

OPERATING & MAINTENANCE MANUAL

For health and safety reasons each section of the manual should be read before attempting to operate the unit and reference made to the unit GA drawing for technical specifications and weights.

When provided, it is advisable that lifting points are used together with suitable lifting equipment, slings, straps etc., for unloading and installation to avoid injury during handling of unit sections.

In the absence of lifting points it is recommended that unloading and handling of unit sections is carried out by means of a suitable Fork lift truck.

Each unit comprises an arrangement of insulated galvanised steel cabinet sections each housing different components (filters, heaters, fans etc.,).

Where maintenance is required (to change filters or fan belts etc.) the cabinet section will be fitted with an access door/panel secured by means of special key operated catches and hinges.

Warning:

Each access door (or panel) should be considered as a 'guard' behind which a potential hazard to health may be present. A special key is required to open the door catches to gain access – these should be removed after use to prevent unauthorised access.

Do not attempt to open any access door until you have first identified the component section and any associated hazard that may be present.

HAZARD IDENTIFICATION;

Electric heater Section:

Risk of electrocution!

Risk of burns from high temperature or radiant heat.

NB: Always ensure that the electrical supply is isolated when working in this section!

Fan Section:

Risk of electrocution!

Risk of injury to limbs due to entrapment or entanglement in rotating/moving parts!

NB: Always isolate the electrical supply before entering the fan section!

Filter Section:

Risk to respiratory system from dust or particle contamination captured in filter cells!

Risk of injury due to sudden release of positively pressurised enclosure (on blow through sections)!

NB: Wear appropriate PPE – as applicable.

Humidifier Section:

Risk of scalding or burns from live (pressurised) steam!

Steam or Medium to High pressure Heating Section:

Risk of burns from high temperature heating medium!

Gas fired heating appliance:!

Risk of burns from high temperature or radiant heat!

NB: Such appliances will be provided with a separate O & M manual – always consult before attempting any maintenance or before operating. It is advisable that such appliances are commissioned and properly maintained by the heater manufacturer to ensure safe operation.

OPERATING & MAINTENANCE PROCEDURES

Fan Section

Prior to shipment from works, fan assemblies are checked and drives are tensioned. However, movement during shipment, or damage by other trades is always possible, and we therefore recommend the following minimum checks are made.

Pre-run Checks:

Remove all packing and foreign matter from within all sections of the air handling unit

- 1) Check visually for damage or fouling to the following:-
 - Fan impeller
 - Fan scroll
 - Motor
 - Drive components
 - Anti-vibration mountings
- 2) Spin drive by hand and check that fan impeller runs true and does not foul the casing,
- 3) Check tightness of fan holding down bolts.
- 4) Check tightness of all fan bearing fixings.
- 5) Check tightness of motor holding down bolts.
- 6) Check drive pulleys are securely tightened, and in alignment. Check alignment with a straight edge.
- 7) Check tension of belts. Over tightening will result in premature bearing failure. (See V-Belt Drives)

Initial Run Checks

Fans should not be run for long periods until the installation is complete and the design fan resistance is in place. Lack of system resistance may overload the motor.

- 1) Set motor overload protection to 10% above normal running current
- 2) Check fan rotation is in the correct direction.
- 3) Check fan speed.
- 4) Check for undue vibration.
- 5) Check there is no slipping of the v-belts.

Regular Maintenance

Every 6 months (or 2 months for continual running) check and adjust or replace as necessary.

- 1) Check that the v-belts are correctly tensioned.
- 2) If the v-belts show signs of wear and tear they should be replaced. Do not mix old and new belts by replacing individual belts. Only replace complete belt sets.
- 3) Check alignment of drive pulleys.
- 4) Rotate drive by hand and check that fan impeller runs true and does not foul the casing.
- 5) Check for play in fan and motor bearings.
- 6) Check that all holding down bolts are secure.
- 7) Check anti-vibration mountings for wear.
- 8) Check flexible connections for wear

Fan Section (continued):

Fan and motor bearings are supplied as standard with pre-greased sealed for life ball bearings. In the unlikely event of a bearing of this type being faulty, the bearing needs to be replaced - the bearing cannot be regreased.

Bearings have a minimum anticipated design life of 20,000 hours at peak performance.

Provided that the limiting values for operational performance of the fan and motor are observed and that the V-belt drive is properly maintained, the bearings should provide long trouble free service life.

Each fan bearing race is mounted in a unique rubber anti-vibration housing retained within galvanised mild steel support arms attached to the fan casing side plate.

If it is necessary to change the fan pulley this should be located on the shaft close to the bearing support assembly to minimise the side load exerted by the tensioned V-belt drive.

Heavy duty Fans and Motors:

Bearings mounted in non-standard heavy-duty fans and in motors with 280-frame size and above, will either be provided with grease nipples or have split bearing housing suitable for re-lubrication purposes.

The re-lubrication period will vary according to bearing size, running speed, temperature and operational hours, however as a guide the re-lubrication period should be halved or doubled respectively if the bearing temperature is increased or reduced by 15K.

However, irrespective of the operating period and temperature, as a minimum the grease should be replaced after every 3 years due to ageing.

When recharging, the bearing should be fully stripped down, thoroughly cleaned and repacked using a Lithium based (e.g. SHELL ALVANIA GS) grease.

Avoid excessive grease in bearing assemblies, approximately 1/3 of the internal volume should be filled with grease ensuring that the hollow spaces are filled and flush with the outside faces. Bearing caps should not be charged with grease when completely repacking the bearing.

Anti-Vibration Mountings

Spring anti-vibration mountings are normally fitted to most fans.

The standard range is totally enclosed with neoprene rubber covers, which prevent any clogging of the coils.

On large fan sections where the fan speed is low, adjustable spring anti-vibration mountings may be supplied. These mountings are each levelled by unscrewing the adjusting screw to the free position, measuring the height of each mounting, and then adjusting the height of each one to that of the highest. Although this procedure will normally be carried out at the works during assembly, if the unit is dismantled for shipping, then it will be necessary to readjust the mountings after re-assembly.

Anti-vibration mountings do not require maintenance – however transit straps must be removed before use.

V-Belt Drives

V-Belts should be tensioned as described below and pulleys checked for alignment

- 1) Measure the distance between pulley centres
- 2) At the centre of this span depress one belt at right angles to deflect by 16mm per metre length of span.
- 3) Compare the force used with the values shown below.

<u>Belt Ref.</u>	<u>Small Pulley Dia.mm</u>	<u>Force kgf.</u>
SPZ	67 - 95	1.0-1.5
SPZ	100-140	1.5 - 2.0
SPA	100-132	2.0 - 2.7
SPA	140 - 200	2.7 - 3.5
SPB	160 - 224	3.5 - 5.1
SPB	250 - 400	5.1 - 6.6

- 4) Provided the measured force falls within the range above then the drive tension will be satisfactory.

When installing new v-belts they should be tensioned towards the higher force value to allow for belt stretch during the running-in period.

After the drive has been running for 30 minutes the tension should be checked and adjusted back to the higher value if necessary.

WARNING: do not attempt to adjust a belt drive until the motor is properly isolated.

Over-tensioning of belts will cause stress on fan and motor bearings and could result in premature bearing failure.

Under tensioning of belts will cause belt damage leading to premature belt failure.

When fitting new belts ensure that the motor is moved sufficiently close to the fan to prevent any pressure being placed on the belts when they are fitted over the pulleys. They must not be forced onto the pulleys with any instrument.

Filter Section

Disposable panel filters, short synthetic bag filters or high efficiency bag filters are the most commonly used filters and each filter section will be fitted with an inclined manometer. Markers are supplied with each manometer for mounting at the commissioning stage to indicate the initial and final filter pressure drops.

Filter replacement will depend upon the application, the allowable system air volume deviation and local conditions, and it is therefore not possible to generalise on replacement periods. Dirt on a filter will reduce system airflow and it is important for the user to appreciate this affect on the system

The recommended maximum final pressure drop for each type of filter is shown below together with the initial pressure drop at a nominal face velocity of 2~5m/s

TYPE	GRADE	INITIAL PD (Pa)	SINAL PD (Pa)
Disposable Panel	EU3/4	50	200
Synthetic Bag	EUS/4	55	250
Hi-Efficiency Bag	EU5	45	250
Hi-Efficiency Bag	EU7	110	250
Hi-Efficiency Bag	EU8/9	145	250

Although a maximum final pressure drop is shown, local requirements often necessitate more frequent replacement.

A clean to dirty differential of 125Pa is commonly used.

Maintenance

- 1) A visual inspection of the filter media and manometer should be carried out at monthly intervals.
- 2) The media should be replaced if it is damaged or if the design final pressure drop is reached
- 3) New panel filters must be installed with the retaining grid on the downstream side of the unit.
- 4) When replacing filters, be careful not to tear the filter media on the slide channels. If originally fitted, replace the filter frame side-blanking plates.
- 5) When removing exhausted filters be careful not to discharge dirt into the unit airway.

Inclined Manometer

Following installation of the air handling unit check that the manometer is set horizontally and adjust if necessary. Check the zero position and if necessary adjust with the level adjuster at the bottom of the reservoir. After commissioning, and with clean filters, apply the initial and final pressure indicators with the fan running

Maintenance

- 1) The manometer should remain maintenance free. However, it is advisable to occasionally check the zero position and reset if necessary.
- 2) If the gauge becomes dirty internally it may be stripped down, emptied, and the body washed in a mild detergent solution. Rinse and dry the manometer and reassemble before filling with clean manometer fluid.

Coil Sections

All Coils:

- 1) Check water coil connections and headers for visual signs of leaks.
- 2) Check direct expansion coil connections and headers for visual signs of leaks.
- 3) Vent water coils regularly to release any trapped air.
- 4) Inspect coil fin surface for dirt and other foreign matter. Operating efficiency will be impaired if the coil surfaces are dirty. If necessary remove dirt by careful brushing, vacuuming or in excessive cases by washing down the coil with a proprietary cleaning fluid. Avoid damaging the coil fins at all times.

Cooling Coils:

- 1) On cooling coils inspect both the drain pan and, if fitted the moisture eliminator and clean with warm water and detergent if necessary. Rinse well.
- 2) Ensure the drain tray outlet is clean and free of dirt and debris.
- 3) Check that the drainage trap is properly filled and forming an effective seal

Heat Recovery Recuperators

Recuperators have no moving parts or fluid flow but are highly susceptible to efficiency loss because of dirty fins. For this reason it is good practice to fit a filter on both airway inlets.

- 1) Clean fins and drain pans as described in the coil section.

Condensate Pipework

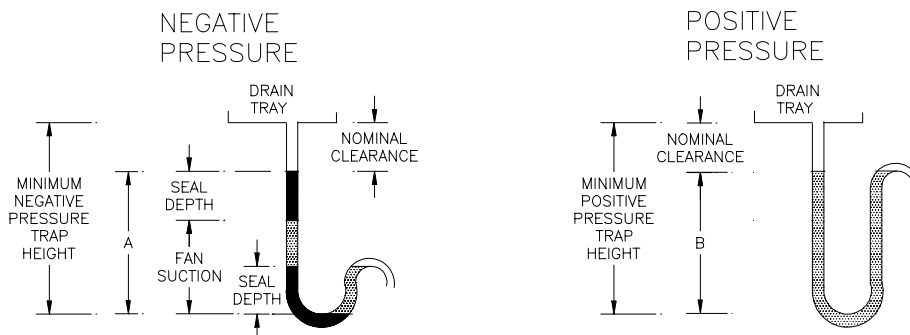
All drains must be correctly trapped. Incorrect trapping may result in flooding of the air handling unit or plant room.

Drain lines should be no smaller than the drain pan connection size and must be installed with an adequate fall. Insulate the drain line to prevent condensation if it passes through a sensitive area.

Recommended Condensate Trapping Details

$A = \text{Fan suction pressure} + \text{seal depth}$

$B = \text{Maximum discharge pressure}$



Electric Heaters

- 1) Ensure the mesh safety guards and elements are free of dirt and debris and brush clean if necessary.
- 2) Check the wiring connections in the terminal box are secure and that there is no evidence of arcing.
- 3) To check that all heater elements are operational, a measured electrical resistance of 20-120 ohms is required through each.
- 4) To check the high temperature safety cut-out for correct operation, first remove any heat sensitive components, such as filters, which are adjacent to the heater. Switch the heater on without the fan running, and with an accurate thermometer positioned adjacent to the cut-out sensor, measure the air temperature. The cut-out should break at a temperature of $113^{\circ}\text{C} \pm 6^{\circ}\text{C}$. Do not allow the air temperature to rise above 125°C before switching off the heater.

Unit Casing

Clean framework and Plastisol panels with a mild detergent solution. Do not use abrasives. Take care not to damage the Plastisol skin

All access panels are fitted with lift-off hinges. Following installation, all hinges should be greased well to ensure free and easy operation

Damper & Mixer Sections

The standard damper construction is galvanised mild steel opposed blades, zinc plated mild steel spindles and Nylatron bearings, and as such should be maintenance free.

- 1) Inspect and remove any dirt and debris from blades and external linkage.
- 2) Check full and free blade movement. If required use WD40 only.
- 3) If motorised, check drive stop-start position.
- 4) Check tightness of motor mounting.

Self Generating Steam Humidifiers

The operation of these units is automatic and they do not require attention on a day to day basis. Cylinder life will depend upon local water hardness and may vary between about 4 months to over one year

In addition, steam and condensate hoses together with the feed valve and drain pump require regular maintenance.

Refer to manufacturers instructions for the full maintenance schedule.

RECOMMENDED MAINTENANCE SCHEDULE

Refer to maintenance procedures for detail of listed checks

Monthly

- 1) Check pressure drop on filter manometer.
- 2) Visually check filter media for damage

Every 3 Months Carry out monthly checks plus the following: -

- 3) Check drive belts for wear and correct tension.

Every 6 Months Carry out 3 monthly checks plus the following: -

- 4) Inspect heating coils and clean if necessary
- 5) Inspect cooling coils and drainage system and clean if necessary
- 6) Inspect heat recovery Recuperators and drainage system and clean if necessary
- 7) Carry out fan section checks

Annually Carry out 6 monthly checks plus the following: -

- 8) Check electric heater operation
- 9) Inspect and clean external unit casing.
- 10) Check that all access panels open and seal correctly and grease hinges
- 11) Check damper mechanisms and operation