



INSTALLATION, OPERATION AND MAINTENANCE MANUAL

Troubleshooting

Introduction

GENERAL

This document provides advice and guidance to aid the installation, operation and maintenance of air handling units. Manufactures a Quality product tailored to our customer's requirements. However, the installation, operation and maintenance procedures described in this document must be followed in order to obtain optimum performance and prolonged service life.

These instructions are for standard products. For specific contract details refer to the General Assembly Drawing and Electrical Wiring Diagrams provided with the unit. A number of national and local safety regulations are mentioned. Strict compliance with these regulations is the users responsibility. Special attention should be paid to electrical wiring systems and safety devices required for pressurizing or depressurizing the air handling unit.

This manual should be read thoroughly before installing, commissioning or operating the unit.

Installers should pay particular attention to the paragraphs headed **WARNING**, **CAUTION** or **NOTE**. The aim of paragraphs headed **WARNING** or **CAUTION** is to identify hazards, which could lead to injury or damage to the unit. Paragraphs headed **NOTE** serve to alert installers to dangers, which could arise if the procedure is not followed.

DESCRIPTION

ALT SERIES

Consisting of an assembly of 25, 50 mm self-supporting panels, which are manufactured from electro galvanized sheet steel with regular modified polyester paint enclosing high density 40 Kg/m³ polyurethane foam (thickness 25, 50 mm), this range meets the majority of configurations.

The external supporting structure of the panels provides for a perfectly smooth internal surface, which meets cleanliness standards required in various industrial applications (food, health, pharmaceutical and electronic products).

An anti-thermal bridge solution has been developed for applications where the difference between the internal and external temperatures results in excessive heat loss or the risk of surface condensation. This is achieved by inserting section of pvc into the panels thereby preventing any contact between internal and external metal parts.

FLEXIBILITY

To ensure maximum ease of installation and assembly, our range of AHUs is based on a modular system. Our units can be supplied as one or more modules. The size of these modules can be designed to suit your site requirements. Where existing premises are being renovated or air-conditioned, these unit can be supplied in kit form.

EASE OF MAINTENANCE

All sings relating to operation and maintenance as well as danger signs are provided. Wiring diagrams for the motors are secured to the motor terminal blocks.

The unique method of assembly permits the easy removal of all the panels from the outside,thereby allowing access to internal components, in addition to the normal access doors.

OPTIONS

FACTORY-FITTED INTEGRATED CONTROL SYSTEM

A factory-fitted electrical switch cabinet houses the isolating switch, transformers, circuit breakers and contactors. This electrical switch cabinet can be integrated directly into the AHU unit.

All sensors, valves and actuators are factory-fitted enabling the unit to be installed and commissioned as soon as it is delivered.

An optional display module, complete with keyboard, allows access to the data from a single air handling unit or from the total air conditioning installation. This data may also be accessed from a PC or a terminal.

NOTE: A detailed description of the necessary control systems is required.

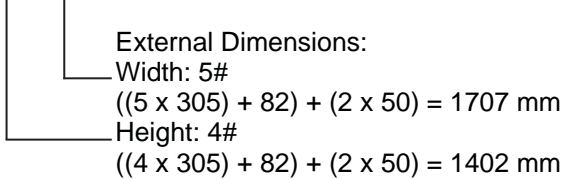
NOMENCLATURE

• **ALT SERIES**

ALT range have the following internal dimensions:

- Height = 305 mm
- Width = 305 mm
- Base = 82 mm

ALT 40 X 50



ACCEPTION

SHIPMENT

Depending on their size, and the number of functions they provide, the units air shipped in one length per module to allow standardized shipment.

For units whose width is equal to or greater than 2452 mm, the total length of the module cannot exceed 2400 mm.

The units are ready to be installed, assembly and then connected to the fluid, hydraulic and electrical supplies.

Accessories (or optional components), where not factory fitted, are supplied in separate packing units placed inside the modules.

ACCEPTANCE INSPECTION

All units leaving the manufacturer factory are prepared for shipment and packed. Once the unpacking operations have been terminated, a careful inspection of the unit and its components should be carried out to ensure that no damage has occurred during transport and shipment.

Always check the following:

- Panels and access doors held in position.
- Any signs of impact on the frames.
- Any signs of impact on the paneling.
- Coil connectors in good condition.
- Internal components held in place (fitter frame, coil fin separator plates etc...).
- Looking devices for fan motor units in good condition.

After inspecting the unit thoroughly, and before proceeding with the final installation, check that the installation conforms to the drawing of the unit as ordered.

Check that each of the modules is numbered from 1 ton and bears an arrow indicating the direction of airflow.

INSPECTION OF NON FACTORY-FITTED ACCESSORIES

Check the packing list for accessories which have not been factory-fitted (the packing list is found in the fan module).

Check that the number of accessories matches the packing list (the packing list indicates the module in which the accessories are stored).

Any missing parts must be reported to manufacturing within 10 days of delivery.

NOTE: Manufacturer is not responsible for any damage to or loss of accessories during shipment and unloading. Unpack and inspect carefully after unloading the units. If an impact mark can be seen, note this on the carrier's delivery note and ask the carriers to send a representative of his insurance company to inspect the damaged units. These observations can be communicated directly to the person delivering the equipment or by telephone but must always be confirmed in writing.

UNIT STORAGE

SHORT-TERM STORAGE

Short-term Storage relates to units supplied by your agency, the final installation of which will take place within less than 6 months. The minimum precautions to be taken during this period are as follows:

If the units are stored outside, special care must be taken to protect the units from dust, rain, snow and rodents. The units should be protected effectively from constant exposure to rain and snow.

CAUTION: If none of the above precautions are taken units not under any circumstances be stored outside for more than 48 hours.

Store the units on a flat site to prevent damage to the frame and panels.

The units must also be protected at ground level to prevent damage to the box section and the various protruding parts (manifolds, etc.) by vehicles or site personnel.

LONG-TERM STORAGE


Long-term storage relates to units supplied by your agency, the final installation of which will take place in 6 months or more. If long-term storage is planned or foreseeable, inform your agent when placing the order to obtain information and recommendations specific to long-term storage. A list of precautions and measures to be taken periodically during long-term storage will be sent to you. It is advisable to protect effectively all rotating and mechanical parts of the components included in the unit (fan bearings, motors, seals on all openings etc).


NOTE: The instructions for long-term storage must be adhered to otherwise manufacturer will not accept any responsibility even if problems arise during the warranty period. The standard warranty is for 12 months from commissioning but not exceeding 18 months from delivery of the units. However, in the case of long-term storage, commissioning and optimization of the air-conditioning system should take place within 24 months of delivery to validate the warranty.


NOTE: Failure to observe the long-term storage instructions will invalidate the warranty with immediate effect.


SAFETY


The air handling units are designed to provide a good level of safety and reliable operation. To prevent any accident resulting in injury or damage to the unit during operation, observe the following:


 **WARNING:** CHECK that the module and its components are well secured so as to avoid any problem during the maintenance and in particular the lifting of the unit so that the operation can take place in complete security. Refer to the specific instructions on this point in this guide.


 **WARNING:** NEVER enter a fan section or remain in the air handling unit while the fan is operating.

 **WARNING:** If a fire damper is supplied, a safety control should be fitted to stop the fan when a fire has been detected, thereby avoiding any rises in pressure or pressure drops.

 **DISCONNECT** the electricity supply to the fan motor unit before working on it. Take the fuse with you if the isolating switch is not near the unit.


 **DISCONNECT** the power to the electric heater before working on or near it. If the heater was operating wait until the heat subsides.


 **DO NOT** open any door until the fan has stopped completely. The pressure produced by the rotation of the fan could throw up or open the hatch or door violently against the person opening it.

 **DO NOT** work on dampers until they have been switched *off* and disconnected.

MAKE SURE that the fan is well secured before working on it.

LOCK the drive gear before working on a fan so as to prevent any unexpected rotation of the fan.

 **DO NOT** restart the unit before checking that all the components have been fitted correctly.

 **NEVER** pressurize the unit beyond these specifications and always make sure the dampers are open.

Installation

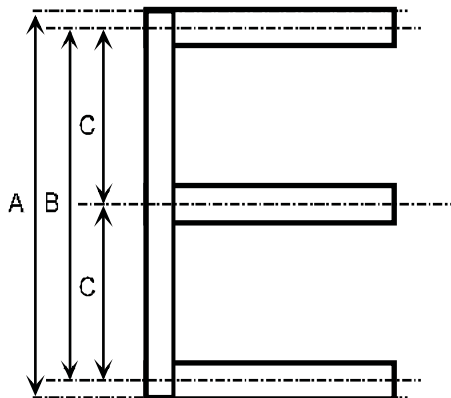
SITING THE UNIT

INSPECTION OF BASES AND FOUNDATIONS

To ensure efficient operation and long service life of the unit, a perfectly level installation site with good foundations is required. Check the instructions below before installing the unit.

- The units should be installed on a level floor or a masonry base which must be not less than the width and length of the unit. The height of this base should be sufficient to enable the condensate siphons to be installed. (See Page 14).
- The structure must be capable of supporting the weight of the unit including the accessories and the weight of water or refrigerant in the coils. The weight of the modules comprising the unit is indicated on the drawings relating to the order.
- If the unit is to rest on iron supports or concrete beams, please contact manufacturer for the framework centre to centre distances for each unit type.

Framework centre to centre distances



Special attention should be paid to the problem of vibration resonance which may be encountered in the machine room. If this is found to be at a dangerous level, anti-vibration mountings should be placed beneath the unit.

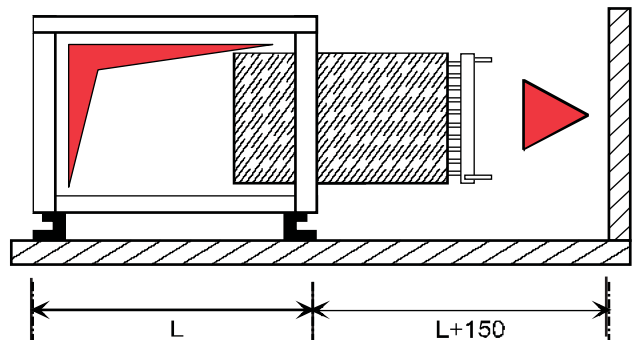
These mountings are not supplied with the unit and are the responsibility of the installer.

Where the unit is installed on a roof or suspended from a ceiling, it should be sited near a load-bearing wall or supporting pillar.

If the unit is fitted with a scrubber and pump, the base should be lengthened.

WORKING SPACE

Provide sufficient space on the service side of the unit to allow ease of access to the installed components such as the fan motor unit, electrical heater and humidifier. The minimum working space to be provided to allow the coils, the fan and the filters to be slid out should be equal to the width of the unit plus 150 mm.



HANDLING

LIFTING

• ALT

The modules are arranged on a framework of folded sheet metal (or channel-section steel for large units) with the framework resting on wooden beams which enable it to be handled by a fork-lift truck. With this method of handling care must be taken to ensure that the forks are properly aligned with the framework and placed as close to the centre of gravity as possible. The wooden beams can be disposed of during the installation of the unit.

To allow lifting by crane, the framework has been provided with holes diameter 40 mm attach the slings. To prevent wear on the shell of the box section it is advised to use very long slings (6 m and over). If this is not possible, use a spreader of the type shown opposite.

The tools necessary for handling the units by crane should be supplied by the installer in charge of the site. The order of assembly is specified by an instruction plate placed on the service side of each module comprising:

- order number.
- Job reference
- Module number.
- Type and size of unit
- Arrow indicating airflow direction

The same information appears on the drawing relating to the order.

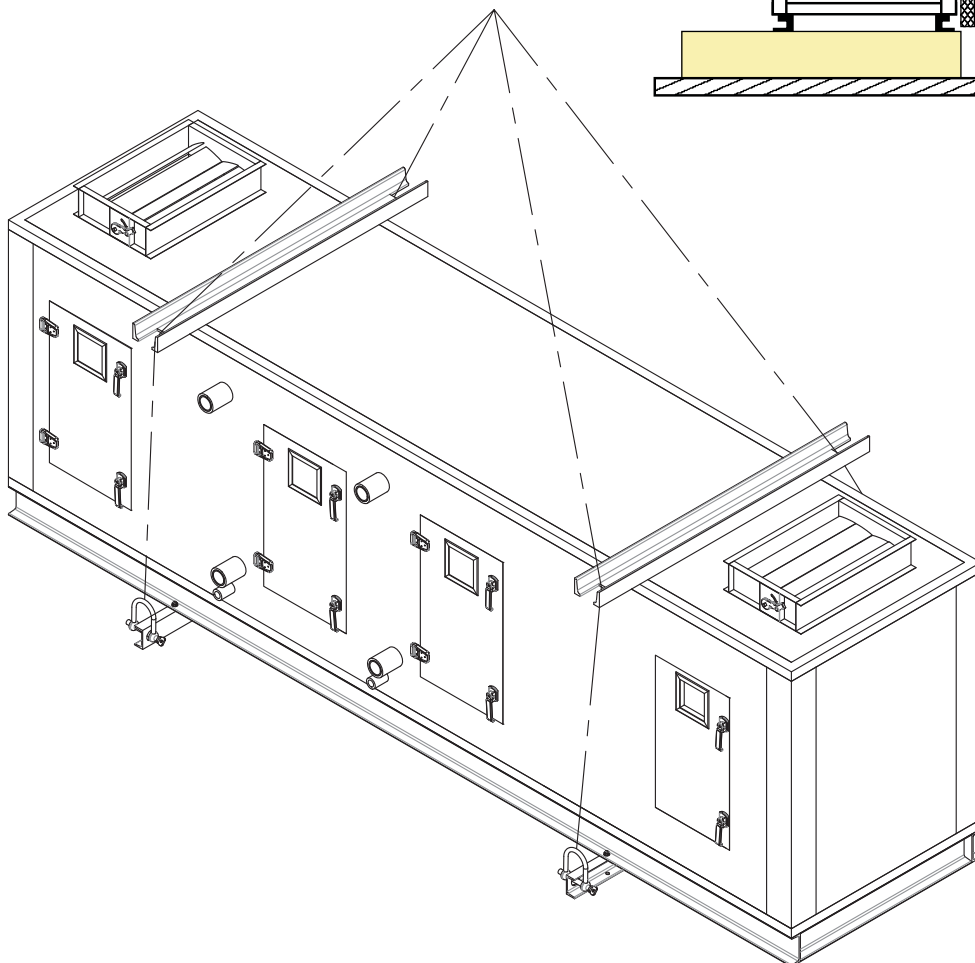
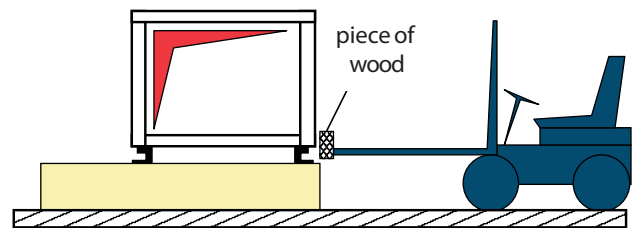
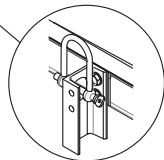
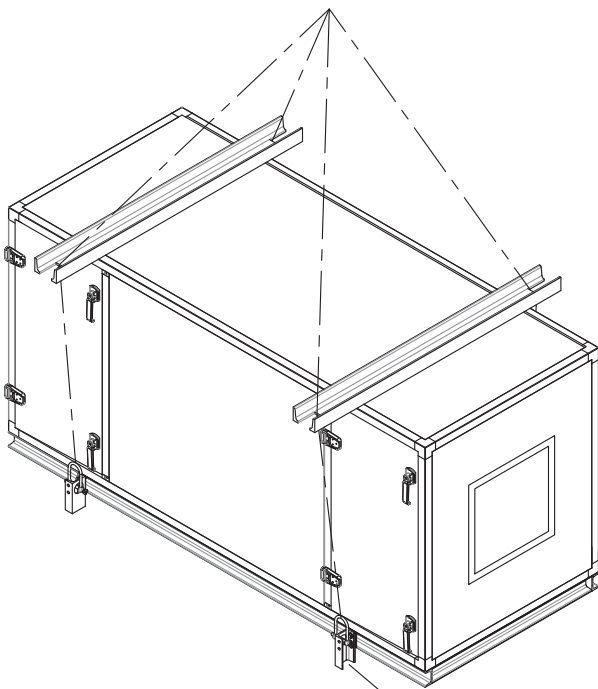
When using chains or ropes to move the unit, no direct pressure must be exerted on the box section. Make sure that no pressure is exerted on manifolds and other projecting parts. Use ropes with a length not less than the longest dimension of the module and position the hook perpendicular to the centre of gravity of the module.

⚠ WARNING: It is essential to handle the box section carefully as if it were to slip or fall even a short distance, major damage could be sustained by the fan bearings, fan spindle, coils, etc.

INSTALLATION ON A MASONRY BASE

Where lifting is not possible, the box section, having previously been placed lengthwise on the base, can be shifted as indicated in the sketch below:

⚠ CAUTION: Do not exert excessive pressure on the box sections as this will damage them. Pressure should only be applied to the surface of the wooden packing beams.



ASSEMBLING THE UNIT

GENERAL

One of the most critical operations involved in the installation of air handling units at the site is the assembly of the various modules which comprise the unit.

If the box units are not positioned properly, the unit may leak permanently. Great care must therefore be taken when positioning and leveling each module.

ALT ASSEMBLY

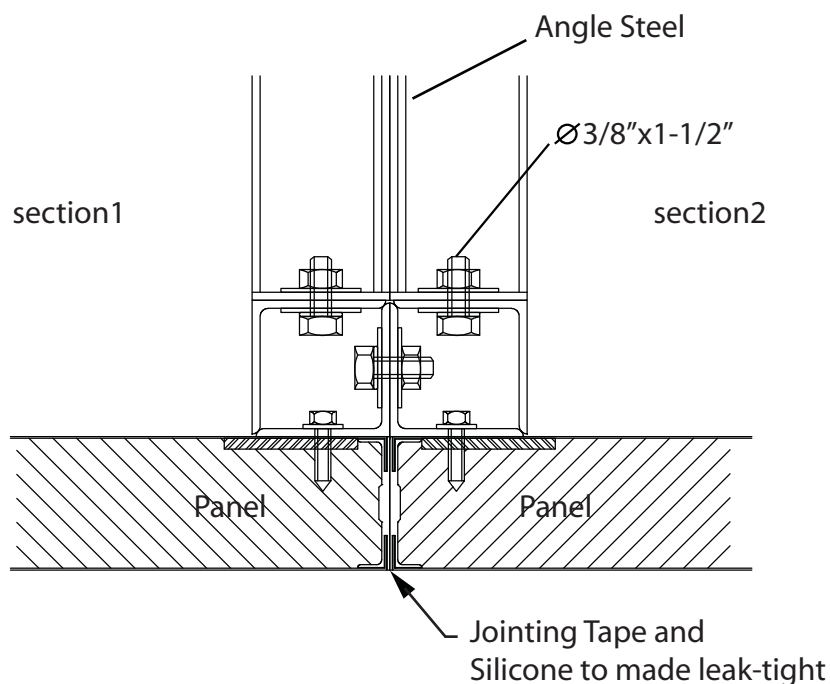
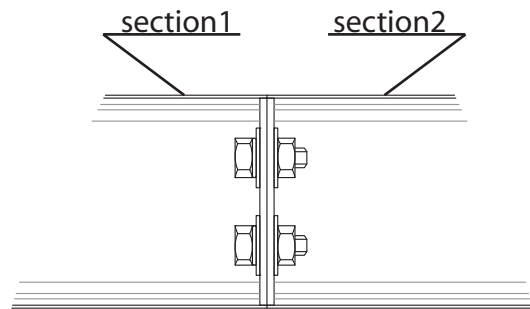
With the first module positioned on its base, made secure and leveled, affix the 19 x 5 mm adhesive jointing tape supplied to the mating face of the second module.

Make sure that there are no breaks when applying the jointing tape. Bring the second module alongside and with the aid of a ruler check that the two modules are correctly aligned.

- Next check that the modules are secure and level before finally bringing them together.
- The bond is made by means of angle irons outside of the box section on the top and on the sides of the units. These angle irons are already fitted and drilled. They are secured by means of $\varnothing 3/8"$ x 1-1/2" bolts with nuts and washers.

ASSEMBLING THE BASE

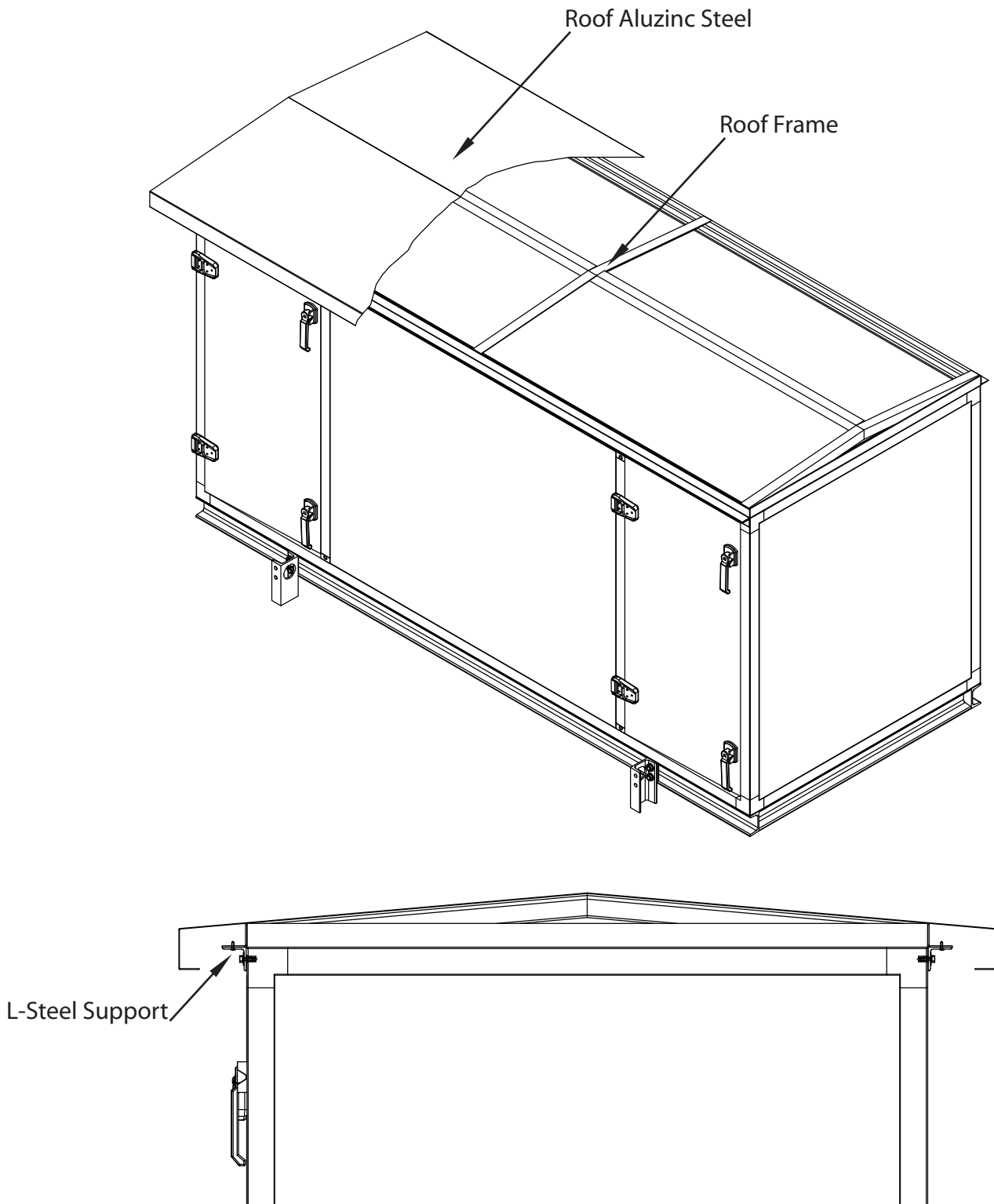
To complete the assembly, the base of each module must be fitted together. An angle iron is located at each corner of the module base. Turn the angle iron until it faces the opposite direction and then secure it in position.



ASSEMBLY OF THE ROOF

In the case of outdoor units the roof is made up of Aluzinc steel sheets. These are supplied loose and must be assembled on site and fixed on top of the box section.

Ensure the sheets overlap sufficiently to provide a good water-tight seal and the roof slopes sufficiently to allow rainwater to run-off efficiently.



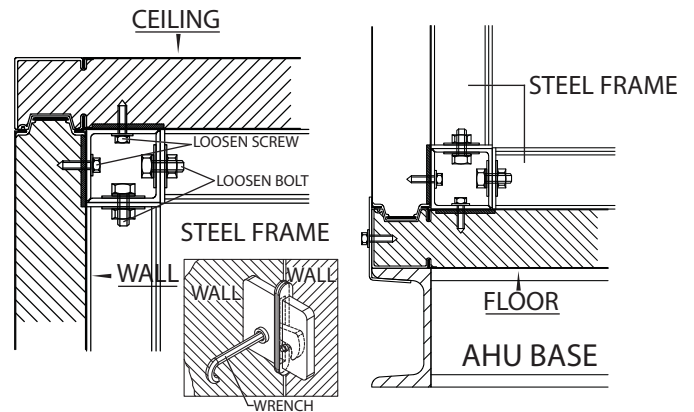
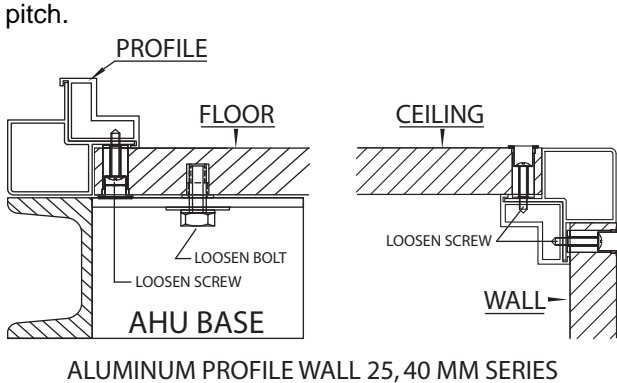
REMOVING THE FIXED PANELS

GENERAL

This is only necessary for removal of heat exchangers or other solidly fixed parts. The doors and/or the maintenance hatches, on the service side, are available for normal access.

REMOVING AHU PANELS

To remove the panels simply remove the self-tapping screws on the panels and the profiles. Proceed in the reverse order to replace them. Do not forget to reseal with silicon and use self-tapping screws of a finer pitch.



CONNECTING THE DUCTWORK

The ductwork must be designed and installed in accordance with current design requirements.

All intake and exhaust openings can be connected directly to the ducts (as the fan unit is completely separated from the rest of the box section by antivibration mountings and closed cell foam joint for fan sizes 450 or less, and above this size by an M1 flexible sleeve on the exhaust inlet of the fan. However, it is recommended that unit should be connected by means of flexible trunking, which can be supplied as an option, as the AHU is not the only element in the installation which can create dangerous vibrations. The trunking plates must never be fitted under tension. The clearance between the two connecting flanges must be approx. 100 mm.

The flexible trunking and the damper and connection frames are fitted with an undrilled cut-off edge of approximately 40 mm. The openings on the panels are reinforced which allows direct fitting. Before bolting the ducts, stick on a continuous piece of closed cell adhesive tape at least 12 mm wide by 3 mm thick.

If the ducts are connected directly to the walls of the unit, they must be supported independently so that they do not place a load on the unit itself thereby preventing any dampers from operating freely.

Changes of direction in the ductwork should not create obstructions. If changes of direction are made without using bends, please provide guide vanes as shown in figure. 1.

The duct connected to the fan outlet must have a straight section with a **minimum length equal to the diameter** of the fan and with no reduction in cross-section (see diagram below). If the duct is curved, it must bend in the same direction as the rotation of the fan.

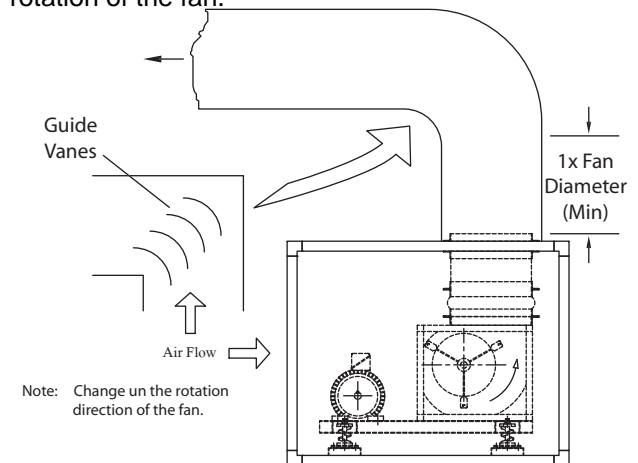
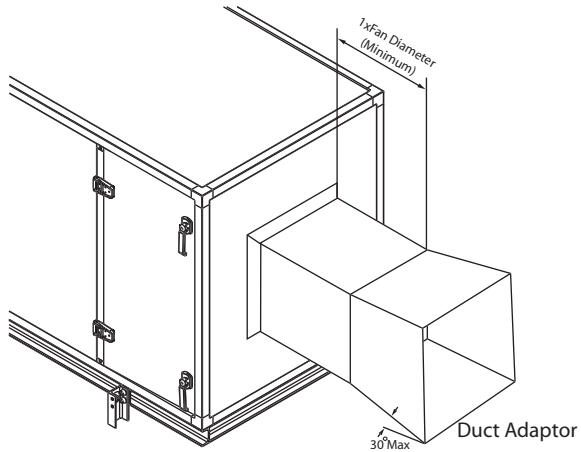


FIG. 1: FAN EXHAUST DUCT IN THE CASE OF A CHANGE IN DIRECTION

WARNING: The installation of guide vanes and dampers on the fan return, or any serious obstruction directly after the fan, may create serious operational problems for the unit. All static pressure losses must be planned for at the design stage of the unit. Standard size openings are provided in accordance with requirements and airflow constraints. Convergent or divergent duct adaptors should be specified where required. These opening must always be completely unobstructed.

NOTE: The unit radiates a sound level in the ductwork which is mainly due to the fan. Noise dampers should be fitted where necessary. Noise dampers can be incorporated into the unit during the design stage.



INSTALLATION OF DAMPER SERVOMOTOR

Before connecting the electrical supply to the servomotor, check that the damper blades can be turned easily by hand. If the blades are hard to turn, check to see that nothing has been jammed in the link mechanism during shipment or installation.

If a rod assembly is fitted between the servomotor and the control spindle, check that the angle formed between the two is a minimum of 40° . If this is not the case the servomotor will tend to move the axis of rotation instead of effecting the rotation necessary to open or close the damper. The stroke of the servomotor should be adjusted so that the end of the stroke occurs when the damper is completely closed.

PREPARATION FOR MOUNTING

- fit the servomotor on to the shutter spindle.
- Tighten the screws on the U clamp by hand.
- If necessary bend the stop bar to the desired shape.
- Attach the stop bar to both ends.

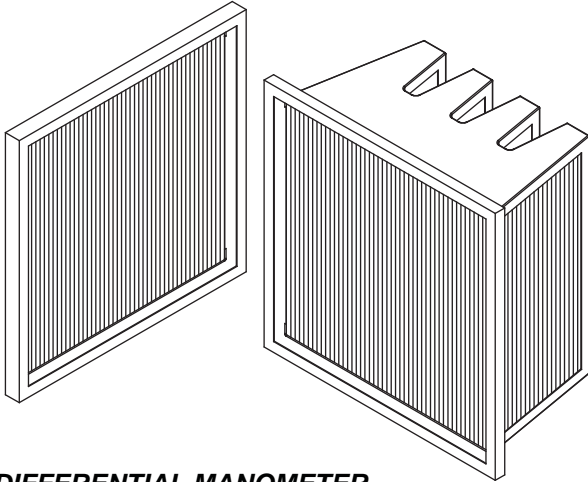
ADJUSTING AND MOUNTING

- Move the shutter to closed position.
- Disconnect the servomotor by pressing the button.
- Turn the drive switch to one graduation before the closing position and release the button.
- Check that the servomotor is correctly positioned at 90° to the shutter spindle.
- Tighten the screws on the U clamp.

FILTRATION AND CONTROL

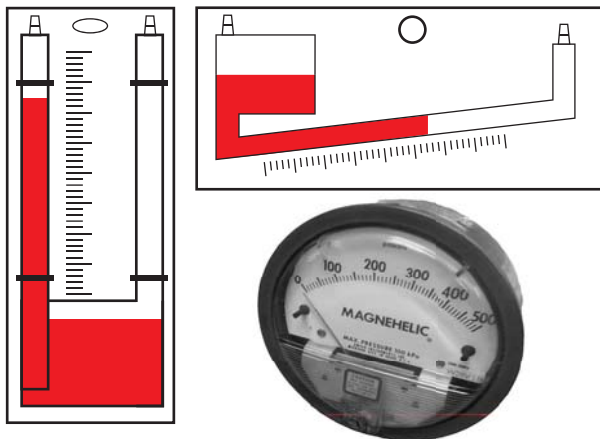
FILTER

The filter cells are supplied in separate cartons (in general 2 per carton). They are installed in individual factory-assembled frames in the filter body. Once, the cells have been installed, secure them on the frames by means of steel spring clips.



DIFFERENTIAL MANOMETER

This option can be supplied directly factory fitted or for installation on-site. If site installation is required proceed as follows:



- Drill two holes of diameter 8 mm upstream and downstream of the filter section and insert the pressure inlet connectors, securing them with 2 x M3 sheet metal screws.
- Leave a sufficient space around the flexible connecting tubes to prevent them being crushed, thereby adversely affecting the operation of the manometer.

DIFFERENTIAL PRESSURE SWITCH

As an alternative, the manometer can be supplemented or replaced by a differential pressure switch. In this case the low pressure alarm can be signaled to the control switchboard.

HEATING COILS

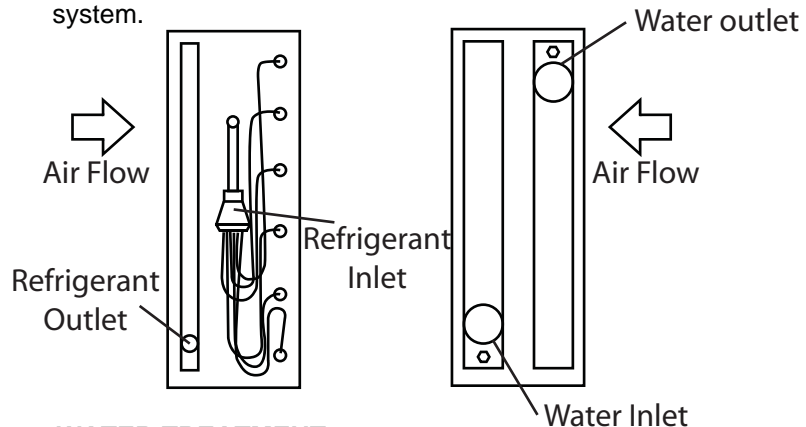
GENERAL

Connect the water inlet to the manifold located at the air outlet of the coil to create a counterflow system between the air and the water (this ensures optimum coil performance). To ensure correct assembly the water inlets and outlets are clearly marked.

An anti-freeze protection is necessary if part of the coil is liable to be subjected to temperatures less than PC. If the coil is not in operation, it's recommended to completely vent the coil and to dry the interior of the tubes with compressed air. Another system of protection comprises the maintenance of a constant flow rate of water. AIRCHAL is not responsible for any freezing damage to the unit, under any circumstances

All water coils are provided with an air vent and a water drain.

A closed water circuit must be provided with an expansion vessel and/or an automatic drainage system.



WATER TREATMENT

The coil copper tubes are susceptible to attack by corrosive condensates. It is therefore recommended to provide a water treatment suitable for the characteristics of the water on your site.

PROTECTION FROM FREEZING

Coils containing chilled water, hot water and steam may be damaged during periods of freezing weather. Preventive measures should be taken, including:

1. For all-season operation, a glycol solution or other anti-freeze solution should be circulating in the system. Drain each coil and its supply and drainage system. Once it has been drained, refill the coil with an anti-freeze such as a glycol solution. A solution of 50% ethylene glycol and 50% water provides protection against freezing to approximately -37°C at sea level.

2. During winter operation and shutdowns such as power failure, nightly shutdown and weekend shutdown, the controls should be set so that the valves on the coils are in open position and the air dampers are in closed position. The water must be circulating in the coils and/or the auxiliary heating plant should be kept running in the machine room.

NOTE: When using a glycol solution or other antifreeze solutions, consult AIRCHAL sales office to find out the liquid capacity of each coil.

DIRECT EXPANSION COOLING COILS

Direct expansion cooling coils may consist of two parts depending on the size of the unit, and have several interlaced circuits (usually two). Each coil and/or interlaced circuit has its own refrigerant inlet (fitted with a directional control valve) and outlet. The refrigerant outlet is at the inlet of the coil in the direction of the airflow and it is located in the bottom part of the manifold if the coil has been properly installed.

The refrigerant inlet, fitted with a liquid distributor for each circuit, is located at the outlet of the coil in the direction of the airflow. Check the general assembly drawing for the unit to determine where the inlets and outlets of the cooling coils are.

⚠ WARNING: Direct expansion cooling coils are pressurised with dry air for shipment. Depressurise each circuit of the coil by means of a protected valve (do not remove or cut the stoppers directly).

The position of the liquid distributors is not critical but its pipe must not become deformed or be bent in a non standard fashion.

An expansion valve must be fitted to each coil. Thermostatic expansion valves must be provided with an external equalising circuit connected to the return (suction).

The expansion valve must be dimensioned in accordance with the recommendations of the valve manufacturer (maximum pressure loss approx. 5 kPa when the coil is fully loaded). Do not over-dimension the expansion valve. Follow the advice of the manufacturer when siting the sensor. The cooling capacity of the coil depends on the correct installation of the expansion valve. See figure. 3.

When a direct expansion cooling coil has an outlet temperature below 0°C frost may form on the finned surface of the coil. Consequently, it is not advisable to use an evaporating temperature (outlet) at the limit of the frost point of the coil for air conditioning systems. If the evaporating temperature at full load is acceptable, Check that it is still satisfactory in the event of a partial load. A hot gas injection valve is recommended to maintain an acceptable evaporating temperature (coil outlet).

The venturi-type liquid distributor supplied on our direct expansion coils is designed to receive a hot gas injection valve. The hot gas bypass can be installed by placing a T piece between the expansion valve and the directional control valve. With this system a constant flow rate is maintained to the refrigeration unit thereby avoiding compressor short cycles.

The performance of our direct expansion coils is calculated using Freon R22. Please advise us if a different type of refrigerant is used.

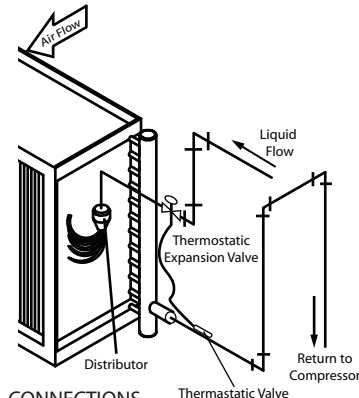


FIG.3 :COOLING COIL CONNECTIONS

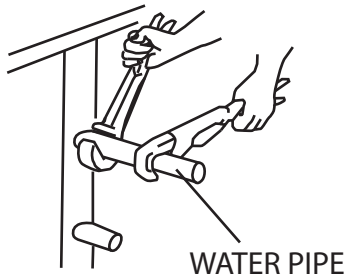
MANIFOLD CONNECTIONS

The coil must be fitted correctly to ensure efficient drainage and venting. The coil cannot perform properly if the air stream is not uniformly distributed over the finned surface of the coil. Too great a flow rate over one part of the coil, for example due to an obstruction in the air stream, may lead to the formation of droplets. Too low a flow rate will result in a loss of performance. The ducts must be designed to provide uniform airflow over the coil. The air inlet duct must be fitted with adaptor ducting in a high-speed system.

The manifolds are threaded as standard. The coils are of the counter flow type. The inlet and outlet are indicated on the service side of the box section.

Connect the water inlet to the manifold located at the air outlet in the airflow direction of the AHU to create a counter flow assembly. To avoid damaging the coil manifolds it is advisable to hold the manifold steady with a pair of pliers when you are connecting it. If this precaution is not taken (particularly in the case of a small manifold) twisting of the manifold may occur, causing leaking at the welded seams.

The supply pipework to the coil must be supported. The manifold must, on no account, bear this load. Fit expansion joints or flexible connectors on each manifold, particularly on heating coils, so as to absorb any expansion or contraction of the pipework. A rigid connector may damage the coil. Our coils are fitted with a vent at the top of the manifold and a drain at the bottom of the manifold.



The water flow can be regulated by various systems of control valves (2 way, 3 way). Follow the recommendations of the control valve manufacturer. To ensure smooth running, it is advisable to connect the manifold by means of a coupling or a flange. Provide an expansion vessel or a pressure sensitive bleed valve in your water circuit to allow for the expansion of the water.

Anti-freeze protection may be provided in the water circuit if part of the installation is likely to be exposed to a temperature below 0°C. If the coil is not in operation, you are recommended to drain it and replace the water with dry compressed air.

Maintain a constant flow of water to your coil. If the control system is not designed to do this, Manufacturer cannot accept responsibility in the event of damage due to freezing.

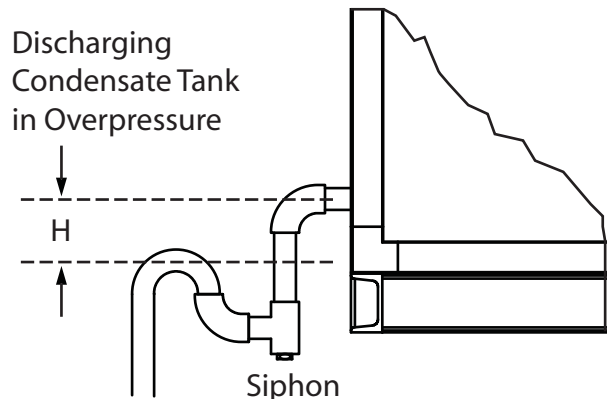
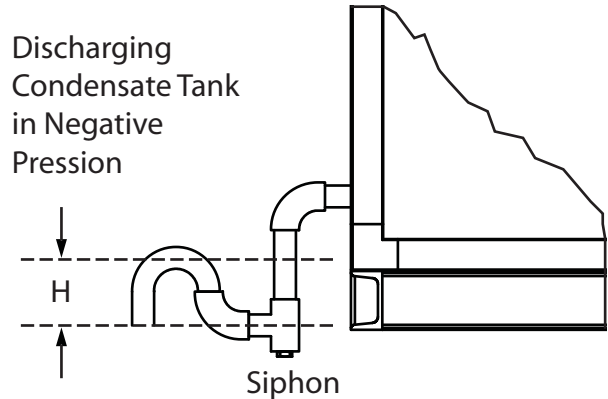
CONDENSATE SIPHON

The length of a smooth joining piece diameter 40 mm is approximately 80 mm.

An external siphon (not supplied) is required to prevent odours and compensate for the difference in pressure outside (atmospheric pressure) and inside the unit. The discharge must conform to the following conditions:

Calculate the differential pressure between the inside and outside of the unit when in operation and add in a 20% safety factor (10 Pa = 1 mm of water column). The siphon should be fitted according to the position of the coil in relation to the fan (negative pressure = before the fan, overpressure = after the fan).

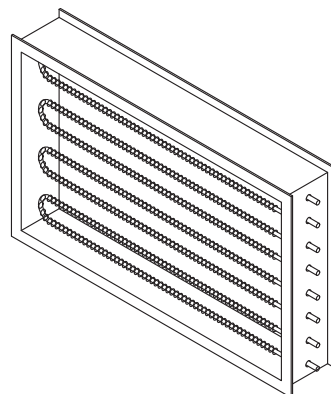
The siphon must be filled before start-up. Each condensate outlet should have its own siphon. The discharge pipes should slope by at least 1%.



NOTE: If the His too small due to lack of space, this causes a movement of air in the pipework resulting in erratic discharge of water. A pipe on the overpressure side must never be hermetically connected to a discharge pipe in a negative pressure zone.

ELECTRIC HEATER

The wiring in the heater is of the star-quad type for 3 phase 400 V (silicone-insulated wire on Entrelec terminal). In accordance with the current standard, electric heaters are provided with a manual reset safety thermostat (98°C ±16°C, contact opened by temperature rise). In addition to the safety thermostat the following safety protection devices should be fitted:



- A flow controller to cut off the power supply if the airflow through the unit reduces significantly.

Installation, Operation, Maintenance

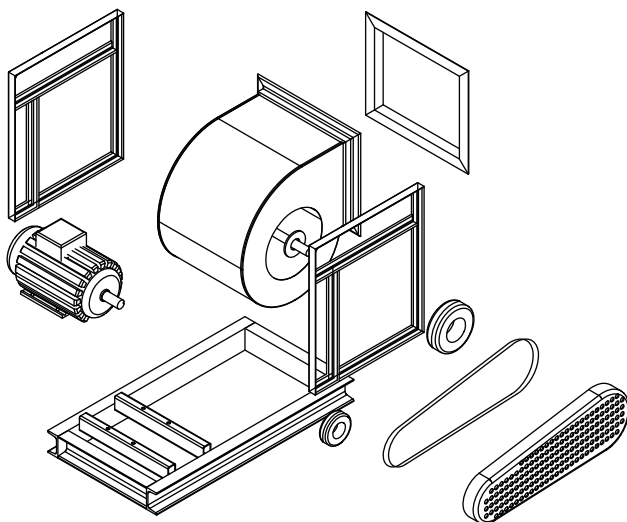
- A step to vary the loading of the electric coil with respect to the variable flow rate (multi-speed motor or inlet vane of the fan).
- A time delay to keep the fan operating for 15 minutes after the power supply to the heater has been cut off.

Failure to observe these essential safety measures may result in a residual heat build-up leading to a risk of fire. AIRCHAL cannot accept responsibility for any incidents due to the non-respect of these guidelines.

FAN MOTOR UNIT

GENERAL

The efficiency of the air handling unit operation depends on the proper installation of the fan motor unit.



FAN MOTOR UNIT

FAN

Check manually that the fan wheel is rotating freely and is not rubbing against any static part.

MOTOR WIRING

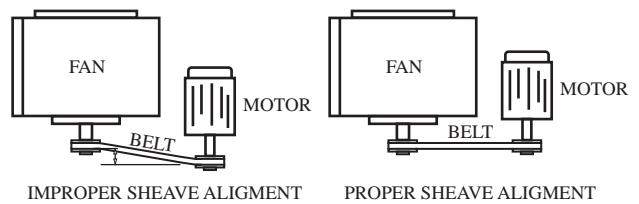
All electrical wiring in the fan motor unit must conform to current international standards as well as those of the country concerned.

The installer must supply all the protective devices required to ensure safety. In particular the emergency shutdown button which must be visible from the unit.

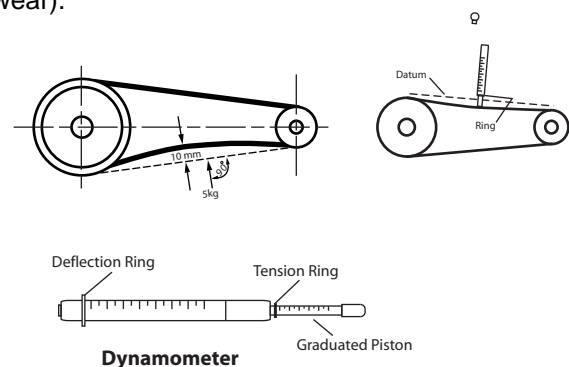
The wiring diagram for the motor is affixed to the back of the terminal block on the motor. Do not forget to leave some allowance in the wiring to enable the motor to be adjusted in relation to the fan.

BELT TRANSMISSION

- Check that the motor shaft is parallel to the fan shaft.
- Adjust the belt tension carefully in accordance with the manufacturers recommendations.



CAUTION: Excessive tension produces unnecessary load on the bearings which could result in premature wear on the bearing unit, leading to rupture of the shaft. Insufficient tension causes vibration (abnormal wear).



With the aid of a dynamometer, measure a pressure of 5 kg on the belt as shown above. If the deflection of the belt from the datum is less than 10 mm the setting is satisfactory.

FAN STORAGE

The fans are provided with closed bearings with permanent lubrication. No special measures are required if the device is commissioned as soon as it is delivered.

After a long shutdown between delivery/installation and commissioning, the following measures must be taken depending on the length of time and the atmospheric conditions:

- Remove the belts and place them away from light. Store them in a good condition.
- Run the fan at least once a month during the period of shutdown.
- Visually check the appearance of the grease before and after 15 minutes operation. If it turns white it should be changed.

To change the grease:

- Open the bearing, remove the old grease, clean the bearing with rectified petrol, dry and fill with new grease.
- For long periods of inactivity and/or bad atmospheric conditions, the bearings may rust due to the formation of condensation. In this case, the bearings must be replaced.
 - During the re-assembly of the bearings, assure that the adapter sleeve is correctly tightened so that the tolerance is situated within the right domain. To verify, carry out an operational test of approximately 15 minutes during which the temperature is monitored. The temperature of the bearings should not rise above the ambient temperature.

Commissioning

INSPECTION AND TESTING PRIOR TO START-UP

Despite the care taken during manufacture and factory inspections, the equipment must always be inspected upon arrival on site, where spare parts can be issued if required. The following points should be checked before starting the system:

GENERAL

- Check that the equipment received corresponds to the equipment as ordered.
- Inspect the general condition of the unit.
- Inspect the interior of the units and if necessary the air ducts to ensure that no foreign bodies have been left behind during assembly (including inside the fan unit).
- Check whether the air filters have been damaged during assembly (including inside the fan unit).
- Check that the components mounted on slid rails move freely.
- Ensure service doors and hatches are operating properly. If necessary. Adjust them as required. Please note that the modules must be in perfect alignment to ensure that the doors open properly.
- Check that access point and working space for servicing allow path to be removed with ease.
- Check that the flexible ducting for connecting the ducts have not been fitted in tension or accidentally punctured.
- Use manual control to check that the shutters of the dampers rotate freely and that the blades are properly supported.
- Check that the various passage hole through the shell made on site to fit optional items (controls, lighting, etc.) have been properly sealed.
- Inspect the condition of the front surfaces of the heating and cooling coils for signs of physical damage. If any damage is observed, use the special comb to fix any flattened fins.
- When admitting water to the circuits check valves and connections for leaks and proceed to vent the coils.

- Start the condensate discharge siphone.
- Check that the unit is properly earthed.

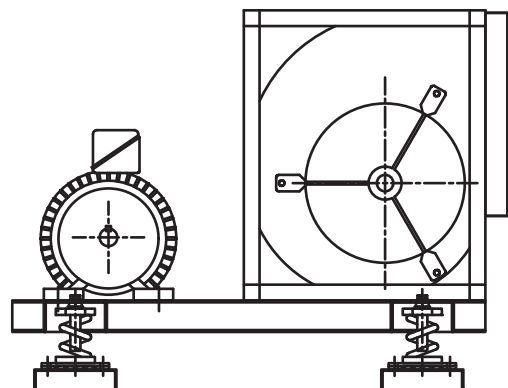
FAN MOTOR UNIT

FAN

- Make sure that the fan motor unit has been released from the clamps which immobilised it during shipment (in the case of spring mountings).
- Check the tension of the belts and their alignment, referring to the directions on the instruction plate located inside the door.
- Check whether the fan bearing are greased (in the case of lubricated cast-iron bearings).
- Check by hand whether the fan wheel rotates freely without rubbing.

TENSIONING THE DRIVE BELTS

In the case of small fan unit the motor is located vertically on two oscillating arms. The belts are tensioned by means of the threaded control rods which are supported by a baseplate attached to the fan casing.



The tension is adjusted by tightening or slackening these rods. It is advisable to make a final adjustment after a few hours operation.

Large units have a motor mounted on one-piece or separate horizontal slides with twin threaded rod tensioners.

After a few hours operation adjust the tension by tightening one screw in the case of a one-piece slide or two screws in the case of separate slides.

Take particular care that the two pulleys are properly aligned with the aid of a ruler or, if not, by tying a piece of string along the flanges of the pulleys.

A label inside the box unit indicates the tension values for the belts with their respective deflections.

ANTI-VIBRATION MOUNTINGS

Rubber type anti-vibration mountings do need a rigid immobiliser for the fan unit support framework during shipment.

Spring type anti-vibration mountings are themselves immobilised during shipment by screws and a wood clamp.

Before commissioning proceed as follows:

- Loosen the unit.
- Unscrew the threaded rod with a hex-head wrench to release the fixing on the bottom flange.
- Tighten the nut.
- Make sure that the framework is properly released.
- Remove the mountings.

MOTOR (See ELECTRICAL INSPECTION)

WATER COILS

- Check the water inlet and outlet connections are in accordance with the arrows on the panels holding the coil. (In general, counterfeit supply).
- Evacuate the coils.
- Check that the manual valves open.
- Check the state of cleanliness of the fins and if necessary blow off the exchange surfaces with compressed air.
- Check the condition of the inside of the condensate recovery tank (remove any debris).
- Check the condition of the inside of the condensate discharge pipe.
- Fill the discharge siphon to the fill level.

ELECTRIC HEATER.

- Check the state of cleanliness of the fins.
- Check that the heater is properly connected to the correct supply voltage.

HUMIDIFIER

- Check that the water inlet is properly connected.
- Check the overflow and the drain for obstructions.
- Check that the water level is being properly controlled by the float.
- Check the pump motor supply voltage (generally the motor supply is 220/400 V – 50 Hz).

Access for inspection is gained by removing a panel or a removeable hatch of located on the side of the top section.

When commissioning, adjust the supply flow (and bleed-off in the case of recycled water humidifiers).

The supply flow is adjusted using the valve with the red handwheel and the bleed-off using the valve with the grey handwheel.

For recycled water humidifiers make sure that the plastic waste pipe is firmly secured in the overflow pipe.

Also check that the top cover on the conduits is correctly housed in the conduit frame so as to avoid any leakage or overflow.

SCRUBBER

- Check the spray ramp consisting of manifolds, pipes and spray units (test water flow manually).
- Check that the float in the reservoir is functioning properly.
- Check the power supply for the pump is correctly connected (220/400 V 50 Hz).

PLATE EXCHANGERS & HEAT PIPES

- Carry out regular blow-off or jet wash, if necessary with detergent.
- Check that the bypass dampers or shutters are operating efficiently.

ELECTRICAL INSPECTION

Before starting any motor it is advisable to check the insulation between each phase and earth and between phases. This check is carried out using a continuous 500 volt megohmmeter. The insulation should be a minimum of 100 megohms when cold.

Where this value is not attained or if the motor windings have become damp, it is recommended that it is allowed to dry for 24 hours in a drying oven at a temperature of approximately 100 C.

If it is possible to dry the motor in and oven, you should:

- Either supply it with three-phase alternating voltage (through an induction regulator or a step-down transformer) at about 10% of its rated voltage for 12 hours with the rotor locked (the rotor being short-circuited on the slipping motors).
- Or supply it with direct current, three phases in series (through a direct current generator with independent excitation or batteries for 21 kW remote motors): direct voltage 1% or 2% of rated voltage.

The alternating or direct current must not exceed:

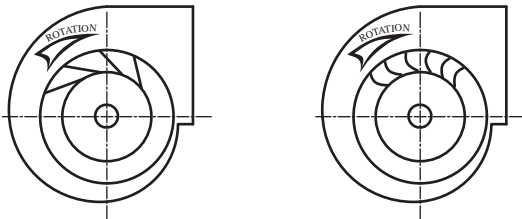
- 40% of rated current for protected motor.
- 60% of rated current for enclosed motor.

You should check the current with the aid of a clip-on ammeter (alternating) or a shunt-type ammeter (direct) and place a thermometer on the casing of the motor: if the temperature exceeds 70 C reduce the above-mentioned voltages or currents by 5% of the original value to a tolerance of 100 C.

In addition, it is necessary to:

- Check that the motor terminals are connected correctly for the voltage required.
- Start the motors with a brief electrical impulse to check that the direction of rotation is correct:

NOTE : The rotation of the fan motor unit is determined by looking at the drive side of the fan. RD = Clockwise rotation. LG = Anticlockwise rotation.



- Adjust the thermal protection relays to the correct current setting.
- If there is a tilt mechanism at the fan induction, check that the blade move freely (no sticking point) between the two end positions.

DAMPER SECTION

- Check the movement of the dampers having first disconnected the servomotor, if fitted.

- Make sure no foreign bodies are present (in the case of a mixing unit).
- Lubricate sparingly with a few drop of SEA 10 oil all the bearings and joints in the shutter control linkage.

OPERATION

MANUAL START-UP

- Open all the dampers.
- Start the fan motor unit briefly to check direction of rotation.
- Start the blow-through and draw-through fans.
- Open the valves on the coils.
- Adjust the dampers.

AUTOMATIC START-UP

- *Make sure that the inlet damper begins to open before start-up.*
- *Start the blow-through and draw-through fans.*

Once all these operations have been completed the unit should be operating. The Operational Checklist can be used as a guide when carrying out an initial series of measures to check that the unit conforms to the desired use.

NOTE : After 24 hours of satisfactory operation, stop the unit and check all the bolts, the fan spindle, the motor shaft and all other parts requiring tightening after 24 hours.

⚠ WARNING: If any unusual noises or vibration are produced, shut down the unit immediately and check all the items.

if the vibrations persist, remove the belts from the pulleys and start the motor to determine whether the motor shaft or the bearings have become worn or whether the motor is not properly balanced.

⚠ WARNING: TEMPERATURE LIMIT
Standard Class F motor – maximum airflow temperature = 60 C Beyond 40 C motor downgraded due loss of power.

Special precautions must be taken when using variable speed gear or tension to control-speed. If the motor is to be used at low speed on a regular basis, thereby causing the motor ventilation system to become much less efficient, it is advisable to install a forced-air ventilation system which operates continuously (irrespective of the motor-speed). It is advisable not to go below 20 Hz or 40% of the rated output of the fan.

Maximum temperature of power cable = 60 C

COMMISSIONING CHECKLIST

CHECKS TO BE CARRIED OUT

GENERAL

- Check conformity of equipment : _____
- General condition of AHU : _____
- Inspect inside AHU and ducts : _____
- Check condition of filters : _____
- Check side-mounted components move freely : _____
- Access-doors open properly : _____
- Sufficient working space beside filters, coils : _____
- Flexible ducting mounted properly (allowance) : _____
- Damper spindle easy to manoeuvre : _____
- All connections properly leak-tight : _____
- Check condition of coils : _____
- Check for leak in supply circuit : _____
- Check earthing of AHU : _____

FAN MOTOR UNIT

- Remove clamping blocks from Fan Motor Unit : _____
- Check tension of belts and alignment : _____
- Check lubrication of bearings : _____
- Check rotation of fan : _____

WATER COIL

- Check direction of mains supply : _____
- Vent the coil : _____
- Check that valve open : _____
- Check for clogging of fins : _____
- Check condition of condensate tank : _____
- Check that discharge is clear : _____
- Start the condensate siphons : _____

ELECTRIC HEATER

- Check for clogging of fins : _____
- Check electrical connections : _____

HUMIDIFIER AND SCRUBBER

- Check water inlet connection : _____
- Check water is flowing well : _____
- Check float control : _____
- Check pump voltage : _____

PLATE EXCHANGERS AND HEAT PIPES

- Check for clogging : _____
- Check that the bypass is operating properly : _____

ELECTRICAL INSPECTION

- Check insulation between phases : _____
- Check insulation between phases and earth : _____
- Check connection to motor terminal : _____
- Check direction of rotation of motor : _____
- Adjust thermal protection relays : _____
- Check manoeuvrability of tilt mechanisms : _____

DAMPER SECTION

- Check movement of damper : _____
- Any foreign bodies in damper section : _____
- Check lubrication in joints : _____

Please return a copy of this checklist duly completed to the AIRCHAL sales department where it will be added to the job file.

OPERATIONAL CHECKLIST

MEASUREMENTS TO BE CARRIED OUT

FAN MOTOR

- Fan speed (rpm) : _____
- Motor speed (rpm) : _____
- Installed power (kW) : _____
- Absorbed power (kW) : _____

AHU PRESSURE OR NEGATIVE PRESSURE

Check the power loss in the following components.

- Pre-filter : _____
- Main-filter : _____
- Heating and cooling coils : _____
- Humidifier : _____
- Scrubber : _____
- Fan motor unit : _____
- Final filter : _____
- Heat pipe : _____
- Plate exchanger : _____
- Sound traps : _____

AIR FLOW IN UNIT

With a hot wire or pilot tube either in an inlet or outlet duct or in the air unit itself.

- Dynamic pressure (CE) : _____
- Air Temperature (dry/°C) : _____
- Air Temperature (wet/°C) : _____
- Air Speed (m/s) : _____
- Blow-through air volume (m³/h) : _____
- Draw-through air volume (m³/h) : _____

- Filtration rate in the AHU (m/s) : _____
- Temperature in the AHU (dry/°C) : _____

Maintenance

GENERAL

A planned programme of regular periodic maintenance will ensure problem-free operation of the equipment over many years. It is the client's responsibility to arrange maintenance for the air handling unit and the heat exchangers. If an accident or breakdown during the warranty period is the result of a lack of maintenance, the manufacturer will be released from its liability in the event of damage.

Doors, hatches and removable panels are provided on all units to improve conditions for necessary maintenance and to allow access to various components likely to require replacement.

In order to ensure the safe and efficient operation, manufacturers recommend the use of original spare parts.

MAINTENANCE INSTRUCTIONS FOR COMPONENTS

DAMPER SECTION

- Check movement of damper blades having first disconnected the servomotor or the linkage.
- Make sure there are no foreign bodies on the damper or in the mixing unit, if fitted.
- Check that the dampers are operating properly.
- If necessary, lubricate all the bearings and articulated joints in the shutter control linkage with a few drops of SEA 10 oil.

FILTER SECTION

Monitor carefully any development of pressure loss produced by the filters.

- The flat media pre-filter must not cause a pressure loss in excess of 200 Pa.
- The bag filter must not cause a pressure loss in excess of 300 Pa.
- The pre-filter and bag filter combined must not therefore exceed a maximum pressure loss of 500 Pa.
- The final filter must not cause a pressure loss in excess of 600 Pa.

NOTE : These are the maximum values advised to ensure the efficient operation of the air unit.

Once the maximum value has been reached you should proceed in the first instance to refresh or replace the prefilter. Should the effect of this intervention prove to be insufficient overall, replace the filter bags as well.

FILTER CLEANING

Pre-filters (slide-mounted only)

Efficiency 85% gravimetric before 1993, then 95% gravimetric. Galvanised metal frame thickness = 50 mm holding a pleated glass-fibre medium supported by a grid.

- Remove the filter cartridge through access hatch.
- Wash the filter in tepid water containing detergent.
- Dry and replace the filter.
- This operation can be repeated a maximum of three times, after which it is recommended that the filter is replaced.

Standard pre-filters mounted on universal frame (slide-mounted)

Efficiency 85% gravimetric, flat medium on galvanised frame thickness = 25 mm, or 95% gravimetric, pleated medium on galvanised frame thickness = 50 mm.

- Remove the retaining clips.
- Carefully remove the dust-filled cells, tilting them at a 45° angle to avoid spilling the dust trapped in the medium.
- Wash the filter in tepid water containing detergent.
- Dry and replace the filter.
- This operation can be repeated a maximum of three times, after which it is recommended that the filter is replaced.

Rigid or Flexible Bag Filter mounted on universal frame (slide-mounted)

Efficiency 65%, 85%, 95% opacimetric supplied with galvanised or (rigid) PVC frame.

- Remove the retaining clips to release the filter from the universal frame.
- Carefully remove the entire filter medium taking care that the dust trapped in the pockets does not spill out.
- Dispose of the filter.
- Check the foam rubber joints in the universal frame, replacing them if necessary (closed cell joint).
- Fit the new filters, making sure that the pockets are in vertical position. Handle the filters with care so as to avoid any tearing of the medium while fitting them into the universal frames.
- Fix the filters in place with the retaining clips.

NOTE : The methods used for dismantling and cleaning the filters relate solely to standard AIRCHAL supplied. For cleaning details for special filters installed. For cleaning details for special filters, refer to the filters as the dust trapped in the pocket or pre-filter medium are highly flammable.

HEATING AND COOLING COIL

- Check the state of cleanliness of the fins and if necessary clean the exchange surfaces using compressed air.
- Check for any obstruction of the condensate discharge pipe (cooling coils).
- Vent air from the circuits regularly (coil air vent is located on top of the manifold).
- Check the droplet separator for clogging.
- If necessary, clean and refill the discharge siphon.

REPLACING COILS

- Remove the side access panel.
- Disconnect the pipework.
- The heating coils are mounted directly on slides.
- The cooling coils and the combined hot and cold coils are fixed to the tank. The tank sits on the set of slides enabling the whole unit to be removed.

Do not forget to remove the separator and peripheral sealing plates secured to the old coils as these are required for fitting to the new coil.

ELECTRIC HEATER

- Check that the manual reset safety thermostat built into the coil terminal is active.
- See section on Electrical Control.

FAN MOTOR UNIT

- Electrically isolate the unit from the mains before carrying out any work inside the unit.
- Check that the anti-vibration mounts are moving freely.

FAN

- Check the belts and their tension periodically, retensioning them if necessary (the correct tension is indicated on the information plate inside the door or hatch of the fan section).
- Check that the internal flexible sleeve is properly leak-tight.
- Make sure the fan is operating properly and check that the bearings are not overheating.
- Check the condition of the external flexible sleeve.

FAN BEARINGS

The fans are fitted with sealed grooved ball bearings which are maintenance-free and have a service life of about 20,000 hours. High-pressure or large-size fans are fitted with lubricated cast-iron bearings.

When topping up, lubricate sparingly with:

- SHELLALVANIA EP2
- ELF EPOXA 2
- MOBILUX EP2

ELECTRIC MOTOR

- Make sure that the motor is operating efficiently.
- Follow the manufacturer's instructions when maintaining the motor.

REPLACING A MOTOR

It is be easier to replace a motor via the top of the air handling unit when dealing with large frame-mounted fan motors.

When dealing with small swing-mounted motors, access can be gained through the side access panel (Pg 8 REMOVING THE FIXED PANELS).

HUMIDIFIER

Access to the humidifier for inspection is gained by removing the access panel located at the top of the service side.

For maintenance work requiring the humidifier unit to be slid out sideways (tank, trickle cell, recycling pumps, etc.) disconnect the supply and discharge pipes and remove the side panel according to the dismantling procedure (Pg. 8 REMOVING THE FIXED PANEL).

During periodic inspections it is advisable to examine the following point with care:

- Furring of trickle cells as heavy furring could result in interruption of the flow of water to the honeycomb structure of the cell, thereby causing droplets of water to be carried over into the airstream.
- Check the condition of the droplet separator if fitted (speed above 3.2 m/s to the cells)
- Verify the covers on the supply conduits are positioned correctly.
- Correct adjustment of supply flow so as not to cause the conduits to overflow.
- Operate float manually to check the correct operation of the make-up water valve (re-cycle models).
- Correct operation of water inlet solenoid valve as required.
- Periphery leak-tightness of the tank.
- Internal coating of the reservoir is in good condition.

ELECTRICAL CONTROL

Check the correct function of the various safety and control devices periodically.

- Pressure switches and travel limits should cause the fan to stop.
- Flow monitors to switch off the electrical heater, in failure case.
- Time delay for fan shutdown in relation to electrical heater, as appropriate (minimum time delay 10 minutes).
- Action of anti-freeze thermostat as appropriate.
- Check that the AHU is properly earthed.
- Check condition of manometer connections.

GENERAL MAINTENANCE

- Lubricate the hinges and latches on the doors and hatches of the AHU with SAE 10 oil.
- Retouch paint on areas which may have been damaged during operation to prevent corrosion of casing and tanks.
- Carry out a general inspection of all seal on supply circuits.

NOTE: if you encounter difficulty in opening access doors on the AHU, check that the unit is level. An optional hinge (adjustable along three axes) is available for all CC and CCM units.

LIST OF PERIODIC INSPECTIONS

EQUIPMENT INSPECTED	NATURE OF INSPECTION	FREQUENCY WEEKS			ACTION
		2	4	12	
Pre-Filters	Checking pressure loss (< 200 Pa)		●		Clean or replace
Bag-Filters	Checking pressure loss (< 300 Pa)		●		Replace
Final-Filters	Checking pressure loss (< 600 Pa)		●		Replace
Dampers	Movement of blade and leak-tightness of damper			●	Lubricate spindles & links
	Operation of servomotors			●	Replace
Water coils	Thermal exchange	●			Vent the coil
	Clogging of fined surfae			●	Clean finned surface
	Clogging of separator			●	Clean
	Appearance ofthe condensate tank			●	Clean, repaint
	Discharge of condensate			●	Clear
	Siphon level	●			Top-up
Fan	Belt tension		●		Increase tension
	Check bearing (heating)			●	Replace
	Vibrations			●	Replace
	Flexible duct on fan			●	Replace
Electric motors	Abnormal heating		●		Replace
	Bearing noise			●	Replace
	Excess current (> value on information plate)		●		Replace
	Earthing			●	Re-establish
Trickle humidifier	Condition of trickle cells			●	Replace
	Operation of float and security of water inlet valve			●	Replace
	Appearance of tank and leak-tightness			●	Clean, repair, replace
Pressure switch	Stops ventilation			●	Replace
Damper travel limit	Stops ventilation			●	Replace
Air flow shutter	Stops ventilation			●	Replace
Coil time delay	stops fan after time lag (10nm)			●	Replace
Anti-freeze thermosta	Activates alarm, stops fan		●		Replace
Manometer	Cleanliness / tube level			●	Clean / top up
Doors and hatches	Operation		●		Lubricate
Casing	Appearance & leak-tightness			●	Repair, seal, repaint
Flexible ducting	Inspect for tearing, leaks			●	Repair or replace

Service

SPARE PARTS

To ensure the efficient operation of our AHU we would advise that a supply of spare parts is maintained for immediate use. Obviously, a unit operating as part of an industrial process should only be shut down in cases of extreme urgency (as well as for periodic inspections). This is why the list below is not exhaustive but rather reflects what could be called the bare minimum.

- Set of spare filters
- Set of drive belts
- Set of spray (scrubbers)

In the case of heavy maintenance, we would advise you to add the following items in a ratio of one for every ten in operation:

Fan Section

- Electric motor 1 of each type
- Set of fan bearings 2 of each type
- Set of anti-vibration mountings 2 of each type
- Set of drive belts 1 of each type
- Set of pulleys 3 of each type
- Flexible sleeve for fan 1 of each type

Damper Section

- Damper blade 10 of each type
- Damper linkage 20 Pieces

Miscellaneous

- Compriband jointing tape 20x15 10 m
- Adhesive jointing tape 12x3 50 m
- Paint for retouching 5 kg
- Bituminous paint (tank) 5 kg
- Fin comb 1 per fin pitch
- Door closure 2 Pieces
- Retaining clips (Filter) 12 Pieces

Spare Parts for Optional Equipment

- Slack tube manometer 2 Pieces
- Differential pressure switch 1 Piece
- External flexible sleeve 1 of each size
- Lighting 2 Pieces
- Damper servometer 1 Pieces
- Complete viewport (joint) 1 Piece
- Anti-freeze thermostat 1 Piece

For other larger components, consult our After-Sales service Department. In order to speed up the search for our spare parts, please advise us the model of air handling unit as well as its size and the location of the site.

BREAKDOWN AND SERVICING

Please do not hesitate to contact the After-Sales Service Department with any proposals concerning replacement or upgrade of all, or part, of your air handling unit.

For any intervention concerning the replacement or improvement of the unit, please provide us with the following information:

- order no.
- Job name
- Unit model reference (ALT)
- Size of the unit (height x width)

For any problems concerning the performance of the unit, please provide us with the following information:

- order no.
- Job name
- Unit model reference (ALT)
- Size of the unit (height x width)
- Design data and Actual data
- Fan speed
- Pressure drop of water across cooling coils
- Air pressure drop across cooling coils
- Temperature Differential across Cooling coil
- Motor voltage
- Motor current
- A sketch of the duct configuration
- A detailed description of the problem

For further assistance in troubleshooting the air unit, refer to the troubleshooting chart (page 27-20)

TROUBLE SHOOTING CHART

In case of problems, Please refer to the chart below before contacting manufacturer, as it may be possible to resolve problems more rapidly.

PROBLEM	ORIGIN	POSSIBLE CAUSE	SOLUTION
Abnormal Noise	Fan or motor		Uncouple the motor from the unit and test the motor
	Drive Noise	Sheave(s) not tight on shaft(s) (motor or fan)	Tighten sheave (s)
Belts hitting belt guard		Adjust or tighten belt guard mounts	
Belts loose		Adjust to proper tension. Belt should be checked twice during the first few day, s operation and periodically checked afterwards.	
Belts too tight		Adjust to proper tension.	
		Install correct belts.	
Belts not matched inlength on multi-belt drive		Install matched belts.	
Misaligned sheave		Align sheaves properly	
Belts worn		Replace belts.	
Motor, motor base, or fan not securely anchored		Anchor loose components as required.	
Belts oily or dirty		Clean or replace belts.	
Incorrect drive selection	Reselect the transmission		
Noisy Operation	Motor	If noise persists after the power supply has been switched off : noise source is mechanical	
		Vibrations	Check key is appropriate to type of balancing
		Defective bearing	Change the bearings
		Mechanical friction : Ventilation, coupling	Check
		If noise stops after the power supply has been switched off : noise source is electrical	Check power supply to the motor terminals
		Voltage normal and 3 phases balanced	Check the connection to the terminals and connections blocks are correctly tightened
		Abnormal voltage	Check the power supply
		Phases unbalanced	Check the coil resistances
Fan: Turbine	The turbine is not sufficiently fixed to the shaft or not centred on the shaft (balanceing)	Tighten the fixations and and re-centre the turbine	
	Turbine is damaged, defective or touches the inlet cone or inlet cone damaged	Replace the defective elements or recentre the turbine	
	The fan shaft has moved on the bearing axis	Adjust or replace	
	Unbalanced turbine	Balance the turbine	
	Turbine is dirty and dusty	Clean	
Fan: Scroll	Foreign matter present in the hood	Clean	
	Hood elements are not properly fixed	Check and tighten	
Fan: Bearings	Defective bearings	Repair or replace the bearings	
	Bearing need lubrication	Lubricate bearings as required	
	Bearing loose on bearing support	Tighten bearing support bolts	
	Bearing loose on shaft	Tighten bearing shaft	
	Bearings misaligned	Align properly	
	Foreign matter inside bearing	Disassemble, inspect and clean. Replace bearing as required	
	Fretting corrosion between inner race and shaft	Clean and replace bearing as required	

TROUBLE SHOOTING CHART

PROBLEM	ORIGIN	POSSIBLE CAUSE	SOLUTION
Noisy Operation	Air velocity too high	Ductwork too small	Increase duct sizes to obtain correct air velocity
		Fan running too fast	Verify correct fan rotation speed
		Static pressure lower than expected	Reduce fan speed to obtain desired flow rate
		Unsuitable fan section	Verify the fan selection
		Grills and dampers too small	Install grills and damper of the correct size
	Rattling of whistling noise in air stream	Dampers, diffusers obstructed. Obstruction in the ductwork	Remove obstruction
		Loose dampers or grills	Tighten the fixations
		Sharp expansion or contraction of the ductwork	Install appropriate ductwork transitions
		Sharp elbows	Install elbows with larger turning radius
		Turning vanes loose or incorrectly installed	Tighten or reinstall correctly
Insufficient Air Flow	Fan	Fan wheel installed backwards	Install in the correct position
		Fan wheel rotating backwards	Reverse any two power leads to fan to change rotation direction
		Fan wheel not centred inlet cones	Re-align fan to centre of inlet cones
		Fan speed too slow	Verify correct fan speed
		Reduction in fan induction due to obstruction by walls or panels	A distance of at least 0.6 x diameter of the air admission between fan inlet and the wall
	Ductwork	System pressure drop is greater than originally calculated	Enlarge ductwork or remove obstructions to match design requirements
		Dampers closed and / or splitter rod disconnected	Open dampers and connect splitter rods
		Obstruction in the fan discharge duct	Check and carry out modifications if necessary
		Insulation duct liner is loose or incorrectly positioned	Re-attach and reposition duct liner
		Fire dampers close	Open fire damper
		Leak in the supply duct caused by open seams or holes in duct work	Repair seams and / or leaks in the duct system
		Actual duct system has more resistance to flow than originally calculated	Check and carry out modifications if necessary
		Not enough straight has more resistance to flow than originally calculated	Install a straight duct at least 1.5 x diameter of the turbine or in increase the fan speed: observe fan speed limits per manufacturers guidelines
	Obstruction in high velocity regions in duct system	Check and carry out modifications	
	Components	Air filters clogged or dirty	Clean or replace filters
Coils clogged or dirty		Clean the exchange surface of the coils	
Air flow too high	Fan	Blade wheel is installed backwards	install in the correct position
		Fan speed is too great	Check the maximum speed of the fan
	Ductwork	Over-dimensioned ductwork	Reduce duct sizes or decrease fan speed to obtain desired flow rate
		Unit access door open	Close all unit access doors
		System not correctly balanced	Balance system per design specifications
		Dampers and grills not installed	Install all dampers and grills
		Fretting corrosion between inner race and shaft	Install air filters

TROUBLE SHOOTING CHART

PROBLEM	ORIGIN	POSSIBLE CAUSE	SOLUTION
	Ductwork	System pressure drop is less than expected	Reduce fan speed to obtain desired air flow also reduce absorbed power and noise
	Fan	Blade wheel is installed backwards	Blade wheel is installed backwards
		Fan speed is too great	Check maximum speed of fan
Noisy Operation	Motor	Overload	Check the current is that indicated on the motor
		Overload	Use larger motor
		Normal voltage and 3 phases balanced	Check the terminal connection and the tightness of connector bar
		Abnormal voltage	Check the power lines
Motor runs excessively hot		Over load	Check the current is that indicated on the motor
		Overload	Use larger motor
		Blocked ventilation	
		Ambient temperature is greater than 45°C	Reduce the ambient temperature or provide an external source of ventilation
		Supply voltage is defective	Check
		Wiring error	Check the wiring diagram
		Partial short circuit	Check the electrical continuity of the coils and / or the installation
Motor will not start		Phases unbalanced	Check the coil resistances
		Fan wheel not centred inlet cones	Re-align fan to centre of inlet cones
		Unloaded	
		Rotor or bearings locked or frozen	Switch power off. Verify manually the free rotation of shaft
		Supply line interrupted	Check fuses, thermal protection and starting device
		Loaded	
Air temperature	Electric heater	Manual reset thermal cut out in electric heater control circuit is tripped	Check reasons for tripping and correct. Reset manual cut out switch
		Air flow switch interlock not closed	Check air flow sensing tube for proper location in air stream and for possible damage. Repair / replace air flow switch / sensing tube if necessary
		Broken electric heating element	Replace element
		Electric heater circuit fuses blown	Check fuses and electrical protection
		Heat limiters blown	Replace heat limiters
		Defective electric heating circuit contact	Repair or replace contact
	Hot water or steam coils	Defective hot water or steam valve actuator motor	Replace actuator motor
		Broken control linkage from actuator to valve assembly	Repair or replace actuator linkage
		Defective hot water or steam control valve	Replace valve