



# Ecosmart Boxer

## AHU's (Fan Speed Control only)

### Installation and Maintenance

**CE** The EMC Directive 2014/30/EU  
The Low Voltage directive 2014/35/EU

## I.O Introduction

This Direct and Belt Drive range of Ecosmart Boxer Air Handling Units is supplied with fan speed control only and consists of the following:

- Units are Fan Control only**
  - BHSEX\*FC Boxer Extract Fan.**
  - BHS\*FC-E Boxer Supply fan with Electric Heater.**
  - BHS\*FC-L Boxer Supply fan with LPHW Heater.**
  - BHS\*FC-LC Boxer Supply fan with LPHW Heater and CW Cooling Coil.**
  - BHS\*FC-LD Boxer Supply fan with LPHW Heater and DX Cooling Unit.**
  - BHS\*FC-ED Boxer Supply fan with Electric Heater and DX Cooling Unit.**
- (\*Denotes unit size in product code, 1-7).

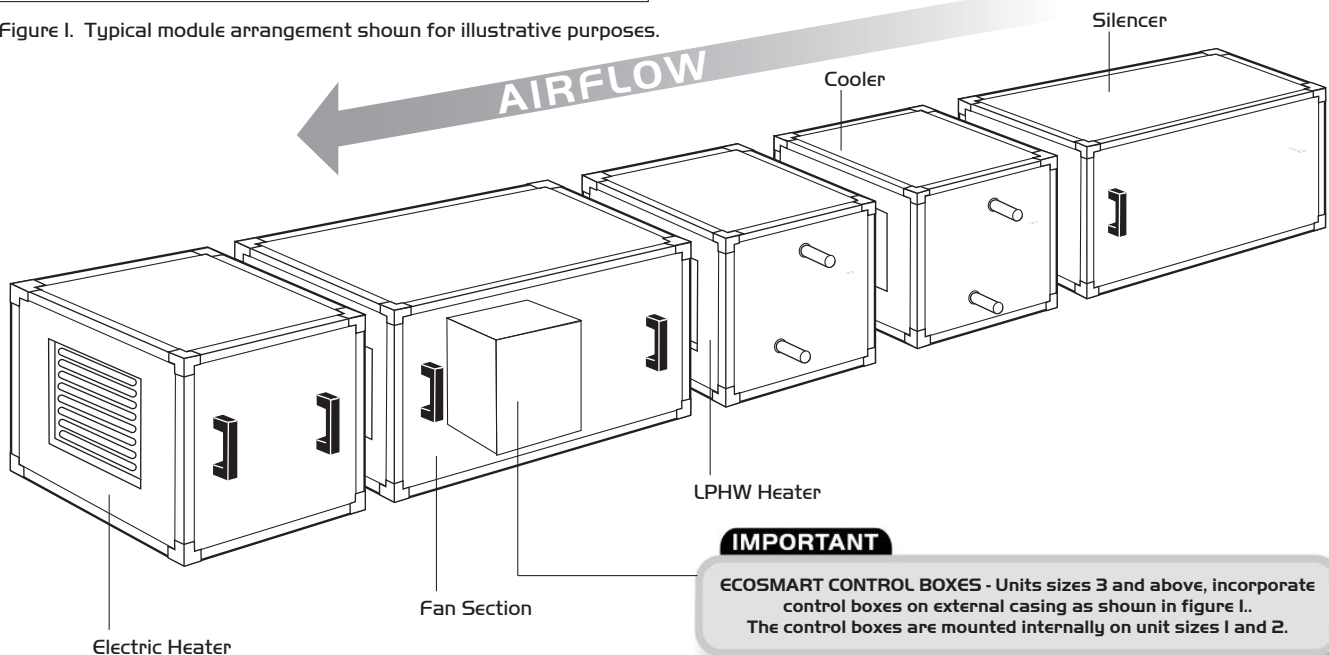
A typical unit will consist of an inlet filter, heating and/or cooling coil and a fan. Size 1 and 2 will typically be supplied in a single section. However ancillaries such as pre-heater and silencers will be supplied as separate modules. Size 3 and above will be supplied as separate modules. The modules must be assembled together on site in a workman like manner with inter-connections of wiring etc. between the modules.

### IMPORTANT

Please note that the units detailed in this manual contain fan speed controller only. All heating or cooling coils are supplied as bare coils. It is the installer's responsibility to supply suitably sized valves, actuators, control and pipe circuits to produce the desired output conditions.

Electric heaters must be connected to suitable control circuit with safety interlock.

Figure 1. Typical module arrangement shown for illustrative purposes.



### IMPORTANT

**ECOSMART CONTROL BOXES** - Units sizes 3 and above, incorporate control boxes on external casing as shown in figure 1.. The control boxes are mounted internally on unit sizes 1 and 2.

### IMPORTANT

#### UNITS OF MODULAR CONSTRUCTION

Units sizes 3 and above will be supplied in modular sections, their assembly and wiring between controls, sensors and actuators located in each section is the responsibility of the installer and is discussed within this document.

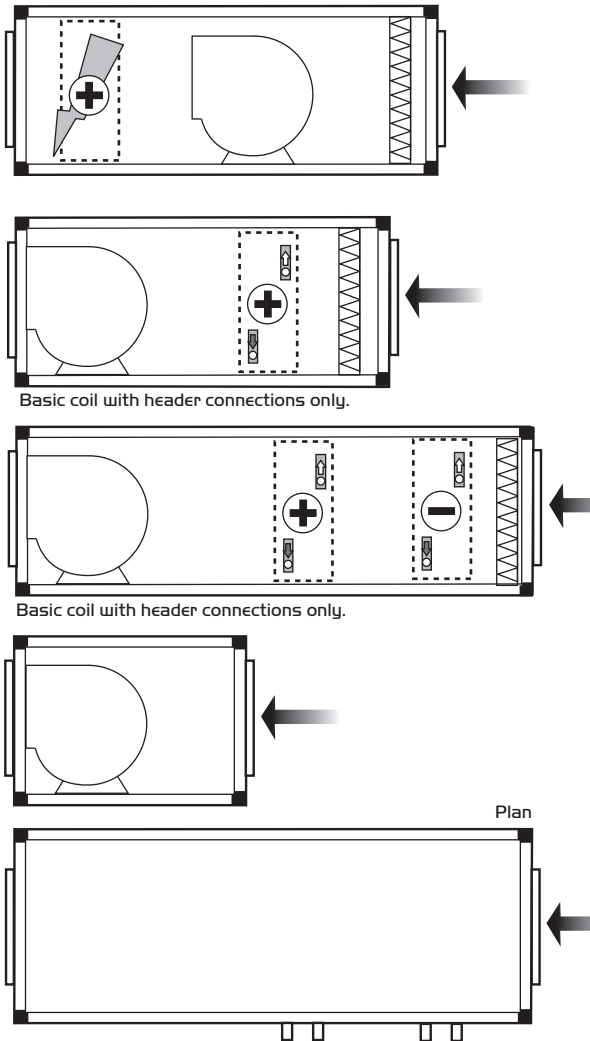
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2.0 Typical unit arrangements

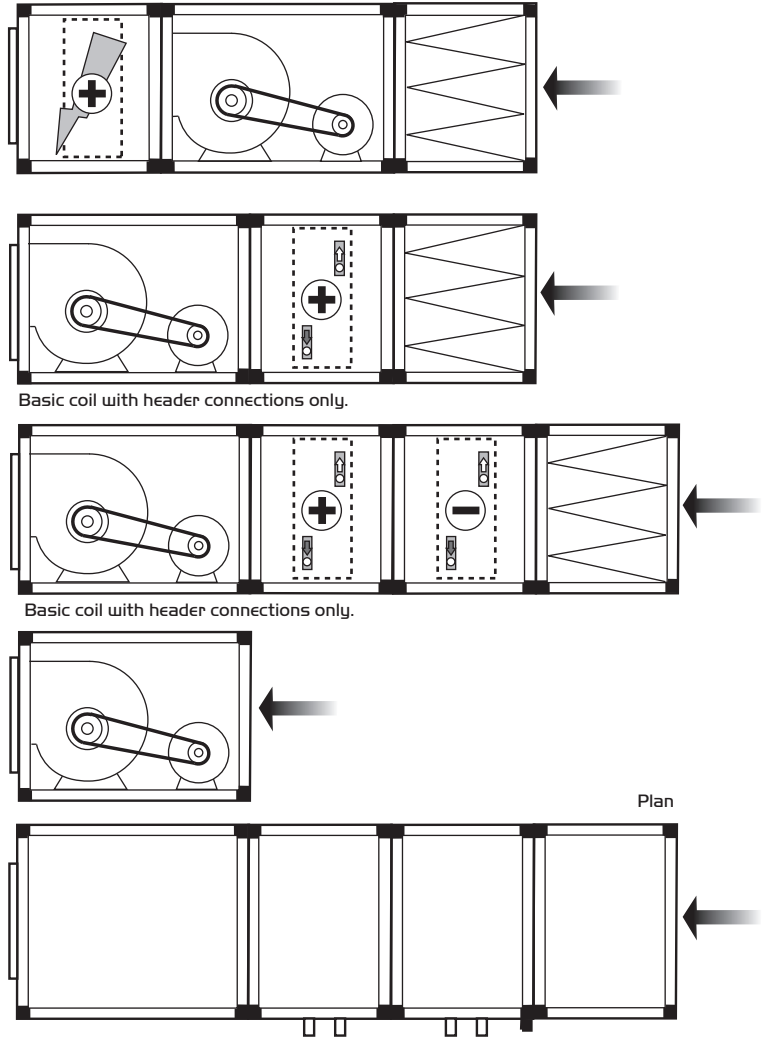
Direct Drive: (Sizes 1 and 2 in fan unit code)

Figure 2.



Belt Drive: (Sizes 3 to 7 in fan unit code)

Figure 3.



Dimensions and weights

Full details, with project specific documents and drawings are available from the Nuair Technical Estimating Department. Quote your project references when calling. Tel: 02920 858200.

Unless otherwise stated all control packs (where applicable) are positioned on the left of the unit when viewed with direction of airflow. For any alternative control or pipework position, contact us on the number opposite.

3.0 Handling

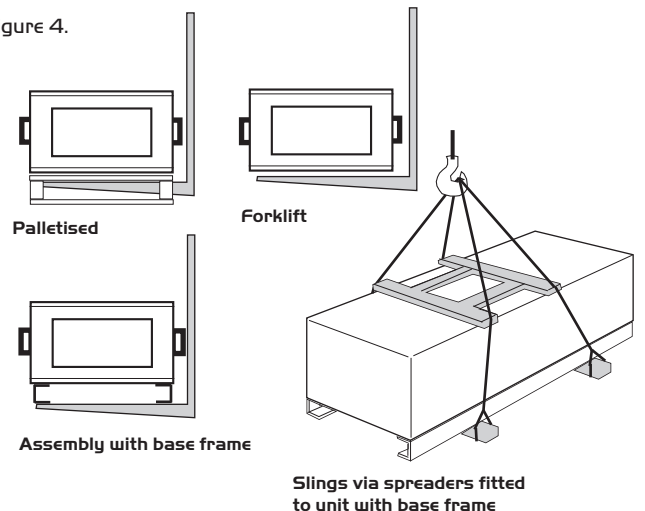
Upon receipt of the equipment an inspection should be made, and before commencement of lifting ensure that normal equipment safety checks have been carried out.

The unit/sections should be removed from the vehicle using a fork lift or crane. Always handle with care to avoid damage and distortion, and where lifting slings are employed use spreaders to ensure slings do not come into contact with the unit case, or control pack. (See figure 4).

Correctly position slings to avoid twisting of the unit case and observe the centre of gravity before the final lift is made.

**Note: the weight of the unit from the rating plate.** Dependent on model and size units may be supplied in single or multi-modula sections. Handle each section individually- **do not stack for lifting or storage.**

Figure 4.



### 4.0 Installation

Installation must be carried out by competent personnel in accordance with the appropriate authority and conforming to all statutory and governing regulations e.g. I.E.E., CIBSE, COHSE etc.

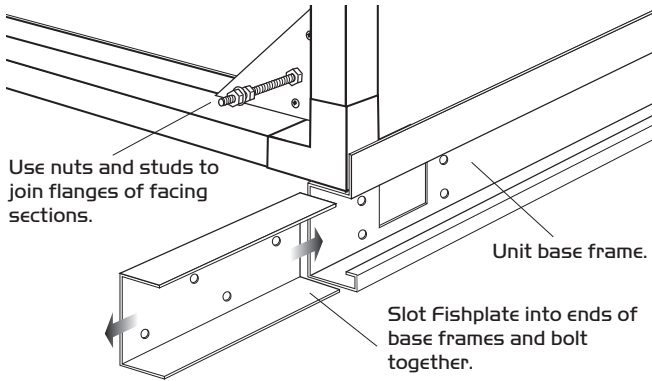
When selecting the unit position, ensure adequate access for connection of external services, commissioning, future inspection and maintenance and the removal of component parts.

#### Erection and Assembly

Unit sizes 1 and 2 are generally single section units and require no assembly.

Unit sizes 3 to 7 are multi-section units supplied on a base frame. The units and base frame will require bolting together using matched drilled flanges and the nuts and bolts provided. In addition fishplates must be used to join two base frames together. (See figure 5).

Figure 5.



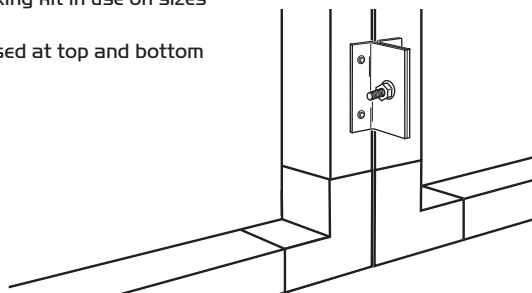
#### Assembly of Equipment

##### a). Mechanical

Ensure all components and sections are available to complete the work. The flanges of facing sections must be offered one to the other, and secured via the studs and nuts provided. Access to each securing point is by removal of the access doors on each section. **Each joint must be appropriately sealed to ensure weathering and to prevent air leakage.**

Figure 6. Fixing kit in use on sizes 1 and 2.

One to be used at top and bottom of sections.



Where cooling coils and heat exchangers are in use condensate drainage points are provided. It is the installers responsibility to ensure connection to the appropriate trap and drainage.

If the condensate tray is located at the inlet side of the fan (i.e. under negative pressure) then calculate the values of A & B as shown below. (and see fig. 7).

**A = Fan inlet pressure (mm H2O) +25mm.**

(Allow 125mm if the pressure is not known for this range of fans).

**B = A/2. (Note: 10Pa = 1mm H2O).**

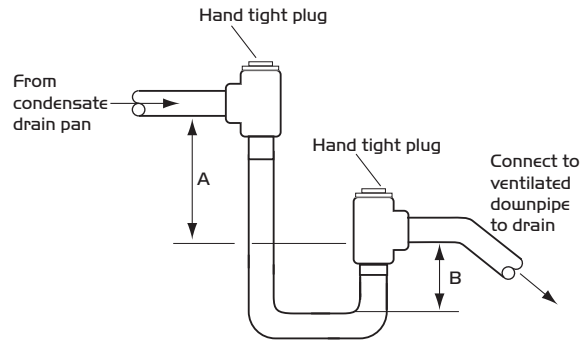
If the condensate tray is located at the outlet side of the fan (i.e. under positive pressure) then calculate the values of A & B as shown below.

**A = 25mm**

**B = Fan outlet pressure (mm H2O) + 25mm.**

(Allow 125mm if the pressure is not known for this range of fans).

Figure 7. Condensate Trap.



On sizes 1 and 2, where motorised dampers are coupled to a system, it will be necessary to remove the spigotted section inlet/discharge to fix the damper into position.

Where ancillaries such as silencers, bag filters, frost heaters etc are to be fitted, each additional component is supplied with a fixing kit. (See figure 6).

**Note: It is the assembler's responsibility to seal all modular facing joints.**

##### b). Electrical - see section 5.

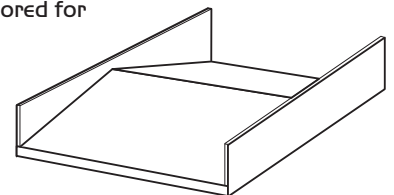
##### c) Indoor Installation

The standard fan is suitable for installation indoors only, away from heat sources, steam generation or water spray. Site the fan on a secure and level surface, using the base frame provided, suspend on a platform or support rails, alternatively hang using drop rods.

##### d) External Installation

Where an external installation is required, install on a secure and level surface, use the base frame and the weather roof tailored for each system. Connect ducting, inlet or extract couls as appropriate.

Figure 8. Weather roof.



##### e) Wet pipe connections

	Frost Coils		Cooling Coils		Heating Coils	
	In	Out	In	Out	In	Out
BHS1FC	0.75BSP	0.75BSP	1 BSP	1 BSP	1.25BSP	1.25BSP
BHS2FC	0.75BSP	0.75BSP	1.25BSP	1.25BSP	1.25BSP	1.25BSP
BHS3FC	1 BSP	1 BSP	1.25BSP	1.25BSP	1.25BSP	1.25BSP
BHS4FC	1 BSP	1 BSP	1.25BSP	1.25BSP	1.5BSP	1.5BSP
BHS5FC	1.25BSP	1.25BSP	1.5BSP	1.5BSP	2 BSP	2 BSP
BHS6FC	1.25BSP	1.25BSP	2 BSP	2 BSP	2 BSP	2 BSP
BHS7FC	1.5BSP	1.5BSP	2 BSP	2 BSP	2 BSP	2 BSP

5.0 Wiring

**IMPORTANT**

Please note: this product must be earthed.

Power requirements

Model	F1c fan only (1)	Electric heater max Kw	F1c heater (2)
BHSEX1FC, BHS1FC-L	4.8A		
BHS1FC-E	4.8A	18	25A
BHSEX2FC,	7.3A		
BHS2FC-E	7.2A	24	33A
BHSEX3FC, BHS3FC-L	4.6A		
BHS3FC-E	4.6A	27	38A
BHSEX4FC, BHS4FC-L	6.1A		
BHS4FC-E	6.1A	36	50A
BHSEX5FC, BHS5FC-L	7.8A		
BHS5FC-E	7.8A	54	75A
BHSEX6FC, BHS6FC-L	8.2A		
BHS6FC-E	8.2A	54	75A
BHSEX7FC, BHS7FC-L	11.4A		
BHS7FC-E	11.4A	54	75A

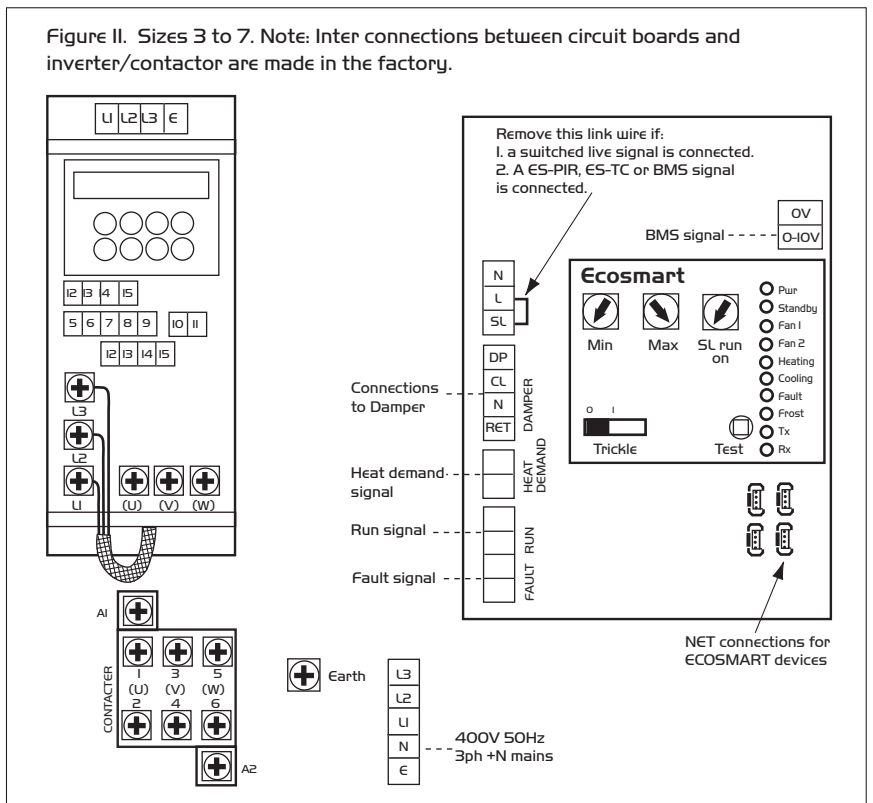
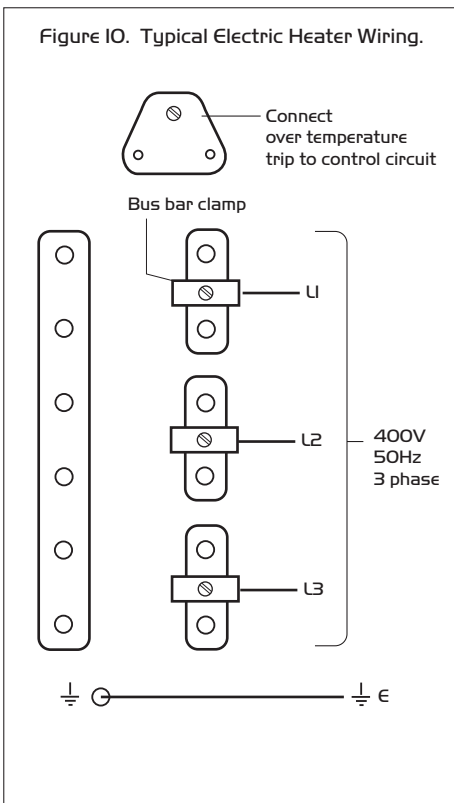
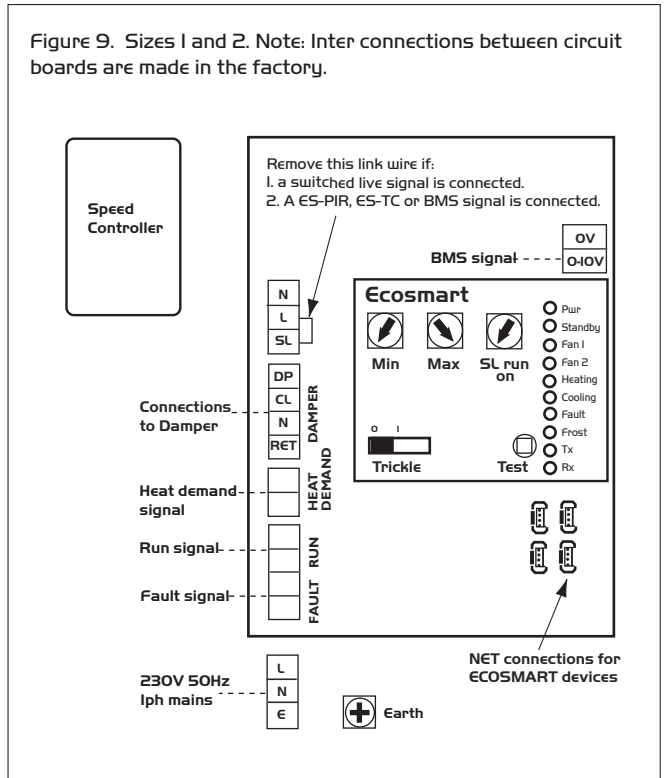
**Note:** (1) Sizes 1 and 2 fans are rated at 230V ac, 50Hz single phase. All other sizes are rated at 400V ac 50 Hz 3 phase.

(2) All electric heaters are rated at 400V ac 50 Hz 3 phase.

i There are no inrush starting currents quoted because the Ecosmart control incorporates a soft starting speed control feature.

ii. The inverters are preset to match the fan requirements. Under normal circumstances it should not be necessary to adjust them.

iii. Pay particular attention to the model type, recorded on the product rating plate and connect as follows.



## Wiring (continued)

The electrical wiring must be carried out by a competent person and the unit must be provided with means of local isolation (by others) for maintenance purposes. A suitable isolator is available from Nuair as a separate option.

### Connections

#### a) Mains connections

Mains cables should be suitably sized and terminated at terminals shown on the appropriate diagram.

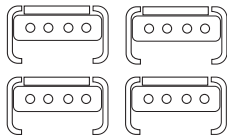
#### IMPORTANT

Where units form part of a system it will be necessary to install and connect mains wiring between controls and devices such as heat exchangers and motorised dampers - refer to the relevant section of this document.

Where units are supplied in modular sections, sizes 3 to 7, it will also be necessary to install and connect mains wiring between sensors and actuators.

#### b) Control Connections

Figure 12. 'Net' connection for Ecosmart devices.



**Net** - the 4 IDC plug-in connectors are provided for the connection of compatible sensors, manual controls and for linking the fans together under a common control. If more than 4 connections are required, the junction box (product code ES-JB) should be used (see data cable installation).

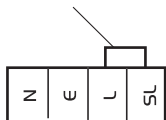
#### IMPORTANT

Where units are supplied in modular sections, sizes 3 to 7, or as part of a system it will also be necessary to install data cable (supplied) between ecosmart controls and from ecosmart sensors and heat exchanger etc.

#### c) Switched Live (SL) terminal

Figure 13.

Remove link if switched live signal, an enabler or BMS signal is connected



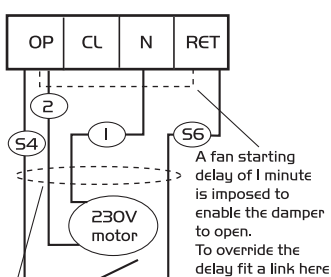
Mains connection  
230V 50Hz 1 phase

A signal of 100 - 230V a.c. will activate the fan from either its off state or trickle state (see setting to work-trickle switch). When the SL is disconnected the fan will over-run (see setting to work-timer adjustment).

Do not take this signal from an isolating transformer.

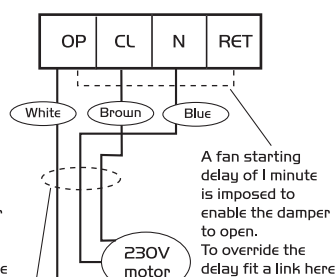
#### d) Damper connections

Figure 14a. Drive open/  
Spring close.



All wiring is IPH 230V 50Hz

Figure 14b. Drive open/  
Drive close.



All wiring is IPH 230V 50Hz

**OP** - 230V 50Hz IA max supply to open the damper

**CL** - 230V 50Hz IA max supply to close the damper

**N** - Neutral supply to damper

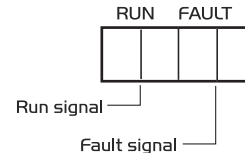
**RET** - 230V ac return signal from the damper limit switch indicates the damper has reached its operating position.

If the return signal is not present, the fan will wait for 1 minute before starting.

Note: If a damper is not fitted, connect a link wire from OP to RET. This will cancel the delay.

#### e) Volt Free Relay Contacts

Figure 15.



Note that the volt free contacts are not fused. If these are used to power any external equipment, the installer must provide adequate fusing or other protections.

These contacts are rated at 5A resistive, 0.5A inductive.

**Run connections** - These contacts are closed when the fan is running.

**Fault connections** - No fault = the contacts are closed.

**Fault** = the contacts are opened.

#### f) Data cable installation

A 4-core SELV data cable is used to connect devices.

Do not run data cable in the same conduit as the mains cables and ensure there is a 50mm separation between the data cable and other cables. The maximum cable run between any two devices is 300m when it is installed in accordance with the instructions.

**Please note that the total data cable length used in any system must be less than 1000m. Keep the number of cable joints to a minimum to ensure the best data transmission efficiency between devices.**

#### g) Maximum number of devices

The maximum number of devices (including fans) that can be connected together via the cable is 32, irrespective of their functions.

#### h) Other low voltage cables

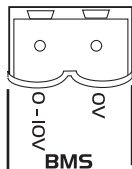
Follow the basic principle (as f). Keep the cable run as short as possible, less than 50 metres.

**j) BMS input signals**

The BMS connection is made with a plug-in connector via the socket (See figure 21). To ensure the connection is made only by suitably qualified and authorised personnel the plug is not supplied.

It is available from R S Components, Part No. 176-7772

Figure 16.



**IMPORTANT**

**Reversal of the BMS connection will damage the control.**

The system's response to a 0-10V dc BMS signal is given in the table below.

Note the BMS signal will override any sensors and user control connected in the system. The voltage tolerance is +/- 125mV and is measured at the fans terminal.

	Ventilation mode
Local control	0.00
OFF / trickle	0.25
Speed 1	0.50
Speed 2	1.50
Speed 3	2.50
Speed 4	3.50
Speed 5	4.50
Speed 6	5.50
Speed 7	6.50
Speed 8	7.50
Speed 9	8.50
Speed 10	9.50

**6.0 Setting to work**

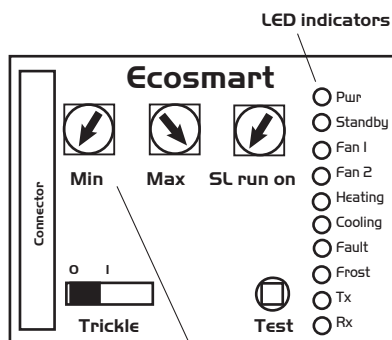
**a) Electrical**

**Using the Test button**

The test button allows the blower within the unit to be checked for its operation. If the fan is running already, press the button once to stop the fan, press again to switch on the fan.

**Note that the fan will return to normal operation after 30 seconds.**

Figure 17.



- MIN = Minimum speed adjustment
- MAX = Maximum speed adjustment
- SL Run on = Switched Live Run-On Timer adjustment
- TRICKLE = Selects trickle running: 0 = off, 1 = selected
- TEST = Test button

**LED Indication** (See figure 17).

- PWR GREEN: Power on & OK,
- Standby LED on when fan is not running.
- Fan 1 GREEN: Fan 1 is running, RED: Fan 1 faulty.
- Fan 2 GREEN: Fan 2 is running, RED: Fan 2 faulty.
- Heating\* GREEN: Heating selected RED:
- Cooling\* Not applicable. See note.
- Fault LED on when a fault is present on unit.
- Frost\* Not applicable. See note.
- Tx LED on when the controller is transmitting data.
- Rx LED on when the controller is receiving data.

**\* Note that the control panel is common to all the Ecosmart products and will have indicators for functions that are not available in this particular fan. However these indicators will not be illuminated.**

**Settings**

**Setting the maximum air flow**

- i) Ensure the power supply is switched off and that a link wire is connected from the supply L to the SL terminal. Unplug all items connected to the 'Net' connectors.
- ii) Switch on the power supply.
- iii) Wait for the fan to complete its self-test operation. Measure the airflow using standard commissioning instruments at a suitable point in the ductwork. If adjustment is required, rotate the pot marked 'MAX' to obtain the desired airflow. Remove the link wire if not required - see "wiring (c)".

**Setting the minimum/trickle airflow rate (nominal 40% sizes 1 and 2 units and 20% all others as standard)**

- i) Repeat the same procedure as for maximum airflow above but without the link wire between supply L and SL terminal. Ensure the trickle switch is in the 'ON' position. Adjustment must be made on the pot marked 'Min'.
- ii) Note that the minimum setting (nominally 40%) must be below the maximum setting, otherwise minimum setting will be automatically set to be the same as the maximum.
- iii) The minimum speed set is the trickle speed at which the fan operates.

**Note: The working speed range of the user control and sensors is between the minimum and maximum set points.**

**b) Mechanical**

- i) Wet systems require the setting of the flow valve, set as general commissioning procedures - refer to the specified design flow duties and the documentation supplied by the valve manufacturer.
- ii) DX coils have two separate cooling stages with independent condenser units, the coils are supplied with ends sealed. Connection, commissioning and setting to work is the responsibility of the condensing unit installer.

## 7.0 Maintenance

### IMPORTANT

Isolation - Before commencing work make sure that the unit and NuAire control are electrically isolated from the mains supply.

#### Warning - Inverter Speed Control

An Inverter is used to provide speed control. When the fan is isolated, allow 5 minutes for the capacitors in the inverter to discharge before commencing any work on the unit.

### Maintenance Intervals

The first maintenance should be carried out three months after commissioning and thereafter at twelve monthly intervals. These intervals may need to be shortened if the unit is operating in adverse environmental conditions, or in heavily polluted air.

### Lubrication

Motors are fitted with sealed for life bearings and do not require any lubrication.

### General Cleaning and Inspection

Clean and inspect the exterior of the fan unit and associated controls etc. Remove the access panel from the fan unit. Inspect and, if necessary, clean the fan and motor assemblies and the interior of the case. If the unit is heavily soiled it may be more convenient to remove the fan / motor assemblies. If NuAire controls and or remote indicators are fitted, remove the covers and carefully clean out the interiors as necessary. Check for damage. Check security of components. Refit the access covers.

### General

1. Check that all fixings are tight.
2. Check sealing strips around the fan outlets are tight up against the bulkhead.
3. Check that duct connections are not leaking.

### Filters

Disposable filters should be changed when fully dust laden. Washable filters should be removed and washed in mild detergent, flushed with clean water and allowed to dry before refitting.

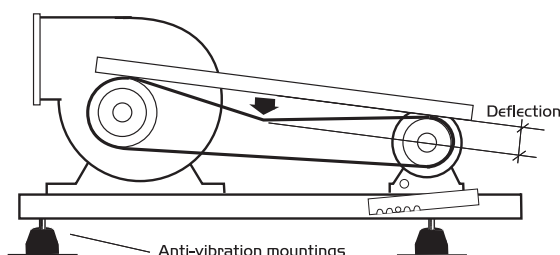
### Cleaning Control Box and Sensors (if fitted)

Remove covers and carefully clean out interiors as necessary. Check for damage and security of components. Refit covers.

### Adjusting drive belt Tension (Sizes 3-6)

To check the correct tension of a drive belt, apply a force at right angles to the centre of the belt span sufficient to deflect the belt 16mm for every metre of span length (see fig. 18). The force required to deflect the 'V' belt should be from 0.5kg to 0.8kg.

Figure 18. Adjusting the drive belts (Sizes 3-6).



### Changing a drive belt

To replace a belt, remove the two bolts from the motor mounting furthest from the fan and slacken the remaining two bolts. Lift the motor plate and remove the belt. Replacing the belt is the reverse of this procedure.

### Adjusting drive belt tension (Size 7)

All belt drive units incorporate belt tensioning devices. To adjust the belt tension, slacken the pinch bolt on the sides of the motor plate. Turn the adjusting bolt clockwise to tighten the belt and counter clockwise to loosen it. The drive should be tensioned until a slight bow appears in the slack side of the 'V' belt when running under load.

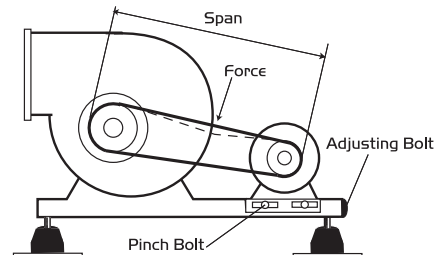


Figure 19. Adjusting the drive belts (Size 7).

### To check for correct tension, proceed as follows:

1. Measure the span length (See fig. 19).
2. At the centre of the span, apply a force at right angles to the belt sufficient to deflect one belt 16mm for every metre of span length (see fig. 19). The force required to deflect the 'V' belt should be from 0.5kg to 0.8kg.
3. Tighten the pinch bolts.

### Replacement of Parts

Should any component need replacing NuAire keep extensive stocks for quick delivery. Ensure that the unit is electrically isolated, before carrying out any work.

When ordering spare parts, please quote the serial number of the unit and the ARC number of the purchase if possible.

(This information will be available on the fan label).

### Warranty

The 5 year warranty starts from the day of delivery and includes parts and labour for the first year. The remaining period covers replacement parts only.

This warranty is void if the equipment is modified without authorisation, is incorrectly applied, misused, disassembled, or not installed, commissioned and maintained in accordance with the details contained in this manual and general good practice.

The product warranty applies to the UK mainland and in accordance with Clause 14 of our Conditions of Sale. Customers purchasing from outside of the UK should contact NuAire International Sales office for further details.

### After Sales Enquiries

For technical assistance or further product information, including spare parts and replacement components, please contact the After Sales Department.



**Telephone 02920 858 400**

## DECLARATION OF INCORPORATION AND INFORMATION FOR SAFE INSTALLATION, OPERATION AND MAINTENANCE

We declare that the machinery named below is intended to be assembled with other components to constitute a system of machinery. The machinery shall not be put into service until the system has been declared to be in conformity with the provisions of the EC Machinery Directive.

**Designation of machinery:** ECOSMART BOXER FANS  
**Machinery Types:** BHS, BHSEX  
**Relevant EC Council Directives:** 2006/42/EC (Machinery Directive)  
**Applied Harmonised Standards:** BS EN ISO 12100-1, BS EN ISO 12100-2, EN294, EN60204-1, BS EN ISO 9001  
**Applied National Standards:** BS848 Parts One, Two and Five

### Signature of manufacture representatives:

Name:	Position:	Date:
1) C. Biggs 	Technical Director	20. 07. 07
2) A. Jones 	Manufacturing Director	20. 07. 07

## INFORMATION FOR SAFE INSTALLATION, OPERATION AND MAINTENANCE OF NUAIRE VENTILATION EQUIPMENT

To comply with EC Council Directives 2006/42/EC Machinery Directive and 2014/30/EU (EMC).

To be read in conjunction with the relevant Product Documentation (see 2.I)

### 1.0 GENERAL

1.1 The equipment referred to in this Declaration of Incorporation is supplied by Nuairé to be assembled into a ventilation system which may or may not include additional components.

The entire system must be considered for safety purposes and it is the responsibility of the installer to ensure that all of the equipment is installed in compliance with the manufacturers recommendations and with due regard to current legislation and codes of practice.

### 2.0 INFORMATION SUPPLIED WITH THE EQUIPMENT

2.1 Each item of equipment is supplied with a set of documentation which provides the information required for the safe installation and maintenance of the equipment. This may be in the form of a Data sheet and/or Installation and Maintenance instruction.

2.2 Each unit has a rating plate attached to its outer casing. The rating plate provides essential data relating to the equipment such as serial number, unit code and electrical data. Any further data that may be required will be found in the documentation. If any item is unclear or more information is required, contact Nuairé.

2.3 Where warning labels or notices are attached to the unit the instructions given must be adhered to.

### 3.0 TRANSPORTATION, HANDLING AND STORAGE

3.1 Care must be taken at all times to prevent damage to the equipment. Note that shock to the unit may result in the balance of the impeller being affected.

3.2 When handling the equipment, care should be taken with corners and edges and that the weight distribution within the unit is considered. Lifting gear such as slings or ropes must be arranged so as not to bear on the casing.

3.3 Equipment stored on site prior to installation should be protected from the weather and steps taken to prevent ingress of contaminants.

### 4.0 OPERATIONAL LIMITS

4.1 It is important that the specified operational limits for the equipment are adhered to e.g. operational air temperature, air borne contaminants and unit orientation.

4.2 Where installation accessories are supplied with the specified equipment eg. wall mounting brackets. They are to be used to support the equipment only. Other system components must have separate provision for support.

4.3 Flanges and connection spigots are provided for the purpose of joining to duct work systems. They must not be used to support the ductwork.

### 5.0 INSTALLATION REQUIREMENTS

In addition to the particular requirements given for the individual product, the following general requirements should be noted.

5.1 Where access to any part of equipment which moves, or can become electrically live are not prevented by the equipment panels or by fixed installation detail (eg ducting), then guarding to the appropriate standard must be fitted.

5.2 The electrical installation of the equipment must comply with the requirements of the relevant local electrical safety regulations.

5.3 For EMC all control and sensor cables should not be placed within 50mm or on the same metal cable tray as 230V switched live, lighting or power cables and any cables not intended for use with this product.

### 6.0 COMMISSIONING REQUIREMENTS

6.1 General pre-commissioning checks relevant to safe operation consist of the following:

Ensure that no foreign bodies are present within the fan or casing.

Check electrical safety. e.g. Insulation and earthing.

Check guarding of system.

Check operation of Isolators/Controls.

Check fastenings for security.

6.2 Other commissioning requirements are given in the relevant product documentation.

### 7.0 OPERATIONAL REQUIREMENTS

7.1 Equipment access panels must be in place at all times during operation of the unit, and must be secured with the original fastenings.

7.2 If failure of the equipment occurs or is suspected then it should be taken out of service until a competent person can effect repair or examination. (Note that certain ranges of equipment are designed to detect and compensate for fan failure).

### 8.0 MAINTENANCE REQUIREMENTS

8.1 Specific maintenance requirements are given in the relevant product documentation.

8.2 It is important that the correct tools are used for the various tasks required.

8.3 If the access panels are to be removed for any reason the electrical supply to the unit must be isolated.

8.4 A minimum period of two minutes should be allowed after electrical disconnection before access panels are removed. This will allow the impeller to come to rest.

**NB: Care should still be taken however since airflow generated at some other point in the system can cause the impeller to "windmill" even when power is not present.**

8.5 Care should be taken when removing and storing access panels in windy conditions.

Technical or commercial considerations may, from time to time, make it necessary to alter the design, performance and dimensions of equipment and the right is reserved to make such changes without prior notice.