

# ***actionair***

## **FAN COIL UNITS**

### **Installation, Operating and Maintenance Guidelines.**

**HYDROPAC - *HORIZONTAL WATERSIDE CONTROL***  
**SERIES PHW230**  
**SERIES PHW170**

**AEROPAC - *HORIZONTAL AIRSIDE CONTROL***  
**SERIES PHA230**

**HYDROPAC – *VERTICAL WATERSIDE CONTROL***  
**SERIES PVW230**

**Ruskin Air Management Limited,  
Joseph Wilson Industrial Estate,  
South Street,  
Whitstable, Kent CT5 3DU**

**Telephone: 01227 276100**

**Facsimile: 01227 264262**

**Email: [sales@actionair.co.uk](mailto:sales@actionair.co.uk)**

**Website: [WWW.actionair.co.uk](http://WWW.actionair.co.uk)**

## **CONTENTS**

### **SECTION A - INTRODUCTION**

PRODUCT INTRODUCTION

### **SECTION B - HEALTH & SAFETY**

HEALTH & SAFETY

### **SECTION C - DELIVERY & INSTALLATION**

RECEIPT OF EQUIPMENT

OFFLOADING

STORAGE

INSTALLATION

INSTALLATION DETAIL DIAGRAM

NR PREDICTIONS

### **SECTION D - COMMISSIONING**

COMMISSIONING

### **SECTION E - SERVICE & MAINTENANCE**

GENERAL / WARRANTY

FANS

COILS

FILTERS

INSULATION

### **SECTION F - GENERAL INFORMATION**

COMPONENT SPECIFICATION

### **SECTION G - GENERAL ARRANGEMENT DRAWINGS**

Fan Coil Drawings from the following series will be provided separately for the Contract .

330850 - Type PHW230 general layout.

330851 - Type PHW230 with inlet plenum.

330950 - Type PHA230 general layout.

330951 - Type PHA230 with inlet plenum.

337080 - Type PHW170 general layout.

337081 - Type PHW170 with inlet plenum.

346000 - Type PVW230 non-cased general layout.

346001 - Type PVW230 with option # 1 case.

346002 - Type PVW230 with option # 2 case.

346003 - Type PVW230 with option # 3 case.

346004 - Type PVW230 with option # 4 case.

330956 - Type PHA230 general layout c/w with electric heater.

339657 - Filter removal detail when fitted with Return Plenum.

330081 - General arrangement of transformer tapplings

**Wiring Diagrams:** refer to project specific wiring diagram. (Numbered AAF- - - )

**Special Projects:** refer to Project Specific General Arrangement drawing.

## **SECTION A - PRODUCT INTRODUCTION**

**Actionair Series PHW and PHA fan coil units are a purpose built range of cooling and heating units, factory wired and tested and designed for horizontal installation within a false ceiling void.**

Type PHW are Waterside Control, controlled units suitable for operation against moderate duct resistance, using chilled water cooling medium and low pressure hot water heating medium. Temperature control is achieved by means of modulating 4 port diverting valves on heating and cooling, operated via a stand alone or BMS temperature controller and room or return air sensor.

Type PHA are Airside Control, similar in application to series PHW but incorporate a Zone Regulating Module (ZRM) to divert air through heating, bypass, and cooling zones to control temperature output.

Unit casings are manufactured from galvanised sheet steel.

The Casing is fully insulated both acoustically and thermally with class 'O' CFC and HFC free open cell foam.

The Coils are located above a one piece welded galvanised sheet steel synthetically treated foam insulated condensate tray with fall to drain.

The direct driven Fans are mounted internally on a rigid bulkhead, vibration isolated from the casing via rubber grommets. The fans discharge into a acoustically treated discharge plenum complete with circular spigots.

Filters are either washable continuous filament media fitted in a galvanised steel frame, supported with steel mesh and spring clip, or vacuum cleanable metal mesh.

Access to the fan is from the underside, via an insulated full width bottom panel.

**Actionair series PVW are Waterside Control fan coil units for vertical wall mounting available in a non-cased option (for concealing behind an architectural enclosure) or in a painted cased option (for exposed mounting). Refer to above general specification and product catalogue.**

***REFER TO ACTIONAIR HYDROPAC AND AEROPAC PRODUCT CATALOGUE FOR GENERAL SPECIFICATION AND DESIGN DATA.***

(Actionair products are manufactured by Ruskin Air Management Limited)

## **SECTION B - HEALTH & SAFETY**

It is essential that the following points are observed to avoid any safety or health hazards.

This section deals with the hazards that could be encountered when any work is carried out on the equipment for which these guidelines are written.

The unit shall be checked to ensure that:

It is suitable for the electrical supply available.

It is suitable for the atmosphere and/or environment in which it is to be used.

It is suitable for the working media, temperature and pressure for which it is to be used.

It can be and is manually isolated from the mains electrical supply.

It can be and is manually isolated from the water supply.

It is earthed to comply to BS7671 and local by-laws.

It is wired in accordance with BS7671.

The procedure for removing and replacing the filter media is carried out as described.

No part of the unit shall be dismantled until a careful study of these guidelines has been made.

These guidelines shall be strictly adhered to.

All persons performing any installation, maintenance or repair work on the units must be fully trained and competent to carry out the necessary tasks.

On completion of any work the interior shall be left clean and free of debris and all access panels shall be correctly re-fastened.

Check for any treatment that is required to the water supply for the prevention of corrosion of the equipment. The material of construction in contact with the water are copper tubes, brass fittings & valve bodies, stainless steel valve stems. In addition allowance must be made for materials in the external pipe system. Information regarding the necessary action to be taken can be obtained from the relevant 'water supply authority' particulars of which can be found in the water engineering handbook yearly edition.

The correct use of additives such as sterilisation tablets in trays must be applied and extreme care is advised in order not to damage condensate pumps.

## **SECTION C - DELIVERY & INSTALLATION**

This section deals with the requirements for the delivery and installation of the range of Actionair fan coil units, and must be read before attempting installation.

### **C.01 - RECEIPT OF EQUIPMENT**

Upon receipt of equipment a visual inspection must be made and any damage noted on the delivery form. Particulars of any damage or short delivery must be endorsed by the driver delivering the equipment.

No responsibility can be accepted for damage sustained during unloading from the delivery vehicle, or on site thereafter.

All claims for damage, or short delivery, should be advised to Actionair within three days and confirmed in writing within seven days of the receipt of the equipment.

### **C.02 - OFF-LOADING**

The units are supplied on pallets unless otherwise specified, and should be off-loaded from the delivery vehicle using a forklift or similar equipment.

Under no circumstances must the units be handled in such a way as to cause damage to coil pipework connections, spigots, drain trays etc.

### **C.03 - STORAGE**

Should it be necessary to store units on site for any period of time prior to installation, they must be stored in a clean, dry, secure area, where any possibility of damage to the units is eliminated.

It is essential that following instructions are adhered to and implemented during the period of storage prior to commissioning.

It is strongly advised that regular attention to the equipment is maintained.

Whilst the following procedures are highlighted they do not exclude other necessary procedures commensurate with good engineering practice.

**Interior** All inlets, discharge openings and pipe openings must be completely sealed.

Whenever any access panels are removed for inspection purposes they are to be refitted and made secure.

**Exterior** Although the units are delivered packed in “bubble-wrap” they must be protected from building rubble, dust etc, dampness, extreme cold and heat. The unit exterior surfaces must be inspected on a monthly basis and any signs of corrosion, scratches etc must be treated immediately.

**Static Indentation** Machines fitted with ball bearings may be damaged if left for long periods. The balls and races may suffer damage by fretting (false Brinelling, stationary vibration marking). Consequently, no motor should be permitted to stand on a vibrating floor while in storage, if this is unavoidable, the unit must be placed on thick blocks of rubber, cork or felt. Actionair will accept no responsibility for damage caused in this way.

**Filters** All filters must be wrapped and sealed to prevent the possibility of the ingress of dust or damp.

### **C.04 - INSTALLATION**

Before installing the units in position ensure that suitable access is available for routine maintenance and the removal of such items as coils, fans and filters.

All units must be installed in accordance with good engineering standards and due care and attention to eliminate any possible damage. The installation must ensure level positioning to facilitate correct operation and condensate removal (for PHW & PHA horizontal models refer to figure 1, Page 7).

The recommended method of unit suspension (figure 2, Page 7 refers to horizontal models PHW & PHA) is by means of M10 studding c/w 25mm diam. form 'C' washers and 28mm diam x 3mm thick rubber washers (supplied by others). Vertical units (series PVW) should be mounted using fixing points provided, onto a flat, solid surface, such as concrete or brick wall in such a way that they are not subjected to undue stress. They must be checked for accuracy of horizontal levelling and the allowance of correct condensate removal. Note that in a small number of arrangements (PHW231/2/3 Left Hand), the suspension rod nearest the controls enclosure needs to be cut accurately to length before installation.

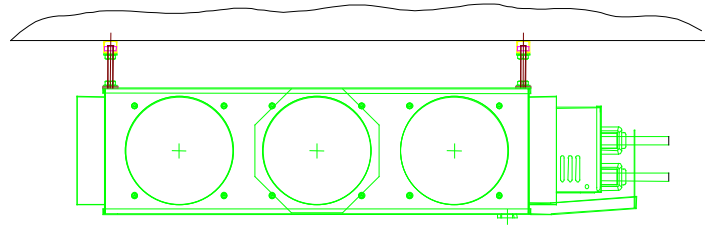
All connecting *ductwork must be independently supported from the fan coil unit spigot connections* in accordance with DW 144

Once the units are installed in situ, prior to commissioning, they must still be protected from damage, in particular to the pipework & spigot connections and filters.

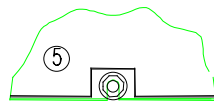
Refer to copper connection detail drawing (issued separately for each project as there are a number of arrangements, depending on size, handing and type of fan coil) for the identification of flow/return & cooling/heating coil connections. Connections must be correct, for performance, for venting of air, and for draining for maintenance and frost protection. Note that coils cannot be constructed to drain completely due to installation constraints, and precautions should be taken against residual water in the coil after draining.

All wiring must comply with all relevant British Standard Codes of Practice and good engineering principles. Drain tray connection fittings should not cause condensate to be held back in the tray. A parallel thread (not taper), shouldered

fitting of the correct thread length should be used and packing washers added where necessary to ensure correct draining of bottom outlet drain trays.



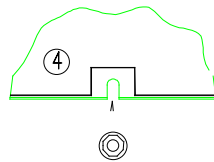
**FAN COIL INSTALLATION MUST ENSURE LEVEL POSITIONING TO FACILITATE CORRECT OPERATION AND CONDENSE REMOVAL**



**RECOMMENDED STUDDING MOUNTING USING R.P.F.S.**

**USE M10 STUDDING c/w 25mm FORM 'C' WASHERS AND 28mm X 3mm THICK RUBBER WASHERS**

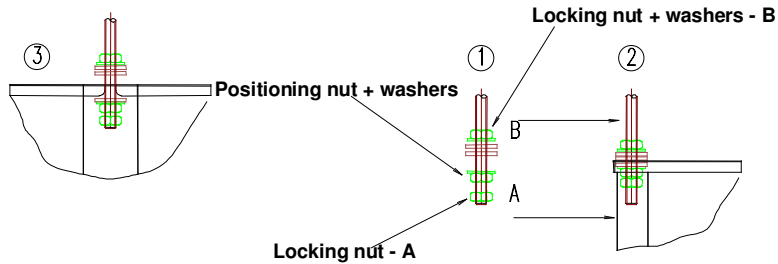
**Note:- All studding, nuts and washers are not supplied**



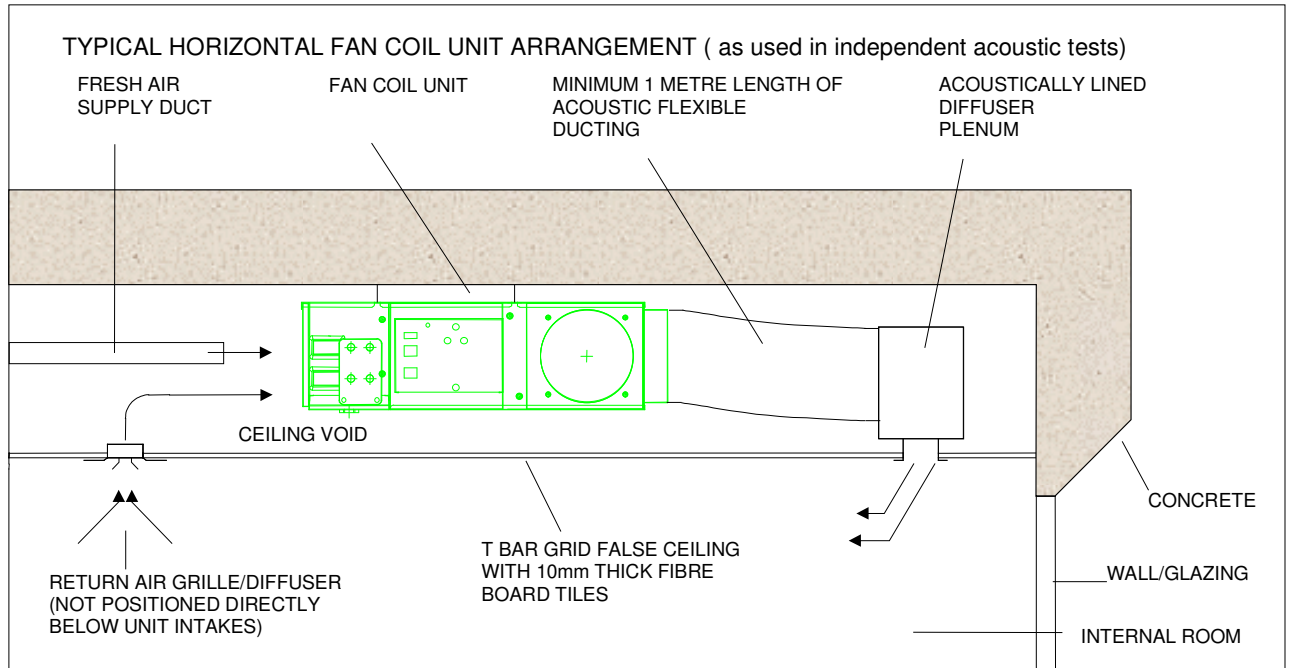
**Details 1,3+4. Drop rods fitted with positioning nuts and washers at required level .**

**Detail 3. Unit lifted and drop rods inserted into R.P.F.S.**

**Detail 2+5. Unit level adjusted , Locking nuts A +B tightened .**



**'NR' predictions**



'NR' predictions quoted are intended as a guide to levels which can be expected, provided that the following qualifications apply:-

Units must be mounted correctly using rubber washers, onto a solid structure.

The units should be mounted into a false ceiling not less than 300mm deep, constructed of a standard 'T' bar grid with 10mm thick fibre board tiles.

Rooms of open plan or partitioned design should be furnished, carpeted and have no more than 20% glass area with no highly reflective surfaces.

Where a single unit is serving a room, the room dimensions should be as detailed on the separate test configuration.

Units serving an open plan area should be mounted at a minimum of 3m centres and return air grilles should not be positioned directly below unit intakes.

At least one metre of acoustic flexible ducting must be used on each spigot outlet (we recommend the use of 'Sonodec 25' acoustic flex), with an acoustically lined diffuser plenum.

A maximum air velocity at 3.0m/s per inlet/outlet spigot for the quoted NR.

The previous parameters should give the predicted  $L_p$  at 1.5M from the nearest diffuser.

For accurate sound assessment, it may be necessary to obtain confirmation from an acoustics specialist, in which case please refer to our Customer Service Office.

## **SECTION D – COMMISSIONING**

The following procedures are designed as a guide to enable the units to be commissioned in accordance with the design requirements and should also be carried out with standard industry management.

An individual unit commissioning “checklist” should be completed during this period:

Ensure that the unit is installed correctly and undamaged.

Ensure that all unit sections are thoroughly clean and free from installation debris, that the filter is clean and free from dust. Ensure that all access panels and blanking plates are in position and secure.

Ensure that all electrical wiring complies with BS7671 and local by-laws and that all components, where applicable, are provided with all necessary safety, protection and isolating devices.

Check that the coil faces are free from any debris and check all coil connections for leaks.

Ensure that all air is vented from both coils and the system independently.

Check that the small gap between coil cheek plate and the drain tray has not been blocked by site debris.

Introduce water to the condensate tray to verify free flow of water into drain.

Start the fan and blow-through the system thoroughly.

Check that the unit air volume and the external pressure are as design.

Check that the motor full load current is approximately equivalent to the unit nameplate value.

Check the on / off temperature across coils and adjust water flows accordingly.

Check the functioning of controls.

After initial start-up and some continuous running of the unit, it is recommended that the following are checked, the motor full load current, the filter condition, the condensate and drains have free flow & no leaks, the valve connections have no leaks and that the controls operate correctly.

### **AC Fans (Fan Coil Designation PHW, PHA, PVW)**

The Fans are supplied factory set in line with the system design volume and external pressure. The air volume can be easily adjusted use by the use of the 3 speed switch and the fine adjustment controller mounted on the side of the control housing.

The transformer tapplings may also be varied to give alternative speed settings on site, this work must be carried out by competent qualified personnel. The unit must be isolated from the electrical supply prior to the commencement of this work. Any adjustment to the factory settings will affect both the acoustic and thermal performance of the unit. (refer to drawing No. 330081.)

### **DC Fans (Fan Coil Designation EHW) – Constant Volume**

The intelligent fan controller is factory set for the design air volume. The control system automatically adjusts the fan speed for any external pressure in the range 20 – 40 Pascal. **NO ON SITE COMMISSIONING IS**

REQUIRED. To adjust the design volume, the control voltage potentiometer must be adjusted in the range 2 to 5 volts (measuring instrument required) or as required to achieve the desired volume. To minimise installation noise, ensure that any regulating devices in the index duct are fully open. As the filters become dirty, the fans will adjust to maintain airflow. If the filters become very blocked, excessive noise and condensate leakage can occur

Please refer to Actionair technical sales office for further information.

#### DC Fans (Fan Coil Designation EHW) – Variable Volume

A 0-10 volt potentiometer is provided for factory testing and site commissioning of the fans. A BMS derived 0-10 volt signal can be used instead of the potentiometer and a switch is provided to change between the two. The control voltage potentiometer must be adjusted in the range 2 to 5 volts (measuring instrument required) or as required to achieve the desired volume. To minimise installation noise, ensure that any regulating devices in the index duct are fully open. If the filters become blocked, excessive noise and condensate leakage can occur.

BEWARE – the potentiometer (and BMS controllers) can provide a control voltage (for heating only, and for process fan coil units), which is beyond the safe operating range of cooling and heating units.

Please refer to Actionair technical sales office for further information.

## **SECTION E - SERVICE & MAINTENANCE**

### **E.01 GENERAL & WARRANTY**

The Warranty period is 24 months from date of despatch.

It is essential that the following instructions are adhered to and implemented prior to any maintenance being attempted to the units.

It is imperative that before any work or maintenance is carried out, the unit is isolated externally from the electrical supply, it may be advisable and necessary to isolate the water supply as well.

The following acts or omissions may render warranties void:

Failure to install, set up, or put to work any part of the equipment as specified in these guidelines.

Operation of motors and other electrical equipment with an electricity supply other than that designated on the nameplate or failing to connect and protect such equipment in accordance with IEE regulations and local by-laws.

Failure to notify Actionair in writing of equipment damaged on receipt within three days.

Failure to comply with the Actionair general terms and conditions of sale.

Failure to run equipment within the design specification as notified at the time of order.

Any modification to the designed arrangement, system layout or performance without prior written approval of Actionair.

Damage caused to equipment on site through lack of adequate protection from the elements, man-handling or misuse by other trades.

Failure to observe all normally accepted engineering practices during installation, commissioning and subsequent operation of equipment.

### **E.02 – FANS**

A check on the fan/motor assembly is advisable to ascertain if any overheating of the motor is occurring and that the fan impeller is free running and has not sustained any damage.

If any overheating is occurring, check that the full load current of the motor is within the nameplate rated value, the impeller is running freely and that there is no obstruction upstream or downstream of the fan causing a high resistance with consequent lack of airflow.

Check the security of the fan fixing bolts.

To remove a fan assembly the following procedure must be adopted:

- Isolate the electrical supply.
- Remove the access panel.
- Disconnect the wiring loom from terminal block on side of fan scroll.
- Remove the two M6 bolts connecting fan scroll to bulkhead.
- Remove the fan from the unit through the access opening, taking care not to damage the impellers.
- To re-install, follow the reverse procedure, ensuring that the electrical supply is isolated.

### **E.03 - COILS**

The coil should be inspected, at the same time as cleaning the filter, to ascertain if any solids or foreign matter has accumulated between the fins and that the coil connections are free from leaks.

Should any matter be found, the coil should be cleaned by using a soft brush and a mild solution of detergent, great care must be taken not to damage the fins, nor introduce liquid into fan windings or to soak the insulation.

The electrical supply must be isolated prior to carry out this task.

Should the fins become contaminated too frequently it is advisable to check the air filter to ensuring it is functioning correctly.

To remove the coil / condensate tray assembly from the unit the following procedure must be adopted;

- Isolate the electrical supply.
- Isolate flow and return pipework to both heating and cooling connections.
- Drain down both heating and cooling coils.
- Remove flow and return pipework to valves and condensate pipe.
- Disconnect valve actuator control leads.
- Support weight of coil and remove the six M6 bolts holding the coil to the rear of the unit.
- Slide out the condensate tray and coil assembly from unit.
- To reinstall, follow the reverse procedure, ensuring the electrical supply is isolated. The coil must be vented when refilling with water.

### **E.04 - CONDENSATE TRAY**

The condensate tray may be removed for cleaning independently of the coil and should be inspected annually.

Should any debris be found, the condensate tray should be thoroughly cleaned; also ensure the drain connection is free from obstructions.

Removal of the drain tray will reveal the underside of the coil which should be cleaned, and internal metalwork which should be inspected for corrosion and

painted with a zinc rich paint as necessary. (Paint must not be allowed to seal the drain path under the coil tube plate.)

To remove the condensate tray the following procedure must be adopted:

Isolate the electrical supply.

Remove the filter (see section E.05).

Disconnect the drainpipe from condensate tray after ensuring that all water has been drained off.

Remove one M6 retaining screw at coil return end and two M6 screws at valve support plate.

Slide the condensate tray approximately 20mm, the tray will then be free to drop away from coil.

To reinstall, follow the reverse procedure, ensuring the electrical supply is isolated. After re-fitting the drain tray, test the fall to drain by slowly adding 500ml of water at the bends end.

## **E.05 - FILTERS**

Filters must be properly maintained in order to ensure proper air cleaning efficiency. Dirty filters will reduce the air volume handled by the unit, thus adversely affecting its performance.

The length of time between cleaning of filters is dependent upon the environment; a three-month cycle is normal, however more frequent servicing may be required in certain cases.

The standard filters units are washable EU3 air filter pads housed in a galvanised steel channel frame complete with steel support mesh. Metal mesh filters are an alternative option.

On series PHW & PHA they are held in place by a return edge on the fan coil unit top plate and an angled bracket each end of the filter and can be removed by slackening the two screws holding the retaining angle and lowering sufficiently to permit the filter to be lifted clear of the keyholes.

The air filter pads can be cleaned by gently tapping and removing loose dust with a vacuum cleaner or with a compressed air-line. To wash the filter pad, remove it from the frame, fully immerse it in water containing a mild detergent, agitate the water until all contaminants have been removed, then rinse the pad in clear water and allow to dry thoroughly before replacing into the filter frame.

Replace the filter by reversing this procedure.

Optional fine metal mesh filters can be vacuum cleaned in situ.

Where return/inlet plenums are fitted to series PHW & PHA horizontal units, refer to drawing No. 339657 for positioning and removal of filter.

On series PVW the filter frames are held in position in two horizontal guide channels, to remove the filter pull it carefully forwards after removing the access panel.

Replace the filter by reversing this procedure.

### **E.06 - INSULATION**

The internal insulation is 100 Kg/M3 density, class 'O' CFC and HFC free open cell foam and complies with 'Section 20' requirements. The external insulation is of similar specification except being closed cell type. All the insulation must be checked for condition and security and if it shows signs of deterioration it must be replaced.

To replace the insulation, the following procedure must be adopted:

- Isolate the electrical supply.

- Peel off affected pad from casing and discard.

- Remove old securing media and residue foam.

- Clean area with Iso-Propyl alcohol (adhering to product usage instructions).

- Fit the new insulation pad into position ensuring that it is securely fixed.

## **SECTION F - GENERAL INFORMATION**

### **COMPONENT SPECIFICATION**

<b>Access</b>	Access to fans/motors is via an insulated bottom panel with keyhole slots for accurate positioning and easy removal. The panel is retained by M6 set-screws which are captive to prevent accidental loss. (PHW & PHA models only)
<b>Fans</b>	Fans are double or single width, resiliently mounted direct driven, forward curved centrifugal type, they are mounted on 1.6mm galvanised sheet steel easily removable decks.
<b>Motors</b>	Motors are permanent split capacitor type external rotor, totally enclosed, speed controllable. Bearings are sealed for life, maintenance free ball type. Electrical supply is 230V 1Ph 50Hz.
<b>Speed Control</b>	Air volume commissioning is by means of a multi-tapped transformer giving eleven settings, three of which are pre-wired (factory set to suit design specification requirements) to a panel mounted selector switch. On/off control to fans is by means of a panel mounted illuminated single throw double pole switch.
<b>Control Housing</b>	A purpose designed, ventilated control housing is mounted on the side of the chassis for easy access and included a hinged/removable cover. The housing incorporates the speed control transformer and switches. The supplied 1M flying lead must be connected to an adjacent fused spur. A 24v AC output is available for connection to a temperature controller.
<b>Coils</b>	Coil matrix blocks are manufactured from seamless copper tube mechanically expanded into aluminium fins having die formed collars providing a tight bond to optimise heat transfer. Vents and drains are fitted as standard with easily accessible slotted/hexagonal plugs. Coils are pressure tested using dry air under water to 15 bar.
<b>Filters</b>	Washable EU3 continuous filament filter pads media to Eurovent 4/5, with F1 fire resistance to DIN 53438 and a dust holding capacity of 380g/m <sup>2</sup> , housed in a galvanised steel channel frame with steel support mesh.
<b>Condensate Tray</b>	See section E.04
<b>Insulation</b>	See section E.06

The above components relate to standard unit supply; for any deviations from these please refer to the details issued at time of order and project design specification (supplied and collated by others).

Refer to layout drawings and/or the design specification for individual unit requirements and check against nameplate details.

**Controls** For fault finding and commissioning data refer to controls manufacturers technical data and specific wiring details.

**Wiring diagram** For specific wiring details refer to project details or contact Actionair Technical Sales Office.

**Optional Electric Heating** Optional electric heating elements where included (in lieu of Low Temperature Hot Water coils) are 230v open coil N40 Nickel/Chrome/Iron wire, with a safety glass cord. Overheat protection is by means of electrical latching high temperature electric re-set cut-out & air pressure differential switch. The HTCO cuts all power to the fans and the elements. The minimum discharge duct pressure normally required to allow operation of the elements is 20 Pascal.

Electric reset cut-outs may be triggered if all power to the unit is lost suddenly without allowing the run on timer to complete it's cycle, but without power to maintain the triggered state, the cut-outs will re-set themselves. If a cut-out triggers at any time, the unit and it's controls must be examined by a suitably qualified and experienced person before being brought back into use.

Normal switching is by means of solid state electric relay or thyristor. **For specific wiring details refer to the project wiring diagrams.**

Prior to any inspection or maintenance work being carried out the electrical supply must be isolated. (This will re-set the cut-out.)

This document is subject to change without notice due to continuing research and development.