

OPERATING & MAINTENANCE MANUAL

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SECTION 1	OPERATING INSTRUCTIONS
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1.1 Ductwork

General

The main duct work will be manufactured from galvanised mild steel sheet of a folded lock-formed and flange construction in accordance with DW/144 specification for Class A Ductwork. The class A ductwork will have a static pressure limit of less than 500Pa positive pressure and 500Pa negative pressure. In-duct velocity should not exceed 10m/s. Ductwork will be constructed from hot-dip galvanized steel sheets confirming to BS EN10142:1991 Grade DX51D+Z, coating type Z275.

The ductwork has been designed to follow the most direct route to atmosphere, whilst minimising bends and pressure.

Initial Start Up

Equipment leaves the factory ready for installation. However, the following checks should be carried out to ensure the machine is safe to operate.

- Motors are wired in accordance with the manufacture's instructions.
- All dampers are in the open position.
- Frost protection systems are in operation. It is most important that water heat exchangers are protected from frost under start-up conditions, particularly where units are handling 100% fresh air.
- Air filters should be fitted.

1.2 FANS

General

Before connecting the fan with the unit, check the impeller and bearings for correct movement. Ensure that the impeller does not brush into the inlet cone. If this occurs, the cone has to be loosened and re-aligned.

Check fan externally for oxidation on metal surfaces.

1.3 ELECTRIC MOTORS

General

Before putting a motor into operation, which has been idle for some time, check that no foreign matter is present and blow off dust and dirt.

Test insulation resistance between phases and to earth. If this is less than 1 Megaohm, the motor should be placed in a warm dry place until the reading is obtained.

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2.1 AIR HANDLING UNITS / FANS

Fan Sections

Fan and motor assemblies should be checked every 6 months. The following items should be checked and adjusted as required.

- Check fan bearings for wear and lubricate.
- Check motor bearings for wear and lubricate.
- Check movement of vibration isolators and ensure that they are free to oscillate.
- Check general condition of cabinet and internal fan and motor supporting structure for corrosion and treat as necessary.

Filter Sections

Filters must be changed when dirty. Maximum PD 225 Pa for panels, 250 Pa for bags. Overloading of the filters can result in filters splitting due to the weight of dust held within the filter media. The pressure differential across each filter can be read directly from the manihelic gauge provided on the air-handling unit.

2.1 AIR HANDLING UNITS FANS(Cont'd)

General

The general condition of all internal and external surfaces should be periodically checked for corrosion. Should any surface damage occur the affected area should be treated immediately.

2.2 AIR FILTERS

General

It is important to keep a log recording when filters are changed as conditions vary from plant to plant and from area to area, and no firm guidelines can be laid down stating time intervals between changing filters.

When filters do become dirty, it is important that they are changed as soon as possible, as dirty filters will cause the deterioration of plant performance due to the decreased airflow.

The following table gives approximate recommendations for frequency of inspections for various types of filter where fitted.

• Synthetic Fibre Glass	-	Every 3 weeks
• Synthetic Pleated	-	Every 6 weeks
• Synthetic Bags	-	Every 9 weeks
• Washable Foam 20 Pore	-	Every 4 weeks
• Washable Foam 30 Pore	-	Every 6 weeks
• Baffle Filters	-	Cleaned Every 3-5 days

Frequency of System Checks

Weekly

For panel or bag filters, check reading obtained on gauge, compare with manufacturers recommendations, and if panels are disposable type, replace.

Cleanable type should be replaced with new media while the dirty ones are removed for cleaning and future use.

2.3 CENTRIFUGAL FANS

Cleaning of Components

Check cleanliness of impeller and remove any grease or dirt. This is necessary to avoid a possible unbalance of the impeller, which causes vibration and increases noise level. Remove any signs of oxidation on housing or shaft as this can cause a higher air resistance and can also damage the fan structure.

Checking of Moving Parts

Check stability of components of the fan if vibrations are high.

Checking of Bearings

The bearings have a minimum theoretical life of 15,000 hours. However they should be checked and cleaned regularly. If a bearing has to be replaced, also replace the rubber support ring where applicable.

The temperature for normal running bearings is from -20°C to +60°C. The grease used is always lithium soap. The bearings are sealed for life and therefore no re-lubrication is necessary.

Check shaft / bearing locking collar is correctly tightened onto corresponding items.

2.4 ELECTRIC MOTORS

General

Before working on electric motors, ensure that they are electrically isolated, preferably by removing the fuses from the control panel.

Electric motors should be kept clean and dry.

Most small electric motors have “sealed for life” bearings which should last for the economic life of the motor and require no attention. Refer to the heading **Bearings** in this section of the manual for maintenance information on other type of bearings.

Frequency of System Checks

Monthly

- Check and lubricate bearings unless they are “sealed for life” type. The following lubrications are recommended :-

Sleeve oil ring bearing - Shell Tellus 27 or Equivalent.

Sleeve disc bearing - Shell Tellus 27 or Equivalent.

Ball or roller grease bearings - Shell Alvania Z or Equivalent.

Ball or roller oil bearings - Shell Turbo 33 or Equivalent.

- Check motor generally. Make sure that ventilation openings are clear; pulleys and holding down bolts are secure.
- Clean slip ring gear on slip ring motors; inspect brushes for wear and freedom of movement. Renew if necessary (refer to manufactures instructions).
- Remember to inspect standby motors if fitted, and spin them to prevent seizure.

3 - Monthly

- Motors fitted in damp situations should have insulation checks carried out on the wiring and the motor itself. As an approximate guide, the value measured across the motor should be greater than the value obtained by the following formula :-

$$\frac{(20 \times \text{Voltage})}{1000 + (2 \times \text{kW Output})} = \text{_____} \quad \text{Megaohms (} M\Omega \text{)}$$

If the value obtained by measuring is lower, the windings are damp and should be dried out in accordance with the manufacturers recommendations.

- Remove motor terminal boxes and check security of cables. Ensure that interior of terminal box is clean and dry.
- On single-phase motors, check centrifugal operated switches for operation and wear.
- Examine starters and check for wear. Do not use abrasive materials for cleaning contacts. Make sure that indicator lights and interlocks operate correctly.

6 - Monthly (Or every 4,000 hours running time)

- Check full load current drawn by motors and compare with previous values.
- Check casing of motors for correct earth.

Yearly (Or every 8,000 hours running time)

- Blow out motors with compressed air to remove dirt and dust.

3 - Yearly

Dismantle and overhaul motors in accordance with manufacturers recommendations.

2.5 BEARINGS

General

Always use oil or grease of the type specified in the manufacturers literature or schedule of lubricants contained in this manual.

Replace grease using low-pressure type grease gun and the correct connector.

Do not overfill bearings as this can cause bearing damage.

After replacing or re-greasing bearings, carefully monitor for approximately 4 hours. The bearing will initially run hot until all the grease is evenly distributed between the bearing and the housing. The bearing should then cool down.

Bearings, which are oil lubricated, should be filled with a good quality oil of the correct viscosity. In this instance, the manufacturers recommendations should be strictly adhered to.

The correct oil level should also be strictly adhered to, as under filling will provide insufficient lubrication, and over filling will cause excessive agitation of the oil. Both conditions cause overheating and subsequent deterioration of the oil, leading to possible bearing failure.

Frequency of System Checks

Weekly

- Check to ensure bearings seals are not leaking and that breather holes are unobstructed. If the bearings are leaking, replace.
- Turn shafts 1.5 turns if the plant has remained stationary since previous week.

Fortnightly

- Check oil level in wick type bearings and top up if necessary.
- Listen to bearings (using a stethoscope if possible) to check for any unusual noises. As a guide, an irregular rumbling noise indicates that the bearing is damaged, while a shrill noise indicates that the bearing is dry.
- Check temperature of bearings and check against previous readings for any dissimilarity.

3 - Monthly

- On oil lubricated bearings, remove sample and check condition. As a guide, if the oil smells rancid, appears darker or thinner than fresh oil, then it is deteriorating through overheating and should be replaced.

2.5 BEARINGS (cont'd)

6 - Monthly

- Check for bearing wear by measuring shaft float and end play and compare with manufacturers tolerances. A further check against previous recorded figures will give an indication of the life expectancy of the bearing.

Yearly

- Drain oil out of oil filled bearings, clean by rinsing out with cleansing agent, and refill with new oil. Renew drain plug washer. If the oil is found to be badly contaminated, inspect bearing for damage.

3 - Yearly

- Dismantle grease-bearing housing and inspect bearing for damage or wear. Replace with new grease and reassemble.
- Dismantle oil-bearing housings and inspect bearing for damage or wear. Renew oil seals, reassemble and fill with fresh oil.

SECTION 3 DRAWINGS

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Drawing No.	Rev. No.	Ref.

SECTION 4	Data Sheets
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SECTION 5**OPERATING PROCEDURES TO
ENSURE MAXIMUM SAFETY*****General***

- Prior to start up, check the unit internally to ensure all airways are clear. With the isolator off, check the fan impeller for clear rotation.
- Close all access doors and ensure they are locked.
- If access is required into the units, ensure that the local isolators are in the OFF position as the fans may be started by the remote control system.
- Prior to opening any access panel, allow 5 minutes after electrically isolating the fan for the motors to run down and stop.

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6.1 *Weekly Maintenance Check*

6.2 *Monthly Maintenance Check*

6.3 *6 - Monthly Maintenance Check*

6.4 *Yearly Maintenance Check*

6.1 WEEKLY MAINTENANCE CHECKS

A.H.U.

- Examine unit externally when running and check for air leaks.
- Check that all access panels are secure.

Fans

- Check flexible connections for damage.

Extraction Canopy & Ducting

- Inspect for leaks.

Filters

- Check Pressure drop against design and replace when necessary.

Bearings

- Check to ensure they are not leaking.
- If motor has not ran for more than a week, turn shaft 1.5 turns by hand.

6.2 MONTHLY MAINTENANCE CHECKS

A.H.U.

- With electrical supply isolated, remove access panels and check internally for dirt and damage.
- Check anti-vibration mountings for security and operation.
- Inspect fan impeller for balance or damage.
- Check sub-frame and tightness of bolted components.

Fans

- Check blades are clean and undamaged.

Motors

- Check bearings.
- Check motor generally (security, holding down bolts).

Coils

- Vent coils of air.
- Check drains and drain trays.

6.3 6 - MONTHLY MAINTENANCE CHECKS

A.H.U.

- Check security bolts between sections and tighten if necessary.
- Clean out fan section.

Fans

- Check performance against original design features.

Motors

- Check insulation readings between windings.
- Check security of the cables.
- Examine starters for wear.
- Check motor full load current.
- Check earthing of casings.