

Swegon **SILVER M**TM

Manual for installation, operation and maintenance

2011-03-22



Swegon[®]

Contents

1. General	3	5. Commissioning & Operation	17
1.1 Intended utilisation	3	5.1 Housing/Units	17
1.2 Hazards	3	5.2 Fan	17
2. Safety	4	5.3 Belt drive (fan)	18
2.1 Safety regulations	4	5.4 Sound attenuator	18
2.2 Safety instructions	4	5.5 Filter	18
3. Storage and Transport	5	5.6 Water coils	19
3.1 Storage, intermediate storage	5	5.7 Droplet separator	20
3.2 Installation-site transport	5	5.8 Cooling system	20
4. Installation	7	5.9 Humidifier	21
4.1 Foundation/Base frame	7	5.10 Louver dampers	21
4.2 Equipment installation	7	5.11 Rotary heat exchanger	22
4.3 Structure-borne noise insulation	7	5.12 Plate heat exchanger	22
4.4 Potential equalisation/Grounding	7	5.13 Coil heat exchanger	22
4.5 Frost protection	8	5.14 Direct lighted burner	23
4.6 Equipment attachment	8	5.15 Gas surface burner	23
4.7 Fan installation/removal	8	5.16 Cleaning	24
4.8 Motor protection	9	5.17 Control equipment	24
4.9 Electrical connection	9	6 Decommissioning	25
4.9.1 Connecting three-phase motors	10	6.1 Decommissioning	25
4.9.2 Wiring with frequency converters	14	6.2 Dismantling and disposal	25
4.10 Pocket type filter	15	7 Emergency Measures	25
4.11 Water coils	15	7.1 Fire prevention	25
4.12 Droplet separator	15	7.2 Leakage of harmful substances	25
4.13 Steam heater	15	8 Explosion Protection	26
4.14 Refrigerant line	15	8.1 Service, maintenance and repair	26
4.15 Air ducts	15	8.2 Identification marking	26
4.16 Drainage	16	8.3 Avoidance of ignition sources	26
4.17 Gas surface burner	16	9. Maintenance	27
4.18 Direct lighted burner	16		

This document was originally written in German.

1. General

1.1 Intended utilisation

The air handling unit may be used only for ventilation and air handling. This applies to air filters, heaters, coolers, humidifiers, dehumidifiers and conveyors. Any other usage is specifically prohibited.

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

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, 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: Explosion protection).

Hazard due to vibrations

Every rotating device has a critical turning speed range.

When operating in its range of resonance, the air handling 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 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 operating Instructions must be read carefully prior to installation and commissioning by installers, commissioning and operating personal. Only through adherence to this manual 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 airhandling system and may be operated only after installation of the entire system.

2.2 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 authorized specialist in accordance to national regulations.

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 handling 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 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. Storage and Transport

3.1 Storage, intermediate storage

Assembly components must be cleaned prior to being put into storage, in particular drilling chips must be removed.

The equipment, assembly components, units and accessory parts must be protected from the weather, humidity, dust and damage. The open sides and equipment openings must be sealed with foil as protection from contamination.

Please be aware that the foil covering, which is placed on the galvanised sheet metal, can lead to damage (white rust) on the tin surface due to condensation water. Complete coverage with foil should be avoided as far as possible or, as necessity demands, used only together with suitable spacers between the sheet metal.

Assembly components must always be stored on a level surface with a secure positioning. They should not be tilted, stored upside down or stacked on top of each other. Assembly components should be placed on pallets or on timber beams under each corner with, if the width is over 2.0 m, an additional beam in the middle.



No foreign components / small parts should be stored in or on the assembly components. Movable components, such as the ventilator, rotary heat exchanger, doors, etc., should be secured against unintentional movement. Assembly components may not be stored in the danger areas from other machines.

3.2 Installation-site transport

General

Equipment components are to be inspected for transport damage immediately upon delivery with annotations made on the delivery slip as appropriate. Damaged, which is not annotated, cannot be taken into consideration.

Possible loose components in or on the transported unit must be removed or secured without fail. Do not climb unsecured onto the equipment and do not deposit anything on top of the equipment. Equipment components may not be transported on their side or or turned upside down. If an equipment component must be tilted for a specific reason, then only on a free side and never on a

side with a cover or door. The ventilator module must never be tilted, as the ventilator shaft must always be situated horizontally.

During transport, particular attention must be given to all register connections, protruding parts, such as door handles, electrical attachments and openings in the flooring in order to prevent damage.

Equipment components may be moved or transported only with suitable transport tooling. Assembly component weights should be checked prior to transport. Secure the transport path. It is prohibited to be present underneath the load.

System components are to be transported only with closed doors.

Transport with forklift

The forks must completely underlie the assembly components to be transported. The forks must be at least 100mm longer than the width of the equipment. Forks, which are too short, will cause damage to the sheet metal flooring. The center of gravity must lie between the forks and towards the forklift side in order to avoid tipping of the components.



The equipment components must be lifted carefully, so that the forklift can be driven into the transport vehicle.

Transport with crane

Only those cranes, load attachment devices, rigging, etc. may be used for the transport of equipment components, which are suitable and approved.

The lift rig must not be able to damage the assembly.

The crane eye-lugs prescribed for transport by crane are to be used only up to their specific weight limit. For larger or heavier pieces of equipment, base frame eye-lugs should be used. Check to determine if the crane eye-lugs have loosened during transport. The crane eye-lugs must be securely threaded to their stops.

The crane eye-lugs on outdoor units must not be removed, otherwise water proofness of the roof can not be guaranteed.

For all other installations, where the crane eye-lugs are removed, the delivered packings should be mounted. Also by two-sections units, the packings should be mounted on the lower section.

With crane transport, the attachment angle must not be less than 60°. As an alternative, cross-beams can be used. The load must be symmetrically distributed in order to prevent slipping or tipping.



Lifting from the transport vehicle or the ground must be undertaken slowly and carefully. Jerking movement must be avoided.

Transport with hand lift truck

When transporting with a hand lift truck the forks must completely underlie the assembly components to be transported. In the event the equipment is larger than the hand lift truck, a second hand lift truck/forklift should be used for transport.



Transport on iron rail/wood beams

It must be ensured that the equipment profile is securely positioned on the transport devices.

The transport media support surface must not be able to cause damage to the equipment.

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. Irregularities can result in door-twisting, leading to possible leaks and surface abrasion.

The support surface must be in horizontal level, in order that draining of coils and trays 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.

For strip foundations, with equipment widths of over 2.0 m, cross-beams are also required under the equipment start and ending, as well as under the component section 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/m² 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 mid-section!

4.2 Equipment installation

Accessibility for repair and service work must be warranted.

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

External installation

It must be observed that the roof frame is insulated, as condensation build-up can occur!

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.

Finally seal the gap on the inside of the unit between the casing sections with elastic sealing compound.

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

4.3 Structure-borne noise insulation

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

Foundation

In order to obtain structure-borne noise and vibration insulation, the appropriate base supports (e.g. elastomeric stripping) must on site 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.

Ducting

The equipment is to be installed 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.

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.



- The bolts can then be secured. The modules should be connected with the threaded connections.



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 tracks on the equipment component.

- For larger equipment depth, the modules should be connected with additional centring threaded connections.
- For large pieces of equipment, the square frames 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.

- Winch the equipment components together until they are positioned exactly together
- Do not pull the equipment components together with the attachment bolts. Deformation hazard!

4.7 Fan installation/removal

Dismantling tracks with individual designs can be delivered as accessories for the installation and removal of the motor or fan, 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 to national regulations.

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 authorized 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.

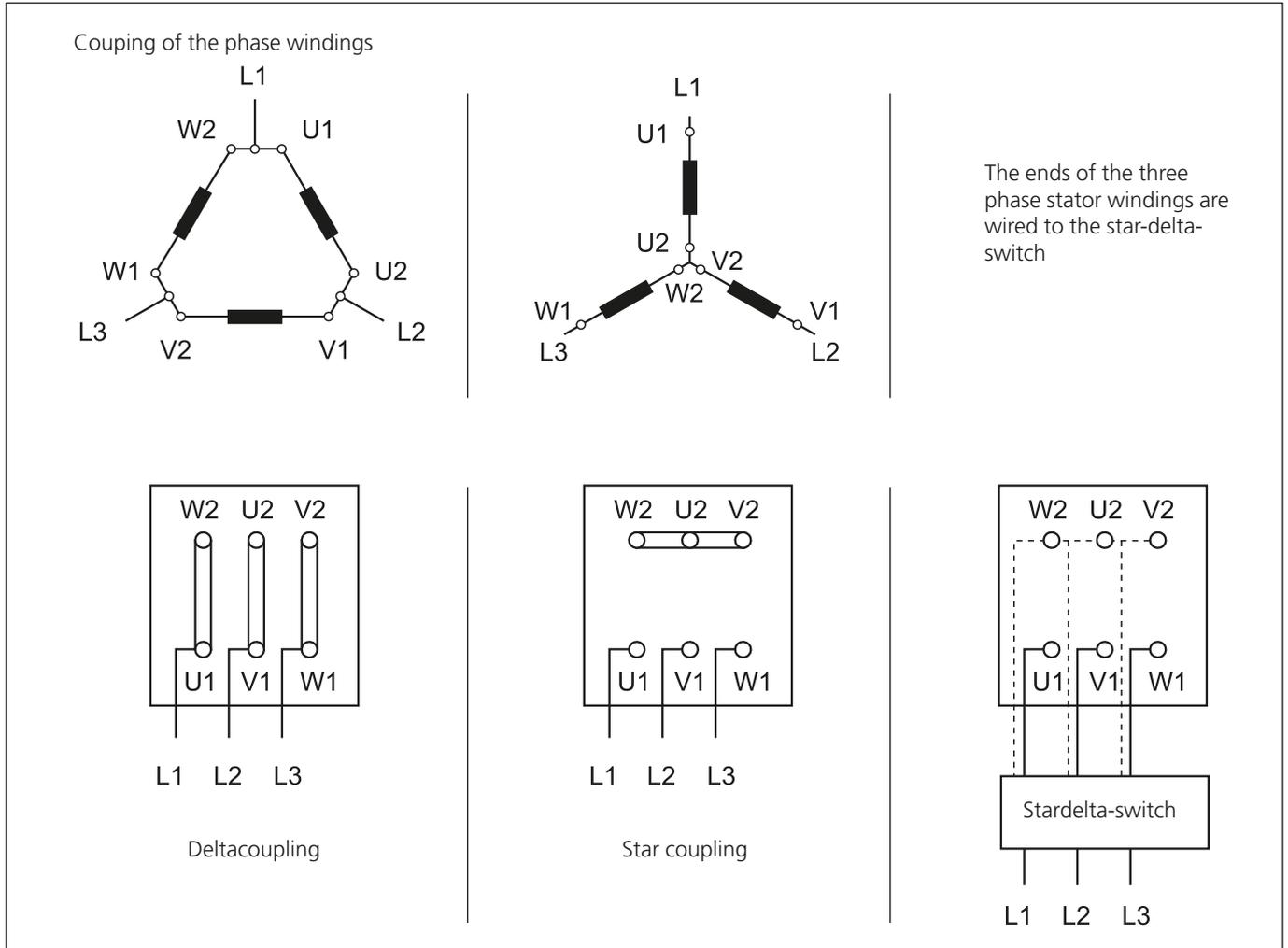
All electrical cables, which run throughout the housing, must be affixed and prevented from being damaged.

4.9.1 Connecting three-phase motors

Important!

Do not switch directly to the upper speed. The wiring diagram in the junction box must be observed for the motors with PTC resistance or thermostatic contacts.

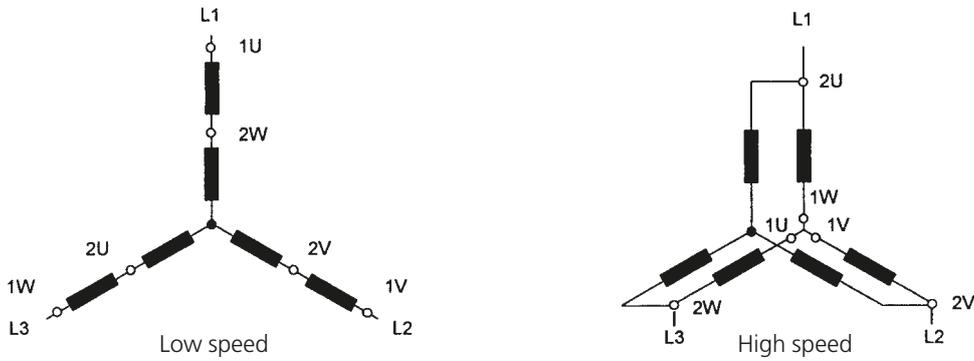
Couplings for one speed:



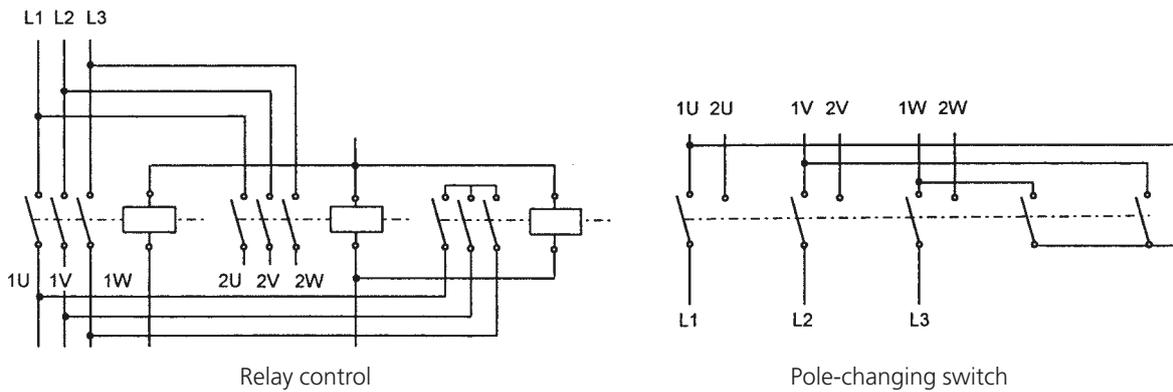
Coupling for two speeds with a ratio of 1 : 2 (stator winding in Dahlander coupling)

Version for e.g. 1500/3000 r/min. and 4/2 poles respectively, or 750/1500 r/min. and 8/4 poles respectively.

On the Dahlander-wound motors, the six stator winding ends 1U, 1V, 1W and 2U, 2V, 2W are connected to the six terminals in a normal junction box.

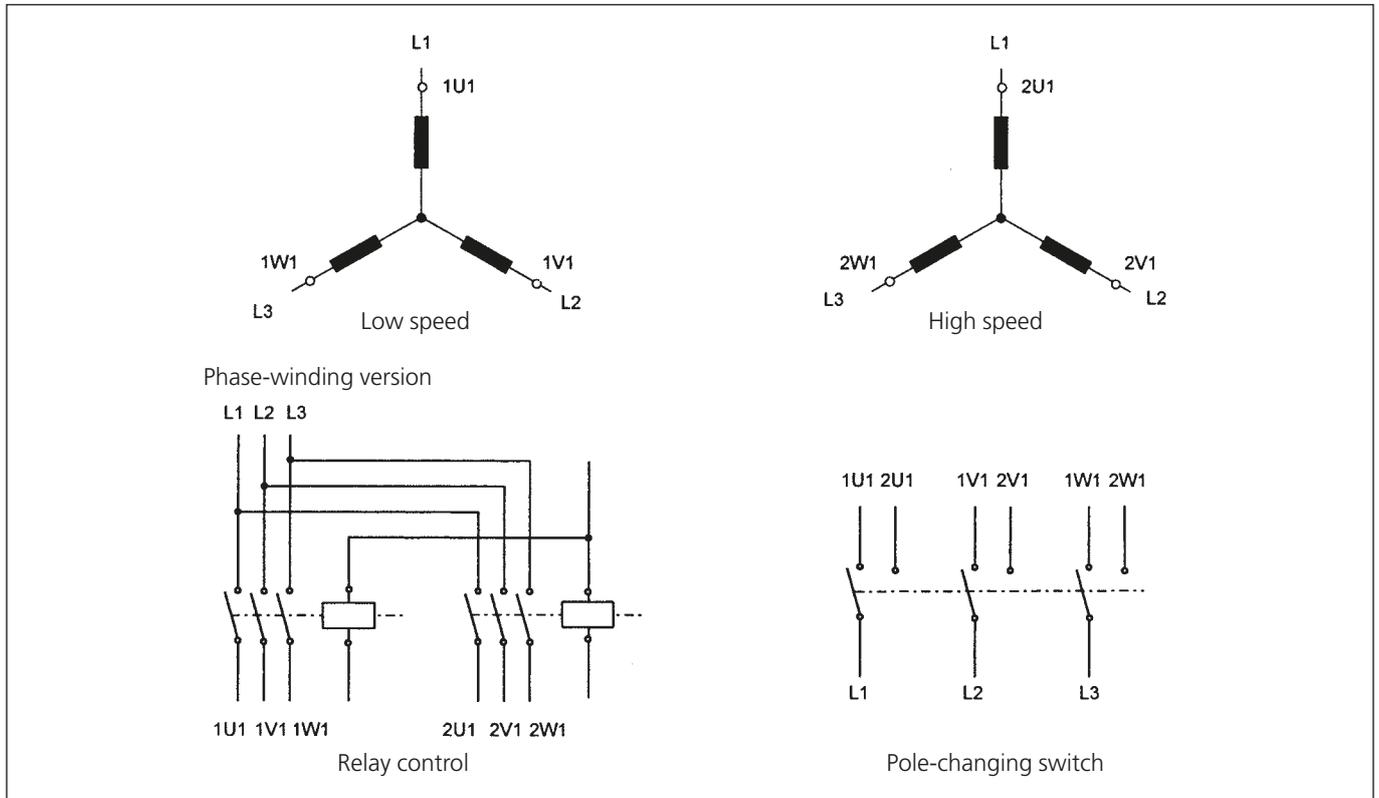


Phase-winding version for one output step equivalent to one torque sequence for fan motors



Coupling for two speeds (two separate stator windings)

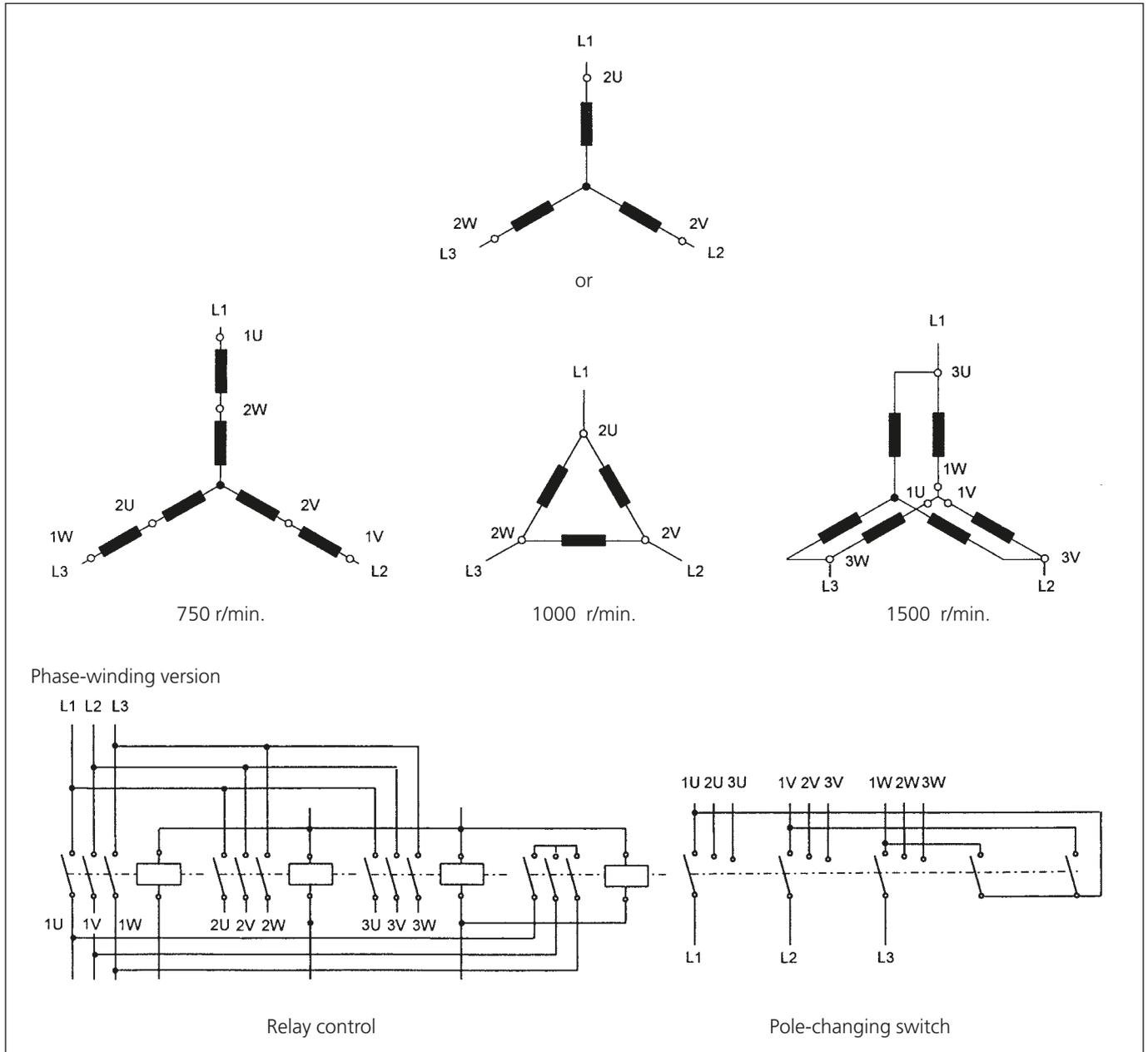
Version e.g. for 1000/1500 r/min. and 6/4 poles, or 750/1000 r/min. and 8/6 poles respectively.



Couplings for three speeds

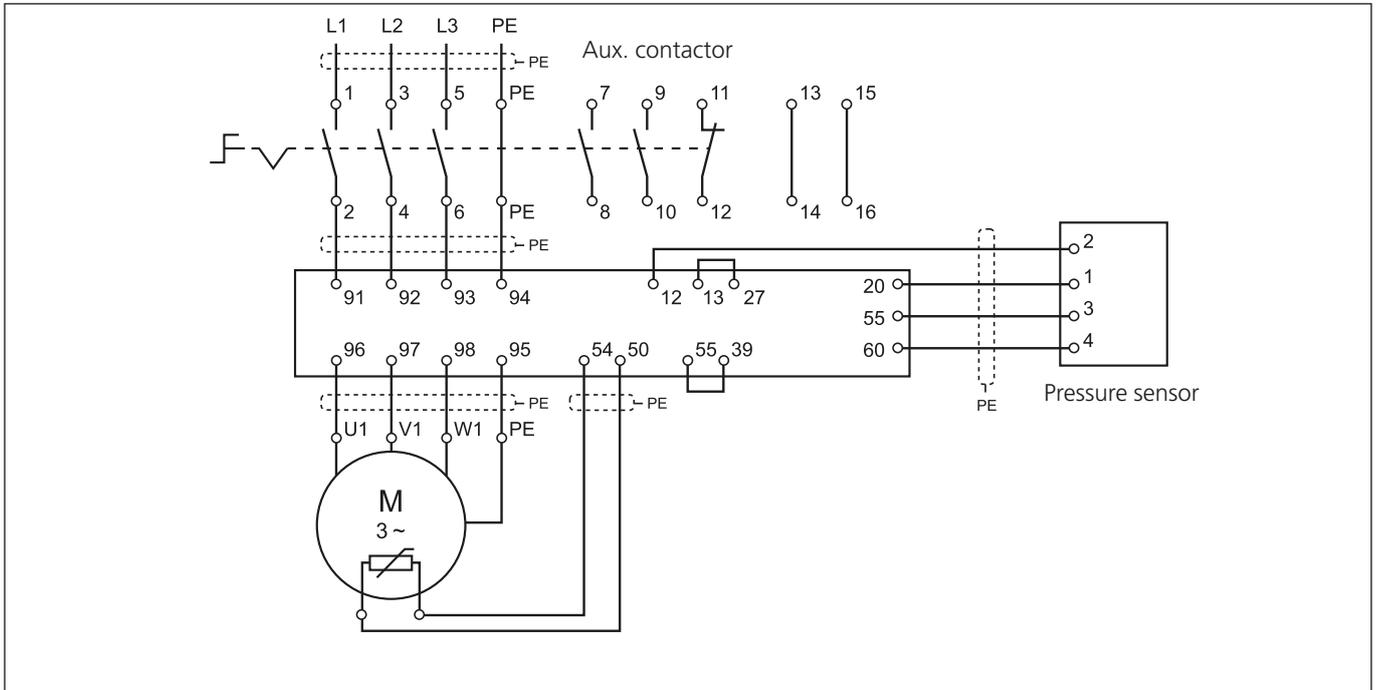
Two separate stator windings one of which is Dahlander wound) Nine terminals are required here.

Version for 750/1000/1500 r/min. fan drives and 8/6/4 poles respectively; 750/1500 r/min. in Dahlander coupling.



4.9.2 Wiring with frequency converters

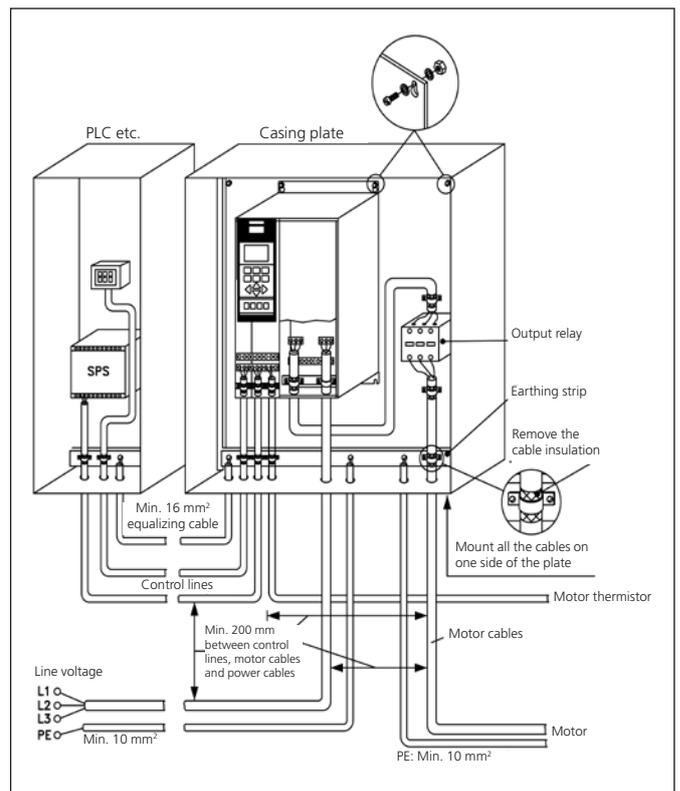
Typical wiring diagram:
 Frequency converter with load measuring device, safety switch and PTC resistor.



Consider the following if frequency converters are used:

1. The fan motor must be designed for operation with a frequency inverter.
2. The motor must be protected against overloading and heating; i.e. have a PTC resistor, for instance. A switch-type motor protection with bimetallic trip is not appropriate.
3. Shielded motor – PTC resistor cables must be run to the frequency inverters.
4. The motor and fan must absolutely not exceed the max. permissible speed.
5. In other respects, we refer to the maintenance instructions from each individual manufacturer of frequency inverters.

Example: EMC-compatible installation



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 Water coils (heating, cooling, heat exchanging)

Water coils is to be connected only in counter current flow, as otherwise its performance can no longer be guaranteed.

Supply 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 „Supply line“, „Return line“ markings. Prior to making a connection, check sign positioning with respect to the drawing and its function.

Flanges, connections and supply/return line shut-offs are to be arranged in such a manner that the water coil 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 coil 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!).

If using a mix of glycol and water, copper pipes are to be used for all piping, not steel.

4.12 Droplet separator

The detachable cover panel 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

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

The guidelines from the chapter “Water coils”, should be observed.

Prior to making connection, check to determine if the factory filled evaporator gas is still pressurised.

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 coils following normal drainage. For safety reasons, the coils must additionally be purged with compressed air.

4.15 Air ducts

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

In every situation where water build-up can occur during operation, a siphon is to be installed 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.



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

Every siphon must empty freely over a collector line funnel.



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

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

The drainage pipes 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 as well as local and national regulations, must be adhered to.

4.18 Direct lighted burner

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 burner must be built in with a natural incline towards the condensation drain. Condensation water must not remain inside the heater coil, and the condensation drain must not be blocked.

The secure temperature limiter must be mounted 500-1000 mm after the heater in the air direction.

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

When installing the equipment, possible requirements from the certifying authorities as well as local and national regulations, must be adhered to.

5. Commissioning & Operation

5.1 Housing/Units

General

Before opening the doors, the fan 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 national 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 this manual, and who have been instructed in the handling of a fan.

These operating instructions are to be permanently maintained at the on-site location of the air handling 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. Check all flanges and boltings.

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.

5.2 Fan

Commissioning

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

- Connection to the ducting system in place.
- Extract air and supply air lines open.
- Transport protection has been removed.
- Ducting system and equipment chamber free of foreign objects and contaminants.
- Fan wheel checked for freedom of movement by manual spin-up.
- All inspection doors are closed.
- V-belt tension checked.
- If using frequency converter, max number of revolutions on the type plate must be observed.



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

Check the 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 the fans 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.

Removal from service

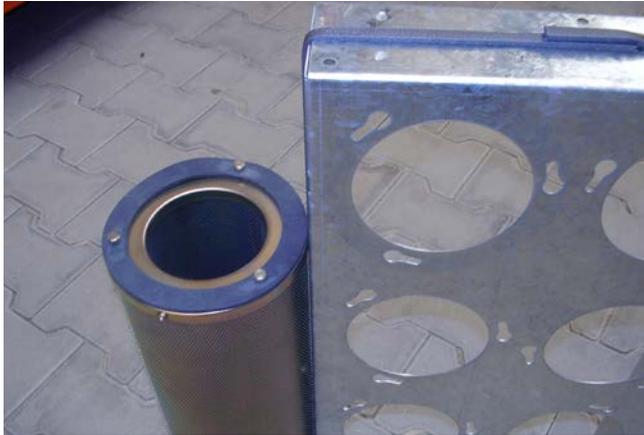
For lengthy periods of downtime, the ventilator should be turned 1x per month in order to prevent one-sided loading of the bearing.

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.

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 Water coils

General

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

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

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

Clean the coil 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 soft 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 coil.

Check to ensure the proper connection of the supply/return lines.

Give heed to counter current flow.

When the system is being filled, the coil is to be carefully bled once it has reached the highest point of the system.

An improperly bled coil 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/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 temperature close to the air handling unit can go below 5°C, the frost protection sensor must be built-in, or outside capillary frost protection 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.

Removal from service

The coil 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 coil 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, 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.

5.8 Cooling system

General

Because the cooling components in the air handling unit 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 national regulations!

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

Service and maintenance should be carried out in accordance to the manufacturers instructions and national regulations.

5.9 Humidifier

General

Switch on the pump only if the tray is 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), at least corresponding to drink water quality. Furthermore, make sure that condensation water is not recirculated to the drink water net.

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

Removal from service

The tray, pump and fixtures must be completely emptied for longer periods of standstill.

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.

5.11 Rotary 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 rotor must turn from the extract 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.

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 extract 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.

5.13 Coil heat exchanger

General

Commissioning, service and maintenance work is to be carried out in a interconnected-circulation system according to guidelines found in the chapter, "Water coils".

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 coils 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 extract air coil lamella-fins at low temperatures, it is necessary to reduce the transmission capacity below the freezing point limit.

5.14 Direct lighted burner (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 and national regulations.

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 extract 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 can not be altered

(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. 110°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.

5.15 Gas surface burner

General

The ambient air CO₂ content must not exceed the locally or national 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.

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 sensor position is located ca. 3m behind the gas burner in the roof area.

Establish operational readiness

- Bleed the oil and gas lines.
- Check setting values on the safety temperature limiter. Rated value: ca. 60°C
- Bring burner into service. The supply and extract air fans must be in operation.

5.16 Cleaning

Appropriate cleaning agent should be used according to the material of the components.

Following material is used as standard:

Housing	Panels, doors, framework	Sendzimir galvanised steel with Anti-Finger print coating
Damper	Damper blades	Warmgalvanised steel
Cooler, humidifier and more	Drainpan	Stainless steel
Heating coils	Fins Pipework	Aluminium or Cupper Cupper
Cooling coils	Fins Pipework	Aluminium or warmgalvanised steel Warmgalvanised steel
Cross flow plate and rotary heat exchanger	Channels	Aluminium

5.17 Control equipment

Beside these general instructions also apply to the instructions from the manufacturer.

General

All installations should be made not blocking or interfering inspection doors or function parts. All electrical connections are to be made in accordance with valid international, national and local regulations and guidelines.

Commissioning

Commissioning are to carried out by authorized personel.

- Check that all equipment is properly mounted.
- Check power supply to the electrical cubicle.
- Check that components work properly.
- Configure control functions and monitoring in accordance to the project plan.
- Make necessary settings and adjustings..
- Check programming.
- Check all safety functions.
- Educate operation&maintenance personel.

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:

- Shut off the energy supply (electrical lines and all media).
- Drain all fluid from coils and pipe system.
- After three weeks water coils should be blown through with pressure air to secure that no fluid is left.
- For equipment with an integrated control cabinet, control cabinet heating should remain switched on.
- Existing dampers must be closed.
- Remove contaminated filters.
- De-water the humidifiers.
- Regarding large fans decommissioned for a lengthy period, if these are not occasionally rotated, bearing damage can be expected. In order to avoid bearing damage, the fans are to be rotated once a week.
- If decommissioning lasts longer than four weeks, v-belts should be removed.
- 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 components and operating media (e.g. oils, refrigerant, brine) are to be disposed or recycled in accordance to national regulations.

7. Emergency activities

7.1 Fire prevention

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

If the air handling 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 air handling system possesses a very low fire and smoke load.

None-the-less, toxicologically critical substances may develop. Additionally, smoke related gases from the equipment can be discharged into the control room.

For this reason, appropriate 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.

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

Fan

In a potentially explosive atmosphere, the fan 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 fan 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 fan turning speed may not be exceeded, as otherwise parts from the fan wheel can loosen and possibly cause mechanical induced sparks!

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

The fan is to be continually monitored for vibrations. This can be achieved by an explosion protection designed vibration monitor, 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 be repaired.

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.

Wiring 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 Explosion protection, in particular, require the installation of proper lightening protection!

Hot surfaces

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

9. Maintenance

The prescribed service and maintenance intervals must be maintained in order to warrant a fault-free operation. Service and maintenance is the basis for a warranty. These interval guidelines apply to standard air handling systems under normal operating conditions. With heavy contamination or 24h operations, the intervals should be set at least one level shorter. If using detergent, it must be harmless to the construction material.

	Activity	Action	Months				
			1	3	6	12	24
1 Housing/Units							
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 sealings by doors and between modules	Replace if required			x		
2 Fan							
2.1	Check fan 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 fan and motor bearings	Determine cause	For conspicuous problems				
2.6	If problems are detected (vibrations), check fan wheel without the v-belt for out-of-balance condition	Determine cause (the fan wheel must come to a rest in any position)	For conspicuous problems				
2.7	Check condition of the internal thermal element	Replace if required			x		
Belt drive							
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							
3.1	Check baffles for contaminants and damage	Carefully cleaning or repair			x		
4 Filter							
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 pressure drop	Replace filter insert when final pressure drop is reached		x			
4.5	Filter change at the latest 1st level			x		x	
4.6	Filter change at the latest 2nd level						x
Carbon filter							
4.7	Perform odour check	Activated carbon filter cartridge to be replaced		x			

	Activity	Action	Months				
			1	3	6	12	24
5 Water coils							
5.1	Allow hot coils to cool down						
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 leak-tightness of the coil	Repair			x		
5.5	Check supply/return lines for function				x		
5.6	Check the frost protection for function	Thermostat by means of coolant spray	Before start of the cold period				
5.7	Check condensation drain at the cooling coil	Cleaning			x		
5.8	Check siphon for function	Clean and refill (at the start of the cold period)			x		
6 Droplet separator							
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		
7 Cooling system							
7.1	Clean lamella-fin surfaces				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		
8 Humidifier							
8.1	Decalcification of entire 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 objects	Cleaning and repair			x		
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 humidifier pump for fault-free running and water extract	Repair		x			
9 Louvre dampers							
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				x		

	Activity	Action	Months				
			1	3	6	12	24
10 Rotary heat exchanger							
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 device			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		
11 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		
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. nachfüllen			x		
11.4	By kitchen extract air	Remove oil and grease residue from kitchen extract air with hot water and grease-dissolving cleaning agents	As required				
12 Coil heat exchanger							
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			

	Activity	Action	Months				
			1	3	6	12	24
13 Direct lighted burner							
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		
14 Gas burner							
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 extract openings	Clean with nozzle neele. Do not come in contact with ignition or control devices			x		
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			

	Activity	Action	Months				
			1	3	6	12	24
15 Control equipment							
Checking should be made the first time after 6 months in operation, thereafter at least byt intervals of 12 months.							
Electrical cubicle, control functions, user terminals							
15.1	Check that all equipment is properly mounted.	Fix if required			x		
15.2	Check all equipment regarding contamination, corrosin and damage	Clean and repair/replace			x		
15.3	Check safe protections				x		
15.4	Check all connections and fastenings	Fix if required			x		
15.5	Check the function of all movable equipment, i.e. damper motors, pumps etc	Fix if required			x		
15.6	Check the function of all sensors and safetey arrangements, i.e. frost protection and safety valves	Fix if required			x		
15.7	Check terminals and read off components	Fix if required			x		
15.8	Check settings, i.e switch clock	Fix if required			x		
Set values, regulation functions							
15.9	Measure and check input signals according to set values	Fix if required			x		
15.10	Measure and check electric, electronic and pneumatic signals and functions	Fix if required			x		
15.10	Measure and check physical values, i.e. temperatures, air flows etc	Fix if required			x		
15.11	Set up a protocol				x		
Mjukvara							
15.12	Make backup/safety copy				x		
15.13	Check if updatings are available	Update			x		