding device profiles and housing covers must first be dismantled. Insertion from the front with a forklift truck or similar, from above with a crane or cable pull.



Here too, after installation, the joints between the plate heat exchanger and housing must be sealed with sealant.

For large or multi-part plate heat exchangers that can only be assembled on site, there is a two-part transport bracket. This must be bolted to the heat exchanger and can be removed after installation. Then seal the drill holes with sealant.



### 5.13. Recuperative energy reclamation (KV)

#### General

Commissioning, service and maintenance work is to be carried out in an interconnected-circulation system according to guidelines found in the chapter, Heat exchanger.

#### Commissioning

If the system is not going to be put into immediate service, then it must be completely drained or filled with frost protection media to protect the heat exchanger and pipelines from freezing. The heat carrier medium must be checked for the effectiveness of its frost protection before each winter period.



In order to prevent condensate icing on the discharge air heat exchanger lamella-fins at low temperatures, it is necessary to reduce the transmission capacity below the freezing limit. Thoroughly ventilate the system when filling (multiple times, if necessary) until all flowing sounds and air bubbles have disappeared. Also vent the pumps and heat exchangers (internal bleed valves). Filling must take place with an external circulation pump as a basic rule. No warranty is honoured for dry-running of the pump.

The static nominal pressure must be adjusted according to the manufacturer's specifications (see data sheet).



#### Maintenance

- Check pumps for damage, attachment, function and noise
- Check fixtures for damage, leak-tightness and function
- Check dirt collector screen for damage and clean
- Check pipeline system for damage, leak-tightness and attachment
- Check fluid level and refill as necessary

### 5.14. Direct lighted heat exchanger (burner chamber in the airstream)

#### General

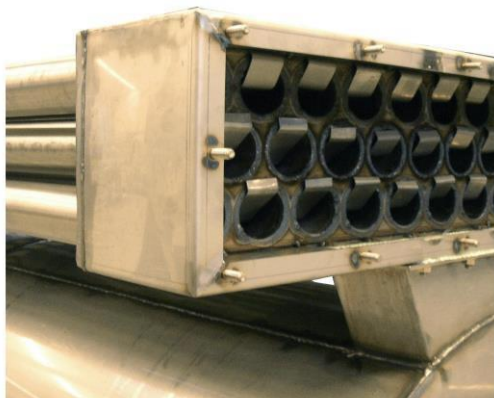


In order to avoid skin burns, do not touch hot surfaces. Observe safety related regulations.

Install and connect the oil or gas burner in accordance with the manufacturer's instructions.

Every system must be outfitted with an Emergency-Stop switch. Overheating damage can result from system operation without sufficient cooling or when emergency system shutdown is initiated by the safety system. For this reason, the Emergency-Stop switch should be used only for the protection of persons. We cannot accept responsibility for damage resulting from Emergency-Stop actuation.

Give heed, as far as possible, to the uniform intake and exhaust flows through the burner chamber. The adjustable covering plates might have to be adapted in order to avoid heat build-up or temperature stratification.



#### Commissioning

Undertake the assembly and wiring of all sensors and thermostats.



Check flame propagation; do not make contact with burner chamber walls. Use a flame head extension or another nozzle angle.

Undertake connection of the chimney. This must be carried out in accordance with technical construction and official regulation.

Establish operational readiness:

- Bleed oil or gas lines
  - Thermostat ventilator: Rated value ca. 40 °C
  - Temperature monitor: Rated value ca. 75 °C
  - Safety temperature limiter – burner: Rated value ca. 100°C
- (These values apply only to standard system designs with a supply air temperature of 60°C. For higher supply air temperatures, the manufacturer's specifications must be observed.)

Bring burner into service. The manufacturer's commissioning instructions must be precisely adhered to. For this, it must be ensured that the ventilator is continually operating. The fuel intake must be adjusted so that the equipment rated performance is not exceeded. For gas burners, it is highly recommended that a gas meter be used.

Determine exhaust gas value.

- Maximum exhaust gas temperature: ca. 210°C
- Minimum exhaust gas temperature: ca. 150°C

All setting values are to be recorded and archived in the setting adjustment protocol.

Use of a condensation separator is permitted only during the run-in phase. Adjust the exhaust gas temperature to the allowable range by adapting the turbulators (removal of the turbulators raises the exhaust gas temperature).

Condensate accumulation should be disposed of according to local directives.



#### Maintenance

##### **Burner chamber**

- Dismantle the burner chamber. Using a suitable light source, check the burner chamber for contamination, damage and leakage. Damaged burners must not be put into service.
- After cleaning the downstream heating surfaces, vacuum clean the burner chamber.

##### **Flame pan**

- Check the flame pan for damage. In the event of damage or deformation, restore or replace. For this, the burner plate and the cylinder cover must be dismantled.

##### **Downstream heating surfaces**

- Remove the inspection cover plate and cleaning cover from the burner chamber. Remove all turbulators and check for general condition. In case of heavy corrosion, replace individually or completely.
- Clean all downstream heating surface pipes with a stainless steel brush and vacuum clean the collector tank.
- Check the de-watering unit and clean as necessary.

##### **Burner**

- Subsequent to cleaning the burner chamber, service and maintenance of the burner is to be carried out in accordance with manufacturer's directives.
- Determine exhaust gas value.
- All work tasks are to be recorded in the protocol.
- Check gas lines, connections and the gas control path for leak-tightness; re-seal as necessary
- Check regulating and safety devices
- Check bypass and burner chamber dampers



### 5.15. Gas surface burner

#### General

The ambient air CO<sub>2</sub> content must not exceed the locally prescribed value limits. Re-circulated air operation is not permitted.

A running system must not be accessed; burn hazard.

Every system must be outfitted with an Emergency-Stop switch.



#### Commissioning

Undertake connection of the gas control path on the gas line. A tension-free connection must be ensured. The gas-type and gas pressure must be suitable to the gas control path.

Direct the blow-off outside the facility.

Undertake the assembly and wiring of all sensors and thermostats.

Check the gas line, connections and gas control path for leak-tightness by means of a testing device.

The safety temperature limiter position is located ca. 3m behind the gas burner in the roof area in front of the next assembly component.

Establish operational readiness:

- Bleeding the gas line
- Check setting values on the safety temperature limiter. Rated value: ca. 60°C

Bring burner into service. For this, it must be ensured that the supply and discharge air ventilators are continually operating.



#### Maintenance

Replacement of damaged parts may be carried out only by a specialist. Replacement parts must be authorised for the system.

- Check gas lines, connections and the gas control path for leak-tightness; re-seal as necessary
- Remove any dirt particles from the burner with a brush; all air holes must be free.
- Check gas discharge openings and clean with a nozzle needle as necessary. Do not come in contact with ignition or control devices.
- Check the ignition electrode gaps; adjust as necessary.
- Unscrew the control monitor (UV cells or ionisations rod); clean with a soft cloth and re-install. Replace if discolouration is detected.

### 5.16. Cleaning supplies

no.	group	aggregat	component	material	coating	cleaner constancy	disinfectant constancy
1	housing	housing	panels	galvanized steel	"Anti-Finger-Print"	metal cleaner article no.: CP502 company: Kuhlmann	Incidur Spray / Incidin Rapid / Incidin Extra N / Incidin perfekt company: Ecolab
2	housing	cooler, humidifier, etc.	condensate pan	stainless steel	no	Edelstahl Protect (EP) company: Solution Glöckner Vertriebs-GmbH	Incidur Spray / Incidin Rapid / Incidin Extra N / Incidin perfekt company: Ecolab
3	heat exchanger	heater	fins	copper	no	Polygon PCG 1948 company: Polygon Chemie AG	Incidur Spray / Incidin Rapid / Incidin Extra N / Incidin perfekt company: Ecolab
4	heat exchanger	heater	pipes	copper	no	Polygon PCG 1948 company: Polygon Chemie AG	Incidur Spray / Incidin Rapid / Incidin Extra N / Incidin perfekt company: Ecolab
5	heat exchanger	cooler	fins	galvanized steel	no	metal cleaner article no.: CP502 company: Kuhlmann	Incidur Spray / Incidin Rapid / Incidin Extra N / Incidin perfekt company: Ecolab
6	heat exchanger	cooler	pipes	galvanized steel	no	metal cleaner article no.: CP502 company: Kuhlmann	Incidur Spray / Incidin Rapid / Incidin Extra N / Incidin perfekt company: Ecolab

### 5.17. Control Systems

After the commissioning, the first maintenance should be carried out already after 6 months. Subsequently a maintenance interval of a year is meaningful.

#### General

##### **Prerequisites**

All structural prerequisites, such as accessibility, finished air handling unit and air duct assembly and uninterrupted availability of all supply median must be fulfilled.

##### **Commissioning**

The commissioning may be carried out exclusively by trained specialist personnel.

##### **Activities**

- Examination of field devices on regular installation
- Examination of voltage supply to switch board
- Function test of parts contained in delivery
  
- Configuration of controls and or DDC lower stations, and if necessary loading the project specific control and SPS software.
- Commissioning and adjust the air conditioning
- Adaptation of the parameters at the operating conditions of the air conditioning
- Testing of the control software
- Introduction of the operator personnel
- Examination of all safety functions

#### **Maintenance**

It is recommended to lock a maintenance contract with a trained specialist company.

##### **Maintenance works**

See maintenance tables

## 6. Decommissioning

### 6.1 Decommissioning

When decommissioning a unit for a lengthy period of time, the following tasks or activities are to be carried out:

- Stop the energy supply (electrical lines and all media).
- Drain all water from the heat exchanger
- For equipment with an integrated switching cabinet, switching cabinet heating should remain switched on.
- Existing dampers must be driven closed or closed manually.
- Remove contaminated filters.
- De-water the humidifiers.
- Regarding large ventilators decommissioned for a lengthy period, if these are not occasionally rotated, bearing damage can be expected.
- General cleaning of components set for decommissioning.

The instructions in the individual chapters must be adhered to, as well.

### 6.2 Dismantling and disposal

After its useful service life has run out, the equipment should be professionally dismantled.



Prior to dismantling, it must be ensured that all energy lines (electrical and all media) are switched off. No lines should remain supplied with pressure, temperature or other energy. Subsequent to this, it must be ensured that all operating media has been removed from the system; no water, oil or refrigerant may remain in the system.



All assembly components and operating media (e.g. oils, refrigerant, brine) are to be disposed of in accordance with local regulations. Metal and plastic parts should be sorted, separated and directed for recycling.

## 7 Emergency Measures

### 7.1 Fire prevention

As a rule, local fire prevention regulations must be adhered to.

If the air conditioning system is part of a smoke-removal concept, then the related guidelines must be adhered to.

Otherwise, in case of fire, immediately remove electrical power to the equipment by interrupting all phases. Louver dampers should be closed in order to interrupt the supply of oxygen and spread of the fire.

### 7.2 Leakage of harmful substances

Due to its optimised design and construction, this Huber&Ranner air conditioning system possesses a very low fire and smoke load. None-the-less, if the construction materials used do catch fire, toxicologically critical substances may develop. Additionally, smoke related gases from the equipment can be discharged into the control room.

For this reason, heavy-duty breathing protection equipment should be used.

Water conducting assembly components can become un-tight in the event of fire. Do not remain in the immediate vicinity of the danger area.

## 8 Explosion Protection

In order to prevent an explosion, a detonation or a fire, potentially explosive atmospheres should be avoided wherever possible!

As a rule, a potentially explosive atmosphere must be divided into respective categories (zones) in accordance with applicable regulations, whereby a differentiation is made between atmospheres, which lie inside or outside the airstream.

Equipment with special explosion protection must be deployed only in their declared category!

### 8.1 Service, maintenance and repair

- Service, maintenance and repair may be carried out only by respectively trained personnel!
- Work tasks may be carried out, either in a non-potentially explosive atmosphere only, or with an avoidance of ignition sources. For this, it must be especially regarded, that all work materials deployed are authorised for the respective zone
- Prior to opening the equipment, the system must be mechanically and electrically taken out of service and secured accordingly.
- In addition, it may be required to purge the equipment with fresh air, as necessary, in order to remove or dilute a potentially explosive atmosphere. In particular, this is required when the internal gas groups differ from the external gas groups! This task can be automated through the control system.
- In particular, the atmospheric concentrations can change in the event of a system shutdown, increasing the risk of an explosion! In any case, all types and sources of ignition should be avoided when performing service, maintenance and repairs.

### 8.2 Identification marking

Identification as to the type of atmosphere, in which the equipment can be deployed, is located at the ventilator chamber. For this, the identification between internal (conveyed atmosphere) and external (installation room) will differ – the equipment may be deployed only in agreement with the respective equipment identification.

Example: Ex II 2G IIA T3 (internal); Ex II 3G IIB T4 (external)

**The individual markings have the following meaning:**

- Ex Ex-protection (group)
- I Underground operation
  - II Above ground operation
- 1 Protection category 1 (Zone 0)
  - 2 Protection category 2 (Zone 1)
  - 3 Protection category 3 (Zone 2)
- G Gas, mist, steam
  - D Dust
- IIA Materials with low ignition susceptibility
  - IIB Materials with medium ignition susceptibility
  - IIB Materials with high ignition susceptibility
- T1 450°C highest allowable surface temperature
  - T2 300°C highest allowable surface temperature
  - T3 200°C highest allowable surface temperature
  - T4 135°C highest allowable surface temperature
  - T5 100°C highest allowable surface temperature
  - T6 85°C highest allowable surface temperature
- internal in the airstream
  - external outside the airstream

A warning notice is located on the equipment, which must not be removed:

**This equipment can convey a potentially explosive atmosphere!  
May be opened only by specialist personnel with suitable work materials!**

As an individual module, the RAC equipment, alone, cannot guarantee a complete and all-encompassing protection against explosion, as the protection concept must apply to the complete system.

The overall responsibility for explosion protection lies ultimately with the operator or the system manufacturer.

### 8.3 Avoidance of ignition sources

#### Ventilator

In a potentially explosive atmosphere, the ventilator may be operated only with the respective identification marking and authorisation for the deployment zone. For this, mechanically generated sparks, such as scraping of the running wheel with the inlet nozzle, must be avoided. This must be ensured through appropriate material combination and through a careful adjustment of the die gap. Furthermore, the maximum allowable ventilator turning speed may not be exceeded, as otherwise parts from the running wheel can loosen and possibly cause mechanical induced sparks!

**Under no circumstances should the ventilator scrape against the inlet nozzle! This can cause ignition sparking.**

The ventilator is to be continually monitored for vibrations. This can be achieved by an explosion protection designed vibration monitor (MSR), as appropriate, or through a daily visual check process. If vibrations are optically or acoustically perceivable, the equipment must be immediately taken out of service and the manufacturer notified.

#### Electrical components

All electrical components (e.g. electrical motors, lamps, switches, etc.) must possess with the respective identification marking and be authorised for the deployment category in order to be operated in a potentially explosive atmosphere.

Cabling must be carried out in accordance with the applicable standards. Overall, a proper potential equalisation must be warranted throughout the entire system so that static electricity can be eliminated as a source of potential ignition sparking.

As a rule, the frequency converter is not suitable for deployment in a potentially explosive atmosphere. It will be delivered as a loose component only and must not be deployed in a potentially explosive atmosphere.

#### Lightening protection

Roof control centres with Ex-protection, in particular, require the installation of proper lightening protection!

#### Hot surfaces

Depending upon the atmosphere, it must be noted that pipeline (e.g. for heaters) temperatures can reach up to 110°C. These temperatures can be sufficient to be an ignition source.

## 9 System Component Service & Maintenance Table

The prescribed service and maintenance intervals must be maintained in order to warrant a fault-free operation.

Service and maintenance are the basis for a warranty.

The application timeframe for the following points cannot be prescribed. Periodic service, maintenance and cleaning of the equipment depends upon the level of dirt and contamination. These interval guidelines apply to standard RAC systems under normal operating conditions. With heavy contamination or 24h operations, the intervals should be set at least 1 level shorter.

Check list for a hygienic operating method and maintenance of ventilation and air conditioning equipment							
	activity	measure (if necessary)	month				
			1	3	6	12	24

### 1 Chamber centre / Equipment housing (see Chapter 5.1)

1.1	All equipment chambers are to be checked for contamination, damage and corrosion	cleaning and repair			x		
1.2	Check the processes in free run-out	repair			x		
1.3	Check doors for leak-tightness and latches for freedom of movement	repair			x		
1.4	Check duct connection attachments for leak-tightness	repair			x		
1.5	Check for water build-up	cleaning, determine cause			x		
1.6	Check seals on doors for function	Replace			x		

### 2 Ventilator (see Chapter 5.2)

2.1	Check ventilator for contamination and damage	cleaning and repair			x		
2.2	Check bearing	re-lubricate (observe deadlines)		x			
2.3	Check the vibration damper for function	repair			x		
2.4	Check attachment bolts	re-tighten			x		
2.5	If problems are detected (noises), check ventilator and motor bearings	determine cause	For conspicuous problems				
2.6	If problems are detected (vibrations), check ventilator running wheel without the v-belt for out-of-balance condition	determine cause (the running wheel must come to a rest in any position)	For conspicuous problems				
2.7	Check thermistor for function	replace			x		

### V-belts (see Chapter 5.3)

2.8	Check the belt drive for contaminants, damage and wear	cleaning and repair		x			
2.9	Check for secure attachment of the complete drive	repair		x			
2.10	Replace the complete belt set		As required				
2.11	Check protection equipment for function	repair			x		
2.12	Adjust alignment of the motor and ventilator plates			x			
2.13	Check belt tension	re-tension		x			

### 3 Sound attenuator (see Chapter 5.4)

3.1	Check baffle for contaminants and damage	carefully cleaning or repair			x		
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### 4 Filter unit (see Chapter 5.5)

Check list for a hygienic operating method and maintenance of ventilation and air conditioning equipment							
	activity	measure (if necessary)	month				
			1	3	6	12	24
4.1	Check pocket type filters and frames for contaminants and damage	cleaning and repair			x		
4.2	Check filter seat for leak–tightness and visually inspect for damage	repair			x		
4.3	Check filter insert for obvious contamination, odours or leakage	replace		x			
4.4	Check differential pressure	replace filter insert when final resistance is reached		x			
4.5	Filter change at the latest 1st level			x		x	
4.6	Filter change at the latest 2nd level						x
Activated carbon filter							
4.7	Perform odour check	activated carbon filter cartridge to be replaced		x			

## Heat exchanger (see Chapter 5.6)

5.1	Allow the heat exchanger to cool down to the ambient temperature						
5.2	Check lamella-fins for contamination	cleaning and repair			x		
5.3	Check lamella-fins and piping for damage	comb out bent or warped lamella-fins			x		
5.4	Check heat exchanger leak-tightness	repair			x		
5.5	Check feed/return lines for function				x		
5.6	Check the frost protection for function	thermostat by means of coolant spray	at the start of the cooling period				
5.7	Check condensation drain at the cooling radiator	Cleaning			x		
5.8	Check siphon for function	clean and refill (at the start of the cold period)			x		

## Droplet separator (see Chapter 5.7)

6.1	Check droplet separator and condensate tank for contaminants and damage	when cleaning the droplet separator, remove the cartridges and lamella-fins (remove bio-film)			x		
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## Cooling system (see Chapter 5.8)

7.1	Clean lamella-fin surfaces	Evaporator and condenser			x		
7.2	Check compressor oil level	the oil should cover at least half of the viewing glass with the compressor switched off		x			
7.3	Check condensate drainage	clean (be aware of unusual odours or operating conditions)			x		
7.4	Leak test	By certified refrigeration specialists			x		

## Spray humidifier (see Chapter 5.9)

8.1	Decalcification of entire spray humidifier	add in the lime solvent to the circulation water and operate the circulation pump until the lime is dissolved. The entire spray humidifier must be subsequently, thoroughly rinsed			x		
8.2	Decalcification of the humidifier nozzles and nozzle fittings, under no circumstances may the nozzle bore holes be cleaned with hard	cleaning and repair			x		

Check list for a hygienic operating method and maintenance of ventilation and air conditioning equipment							
	activity	measure (if necessary)	month				
			1	3	6	12	24
	objects						
8.3	Check droplet separator and flow straightener	clean with water, decalcify and thoroughly rinse with water or clean with a steam jet-spray unit			x		
8.4	Check the water quality	check conductivity of the water	x				
8.5	Check float valve				x		
8.6	Check integrated siphon	cleaning			x		
8.7	Check the spray humidifier pump for fault-free running and water discharge	repair		x			

## Louver dampers (see Chapter 5.10)

9.1	Check louver dampers for contamination and damage (where geared drives are used, special attention should be given to clean toothing)	cleaning and repair			x		
9.2	Check mechanical function				x		
9.3	Check damper positioning motors for proper mounting and correct end-positioning	re-adjust			x		
9.4	Freedom of movement and leak-tightness of the dampers will be determined after decoupling the positioning drive	repair			x		

## Rotary heat exchanger (see Chapter 5.11)

10.1	Check rotation surface for air-side contamination and damage	adjust gasket seals, cleaning, repair		x			
10.2	Application oriented cleaning	(e.g. usage of compressed air or grease-dissolving cleaning agents)			x		
10.3	Check sealing strips for contamination, foreign objects and contact pressure	replace			x		
10.4	Check rotor bearing play, out-of-balance and lateral trueness			x			
10.5	Check drive elements			x			
10.6	Check minimum and maximum turning speed				x		
10.7	Check through the range of control				x		
10.8	Check turning direction				x		
10.9	Check motor bearing			x			
10.10	Check electrical connections				x		
10.11	Check gear mechanism leak-tightness				x		
10.12	Check v-belts	re-tension, shorten or replace		x			
10.13	Check regulating device control display function				x		
10.14	Check water drain and siphon for function	cleaning and repair			x		

## Plate heat exchanger

11.1	Check Plate heat exchanger and evtl. droplet separator for contaminants and damage	clean with compressed air or high-pressure cleaner (only water, without additives), carefully remove contaminated water			x		
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Check list for a hygienic operating method and maintenance of ventilation and air conditioning equipment							
	activity	measure (if necessary)	month				
			1	3	6	12	24
11.2	Remove any dry dust and fibre material at the exchanger intake	remove with vacuum cleaner	As required				
11.3	Check condensation drain and siphon	cleaning und evtl. refill			x		
11.4	at kitchen discharge air	remove oil and grease residue from kitchen discharge air with hot water and grease-dissolving cleaning agents	As required				

Recuperative energy reclamation – KVS system (see Chapter 5.13)

12.1	Check pumps for damage, attachment, function and noise				x		
12.2	Check fixtures for damage, leak-tightness and function				x		
12.3	Check dirt collector screen for damage	cleaning			x		
12.4	Check pipeline system for damage, leak-tightness and attachment				x		
12.5	Check fluid level	refill		x			

Burner chamber (see Chapter 5.14)

13.1	Dismantle burner chamber. Using a suitable light source, check burner chamber for contamination, damage and leakage	damaged burners must be put into service			x		
13.2	After cleaning downstream heating surfaces, vacuum clean the burner chamber	cleaning			x		
13.3	Check flame pan for damage	in the event of damage or deformation, restore or replace. For this, the burner plate and cylinder cover must be dismantled.			x		
13.4	Remove inspection cover plate and cleaning cover from burner chamber. Remove all turbulators and check general condition	in case of heavy corrosion, replace individually or completely.			x		
13.5	Clean all downstream heating surface pipes with a stainless steel brush and vacuum clean the collector tank	cleaning			x		
13.6	Check de-watering equipment	cleaning			x		
13.7	Subsequent to burner chamber cleaning, carry out burner service and maintenance in accordance with burner manufacturer's directives.				x		
13.8	Determine exhaust gas value.				x		
13.9	Check gas line, connections and gas control path for leak-tightness	re-seal			x		
13.10	Check regulating and safety devices				x		
13.11	Check bypass and burner chamber dampers				x		

Gas surface burner (see Chapter 5.15)

14.1	Check gas line, connections and gas control path for leak-tightness	re-seal			x		
14.2	Remove any dirt particles from the burner with a brush; ensure that all air holes are free	cleaning and repair			x		
14.3	Check gas discharge openings	clean with nozzle needle. Do not come in contact with ignition or control devices			x		

Check list for a hygienic operating method and maintenance of ventilation and air conditioning equipment							
	activity	measure (if necessary)	month				
			1	3	6	12	24
14.4	Check ignition electrode gaps	adjust		x			
14.5	Unscrew control monitor (UV cells or ionisations rod), clean with a soft cloth and re-install. Replace if discolouration is detected	cleaning and repair		x			

## 15. Control Systems (see Chapter 5.17)

15.1	Check all components for a proper and functionally correct installation				x		
15.2	Check all components for dirt, corrosion or damage	clean to maintain the function			x		
Switchboard, Control panel, Control							
15.3	Check guards for completeness				x		
15.4	Check connections for electrical and mechanical functions	tighten (torque wrench)			x		
15.5	Check functional elements (e.g. operating and display devices)	adjust, tighten			x		
15.6	Check input signals for accordance with desired value	synchronize signals			x		
15.7	Check optical and acoustic monitoring equipment	replace			x		
15.8	Check contactors and relays for wear and damage (e.g. contact erosion)	replace			x		
15.9	Check switching and control procedures (e.g. frost protection)	spray with cold spray			x		
15.10	Check safety devices (e.g. thermal release)	replace			x		
15.11	Check settings of switchboard components (e.g. time relay)	readjust			x		
15.12	Check manual, automatic and remote control function	readjust			x		
Sensors / Safety devices							
15.13	Check connections for electrical and mechanical functions	readjust, regenerate			x		
15.14	Measure and log the physical parameters at the measurement site				x		
15.15	Check electrical, electronic and pneumatic measuring signals	readjust, regenerate			x		
Controller / Additional modules							
15.16	Check own power supply (e.g. batteries, accumulators)	replace			x		
15.17	Check connections for electrical and mechanical functions	tighten (torque wrench)			x		
15.18	Check functional elements (e.g. operating and display devices)	adjust, tighten			x		

Check list for a hygienic operating method and maintenance of ventilation and air conditioning equipment							
	activity	measure (if necessary)	month				
			1	3	6	12	24
15.19	Check electrical, electronic and pneumatic input signals (e.g. sensors, remote dial, reference variable)	synchronize signals			x		
15.20	Check controller function and control signal	adjust			x		
15.21	Check control loop according to setting parameters, taking into account all additional functions	adjust			x		
Actuators							
15.23	Check electrical, electronic and pneumatic input signals and working range	readjust			x		
15.24	check position indicator, limit indicator and limit switch for function	readjust			x		
Software							
15.25	Run Backup				x		
15.26	Keep recently created program and copies of data	update system, if problems			x		

The present installation, operating and maintenance manual is an aid for installation. It is based on many years of experience and should help you to avoid typical installation errors. It is in no way a substitute for the necessary technical knowledge. Use of the manual does not relieve the persons involved of responsibility for their own professional judgement.

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