



Bigneat
Containment Technology

Chemcap™ DUCTLESS FILTRATION RANGE

POWDER HANDLING CABINET EXCEL-PLUS RANGE

A GUIDE TO INSTALLATION, OPERATION
SAFETY AND MAINTENANCE

Operating Manual



Cabinet designs
Tested and approved by

invent-uk
Flow Containment & Instrumentation



BIGNEAT
Containment Technology
PUBLICATION CODE: EP001/B



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i About this Manual

This manual is intended as a guide. Whilst every effort has been made to ensure accuracy, no responsibility can be accepted for any technical or editing errors contained herein.

Intended Users

The cabinet may be delivered part assembled for final assembly, installation and commissioning on-site by Bigneat's own technical staff. Installation and commissioning details are included in this manual for completeness, providing the end user's own technical and service staff with important safety information concerning this product.

ii SAFETY NOTES

General

This equipment can cause danger through employment of high speed rotating fans and high voltages¹. Failure to observe the following recommendations will constitute an ELECTRICAL SHOCK HAZARD

Installation

If the equipment is installed in a manner not recommended by the manufacturer, the electrical protection and/or the airflow integrity of the enclosure could become compromised. Any such installation will invalidate all guarantees and warranties.

Protective Earth

The connection to the cabinet earth terminal must be provided by a permanent, assured low impedance, safety earth supply and made before any other supply voltages are made.

Any subsequent disconnection of the Earth terminal (whether by accident or other cause) could make the recirculating cabinet dangerous, under some fault conditions.

Maintenance and repair

Repair, adjustment or maintenance with safety or normally fixed covers removed whilst the cabinet is under voltage should be avoided. Skilled personnel only, aware of the potential hazards involved, should carry out these operations. No user-serviceable components are incorporated in this equipment.

Containment & Operator Protection

Safe, acceptable levels of containment and operator protection can only be provided whilst the cabinet is fully operating, developing an essential negative air pressure regime under normal conditions. In the event of a power failure all chemicals and substances under process should be removed from the enclosure (to a separate safe environment), or separately sealed whilst within the enclosure, with all doors remaining closed.

Electrostatic damage

All circuit boards associated with the airflow control system contain sensitive electronic components, which can be damaged or stressed by static electrical discharges. The operator, circuit board and the work area should all be 'grounded' at the same electrical potential whenever such repair work is undertaken.

¹ defined in BS EN 61010: 2001 as voltages greater than 33 Volts AC, (46.7 peak) 70 Volts DC



EXCEL-PLUS POWDER HANDLING CABINET

1. INTRODUCTION

Bigneat Excel-Plus Powder Handling Cabinets represent a range of advanced design particulate containment products, built and tested to exacting standards. The equipment is designed as a freestanding unit and manufactured to provide consistently safe and durable operation, with extended filter life.

When used as part of a comprehensive safety routine it will provide optimum protection from airborne particulates at an absolute filtration efficiency of 99.997% at $> 0.3 \mu\text{m}$.

Bigneat technical staff will assist you with any queries on specialised aspects of the units or their application that may not be covered in this manual.

CABINET IDENTITY

The cabinet is fitted with a self-adhesive Rating and CE Mark Label, which uniquely identifies the equipment. The label should not be removed, as evidence of original Quality Assurance Tests and CE Mark integrity may be lost.

QUALITY ASSURANCE

Powder Control Cabinets are subject to established factory acceptance and installation commissioning tests by our trained engineers, in accordance with fully documented Quality Assurance Procedures and applicable National Standards.

The integrity of the design, manufacture and performance of the filtration and airflow of the cabinet, on leaving our works is assured.

VALIDATION & QUALIFICATION

Validation and qualification protocol must be determined by the end-user, to conform to the requirements of their associated industry and regulatory bodies as applicable.



2.0 EQUIPMENT SPECIFICATION

The factory-set fan speed controller enables the air velocity through the front working aperture to be preset precisely, with the integrated electronic airflow alarm continuously monitoring the airflow.

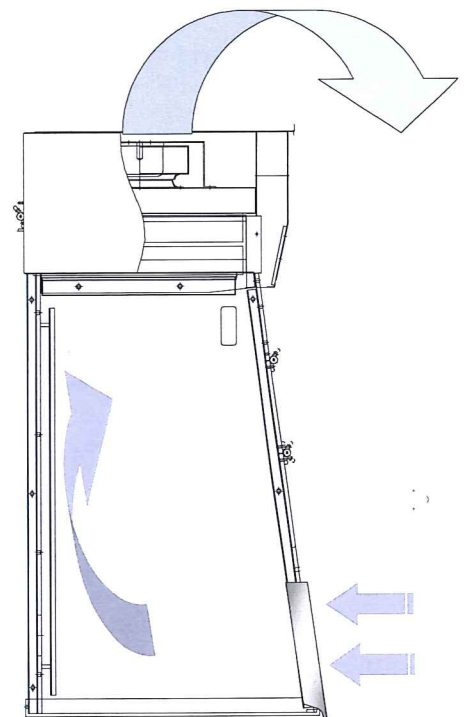
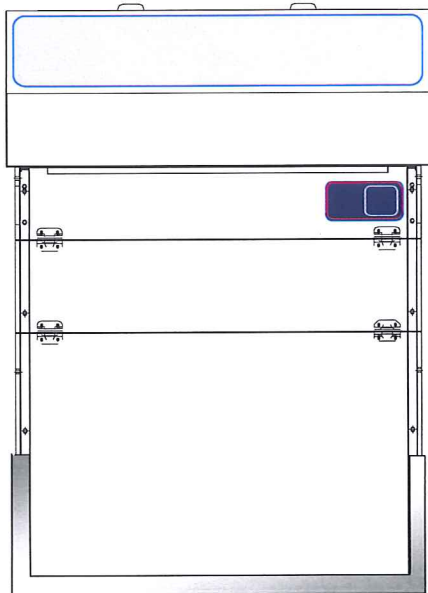
During normal operation the incoming air stream is routed over the specially designed aerofoil at the front, flowing horizontally (away from the operator) through graded intakes within the baffle located at the rear of the cabinet, reducing airflow turbulence and providing excellent containment and overall pressure balance.

The extracted air is fully filtered through the integral HEPA filter located in the top mounted fan and filter housing and subsequently re-circulated into the laboratory air space.

General construction

The cabinet comprises an 8 mm thick 'safe-edged' clear acrylic enclosure with an acrylic rear plenum containing a synthetic pre-filter. The front aerofoil is manufactured from stainless steel. Mounted above the enclosure is a fully welded, mild steel fabricated Chemcap™ Fan & Filter housing, containing the fan, variable fan speed controller and integrated HEPA filter,

Finish overall is polyester powder-coat gloss paint, colour White.



Performance Specification

Effective dimensions:	EP804	EP1004	EP1206	EP1506
Cabinet Width:	800 mm ext	1000 mm ext	1200 mm ext	1500 mm ext
Cabinet Depth:	830 mm ext	830 mm ext	830 mm ext	830 mm ext
Cabinet Height:	1100 mm ext	1100 mm ext	1100 mm ext	1100 mm ext
Face Velocity:	Minimum (averaged value) 0.35 metres/sec			
Filtration system:	Chemcap comprising: Synthetic Pre-filter media for particle removal of >5 microns HEPA filter (Class H14), efficiency 99.997% @ 0.3µm particle size			
Fan type:	R2E 190-AE77-05 Backward-Curve, balanced x 1 The EP1206 and EP1506 are fitted with 2 fans			
Cabinet Noise Level:	< 50dBA			
Power requirements:	230 Volts, ± 10% Single Phase, 50/60 Hz 98 watts max			
Airflow alarm type:	'AUTOCAL' electronic alarm, sensitivity: ± 3% of set point			
Relevant Standard:	Incorporating essential principles of BS 7989:2001			



3. INSTALLATION

Site Selection

Powder Control cabinets must be placed well away from open windows, doors and other sources of disruptive air changes which may affect safe, consistent function. Where there is a comprehensive choice of site, choose the cleaner environment, as this will reduce pre-filter maintenance costs.

Warning! The pre-filter should never be obstructed in any way.

Space and ventilation

The laboratory or workroom should be of sufficient size to provide ample space around the cabinet to move and operate conveniently. The small but constant heat load generated by the fan and any lighting will be easily dissipated in average room sizes.

General installation recommendations

Recommendations for installation are to be found in BS: 7258-2: 1994 covering Laboratory Fume Cupboards.

Setting the 'Autocal' electronic airflow alarm

The fan should be allowed to run for several minutes in order to stabilise, after which the electronic airflow alarm 'set-point' can be programmed. For detailed instructions refer to Section 4 of this manual.

Electrical connection

The cabinet is supplied with a pre-tested (IEC to UK style plug) power cord, for connection to a supply of 230 Volts, 50 Hz, single phase, 5 Amps maximum: where there is a requirement to re-wire this then connections should be made in accordance with the following colour code:

Green & Yellow Lead		Protective Earth
Blue		Neutral return
Brown		Live phase



4.0 COMMISSIONING

Having connected the cabinet to the correct supply, switch ON by pressing the fan switch, the integral green indicating lamp should now be illuminated and the fan running.

Allow the fan to run for several minutes in order to stabilise before proceeding with the commissioning tests.

Face Velocity

Measure the average inflow air velocity at the front aperture using a calibrated rotary-vane type anemometer. Measurements should be taken at multiple, uniform grid points to accurately determine the average airflow, refer to BS 7258-1: 1994 Annex D. The fan speed is pre-set during factory acceptance testing to provide the specified average face velocity, but adjustments may be necessary to accommodate local air regimes and voltage variations.

Airflow Alarm

The alarm is calibrated during factory testing and after initial start-up the Green light indicating 'AIR SAFE' should illuminate. Test the alarm function by raising the lower front door, after a few seconds the alarm should sound and the Red light will illuminate to show 'AIR FAILURE'. Close the door and within a few seconds the alarm should return to the 'AIR SAFE' condition.

Calibrating the electronic Airflow Alarm

The Bigneat 'Autocal' low flow alarm is a solid-state air velocity sensing module with audible, visual and optional hard wired relay outputs. Pre-programmed software enables the device to accurately sense air velocity levels from 0.1 m/sec. to 2.2 m/sec via the inlet port at the front lower edge. Accuracy is within $\pm 3\%$ of the calibration set point.

To set up and calibrate the 'AUTOCAL' electronic airflow Alarm, carry out the following steps:

Switch on cabinet while pressing the 'MUTE' button on the Alarm unit, the 'AIR SAFE' light will illuminate and the buzzer will sound once. When the mute button is released the 'AIR SAFE' and 'AIR FAILURE' lights will both pulse and during this time the alarm unit will be in calibration standby mode.

Adjust the airflow potentiometer (located at the rear of cabinet) to an 'offset' value ¹ (e.g. 20%) below the required minimum flow rate, using a calibrated Anemometer. *This value should be measured over several inflow points to accurately determine the average value.*

Allow the fan to run for 3 minutes to stabilise whilst continuing to monitor the anemometer readings, then:

Press the 'MUTE' button again. The alarm point will become set.

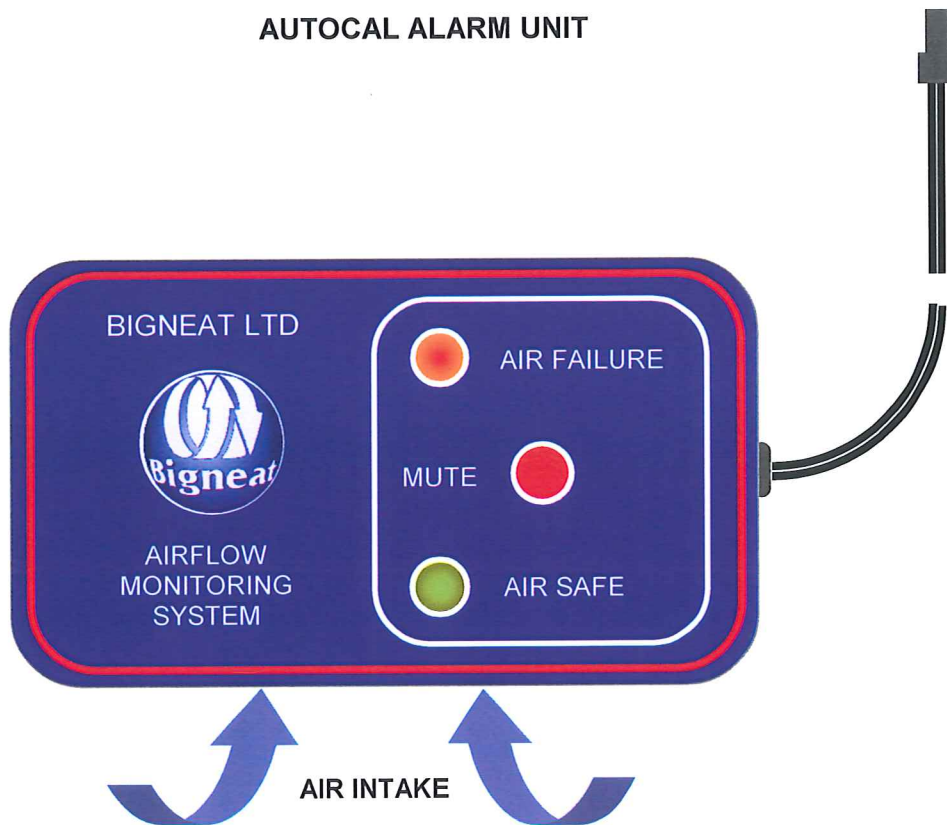
It is now possible for the 'AIR SAFE' light to illuminate.



Readjust the fan speed to bring the airflow back to the actual required (normal) operating level. Allow the fan to run uninterrupted for at least 3 minutes to ensure that the fan speed is correct. Determine the average reading by taking several 'inflow' measurements. Adjust fan speed as necessary to the optimum level.

To check that the alarm is responding, open the access door slowly and confirm that the alarm is activated at the calibrated airflow setting. Close the access door. If recalibration is required, switch off the cabinet, wait a short time and then repeat the process.

AUTOCAL ALARM UNIT



¹ this offset value is intended to accommodate the inevitable disturbed airflow in the laboratory caused by the movement of people, doors and windows, which would otherwise falsely trigger the low airflow alarm sensor.



4.0 contd..

Containment

As it is not generally practical to carry out on site SF6 containment testing of ductless recirculatory cabinets owing to the need to provide a temporary exhaust system, the airflow at the face of the cabinet should be evaluated by smoke testing. Refer to test method described in BS 7258-4:1994.

Filter and Seal Integrity

The integrity of the cabinet HEPA filter and seal is tested during factory acceptance using the D.O.P. aerosol test method. After installation the system should be re-tested in accordance with the guidelines in Annex D of BS EN 12469:2000

Initial Cleaning

Following commissioning, clean the enclosure with the fan running. The recommended method of cleaning hard surfaces is by damp wiping which has been shown to have a removal efficiency of more than 99% on particles of 5 μm , but is unlikely to pick up more than 10% of 10 μm particles.

Wipers should always be of the highest quality, non-shedding type suitable for clean room use. A variety of purpose made clean room-cleaning products is on the market and manufacturers advice should be sought for each application. Cabinets are considered as 'critical areas' and products should be selected accordingly.

Warning! Do not attempt to clean the filter face. Although a metal mesh protects it, it remains vulnerable to accidental damage and great care should be exercised at all times.

Operating the Excel Plus Powder cabinet

Press the Fan pushbutton switch to the ON (illuminated position). The fan speed will eventually stabilise at the level preset during commissioning, however, during this period the airflow monitor will alarm until the air velocity has reached the calibrated setting.

The bi-folding front access door should be closed during normal processing routines using the safety cabinet; to maintain airflow and containment integrity, which will otherwise be affected. In the event of a significant disturbance to the incoming airflow during use the airflow monitor will alarm, however, this will cease as soon as the airflow velocity is allowed to return to normal levels. During this period, the MUTE button can be pressed to silence the alarm for convenience.

For full access to the enclosure, the complete front bi-folding acrylic panel can be hinged upwards. This panel should be secured for safety and convenience by folding the door as necessary to align the two holes in the lower panel and 'hooking' them over the retaining tabs fitted on top of the fan housing



5.0 FIRST-LINE MAINTENANCE

Regular maintenance is essential to the safe functioning of the filtration cabinet and we advise entrusting this to a service department or outside company who are technically competent and equipped with calibrated instruments. They will also be familiar with the current UK COSHH regulations demanded by Government and the industry, and will maintain a service record for each unit. Refer to Table1 for replacement filter types.

Pre-filter monitoring

The particle pre-filter is the first-line of defence and will therefore be contaminated with particles from the range of substances processed within the enclosure. It requires changing regularly to ensure proper airflow and to ensure long life of the main filter.

The frequency of changing depends on the environment. It can vary from a week in exceptionally dusty conditions to 6 months or more in a clean environment. Regular visual inspection should be carried out. A pre-filter that has turned black or dark grey needs changing. Studies have shown that pre-filters should be changed twice a year.

Procedure for Safe-change type method

Safety Warning! 

Protective overalls, gloves, facemask and glasses should be worn at all times when carrying out these procedures. The glass fibres within the media can cause irritation to eyes and skin. Flush eyes or wash hands with copious amounts of cold water if affected

Having first cleaned the inside of the enclosure and removed any hazardous materials, switch the fan ON in order to create a negative air pressure environment within the enclosure.

Open the bi-folding front acrylic doors and fold as necessary to secure to the special retaining bracket mounted on top of the fan housing. Open the individual acrylic access panels located under the Pre-filter grilles. Lift and withdraw the metal pre-filter grille fitted to the underside of the filter housing. Remove the saturated pre-filter and place 'double-bagged' promptly into appropriately labelled hazardous waste sacks.

Position a new filter element in the tray (with the direction of flow arrow upwards) and assemble the grille back into the unit.

Note.1 If it is intended to replace the HEPA filter also at this time, then before refitting the pre-filter and grille, spray the exposed face of the HEPA filter sited above to reduce the risk of loosening the particle contaminants during later removal of the HEPA filter.

Close the front acrylic access panel and the front bi-folding door.

Table 1

Model:	EP804	EP1000	EP1206	EP1506
Pre-filter type:	PF4 x1	PF4 x 1	PF3 x 2	PF3 x 2
Main Filter type:	HP4 x1	HP4 x1	HP3 x 2	HP3 2



5.0 contd.. REPLACING A MAIN FILTER



Safety Warning!



- Switch OFF the cabinet and isolate from the mains electrical supply!
A suitably trained engineer should carry out the replacement of the main filters. It is important that gloves, facemask and safety goggles are worn when handling used filters.
- Filter housings longer than 1000 mm require two people to carry out this procedure.

Removing a contaminated HEPA filter

Having first cleaned the inside of the enclosure, lift open the fan housing and secure it with the two red coloured stays, which should be pulled out from each side of the lower housing. Make certain that both stays are correctly 'latched' into position.

Fully remove the contaminated filter by lifting it off the spacer frame below and sliding outwards.

Spray the 'contaminated face' with (hair) lacquer to seal the surface. (See Note.1)

Place promptly inside an appropriately labelled hazardous waste sack, double-bagged.

Note. 2 *The 'stiction' effect of the spacer frame top seal may make initial removal of the main filter difficult, however, avoid applying extreme 'jerking' movements to remove it from its position otherwise particles may be loosened and contaminate the local area.*

Install the new filter in reverse order; making sure it is pushed to the very back of the tray.

The filter airflow indicator arrow should be placed in the upward direction.



5.0 contd...

Lift up the fan housing again, unlatch the stays and slide them back into the casing. Close the fan housing *taking great care not to trap fingers*. Carry out airflow velocity checks and adjust fan speed controller as necessary. Recalibrate the electronic airflow alarm.

Safety Note!

It is important that the type of chemical being used is identified in order that correct labelling of the hazard waste sack and disposal methods are applied. The classification, final labelling and disposal of used filters are the responsibility of the end-user. Under current COSHH regulations, Bigneat are unable to transport hazardous materials away from customer sites.

6.0 SAFETY MONITORING



Air Velocity

Over time, the progressive saturation of the HEPA filter will reduce the airflow velocity within the cabinet. The airflow alarm will continuously monitor the face velocity and will enunciate an alarm when the value falls below the level set during commissioning, however, adjustment to the fan speed will be required to compensate for this reduction in airflow.

The cabinet should be checked at least twice yearly with a calibrated anemometer.

Main Filter

If, following the fitting of a new pre-filter, the specified averaged airflow face velocity cannot be obtained the Main Filter must be replaced, the used Main filter should be removed and sealed in a heavy-duty waste bag for disposal. Refer to Page 7 for method of changing a main filter.

Safety Warning! Protective overalls, gloves, facemask and safety glasses should be worn throughout these procedures.

Electrical Safety

This Powder Control Cabinet is tested as an [Class 1 electrical] appliance, and must continue to meet the requirements of the Electricity at Work Regulations 1989. This includes the associated IEC mains cord set supplied and this along with the electrical system of the safety cabinet should be examined frequently for signs of damage. There should be regular formalised inspections carried out by a 'competent' person and must include earth bonding and insulation tests.

Cleaning

Cabinet enclosures should be cleaned (and disinfected if this is applicable) frequently and regularly. The frequency of cleaning will depend upon the use to which the cabinet is put but as an indication cabinets for non-organic use might be cleaned weekly. Those used for pharmaceutical procedures are normally cleaned before and on completion of specific operations.

Clean the enclosure with the unit running. The recommended method of cleaning hard surfaces is by damp wiping which has been shown to have a removal efficiency of more the 99% on particles of 5 μm , but is unlikely to pick up more than 10% of 10 μm particles.

Wipers should always be of the highest quality non-shedding type suitable for clean room use.



7.0 EXAMINATION & TESTING

COSHH Regulations

Current UK COSHH regulations recommend that this Safety Cabinet be examined, serviced and revalidated at least once every 14 months and should include the following checks:

- Average (inward) airflow velocity and efficiency.
- Operation of the airflow detectors.
- Filter saturation and seal Integrity
- Fan motor noise or vibration
- Electrical safety, to include cord set

Bigneat's own Service Department has many years experience in Fume and Particulate Extraction maintenance, test and validation. We would be pleased to quote you for an appropriate Service Contract.

Call our Service department on direct telephone number: +44 (0) 23 9224 6443 for further information and advice.



APPENDIX 1

NOTES ON UK COSHH REGULATIONS

1. The "Control of Substances Hazardous to Health" (COSHH) 2004 regulations,
2. The regulations are the UK implementation of an EEC Council directive 80/1107/EEC.
3. The regulations require an employer to protect his employees and any other people (whether working for him or not) from hazardous substances.
4. A hazardous substance is defined as:-
 - a) A substance or mixtures of substances, which are on the list of hazardous substances as defined by the Classification, Packaging and Labelling Regulations 1994.
 - b) A substance for which an Occupational Exposure Limit (OEL) value exists. This list is similar to US threshold Limit value Levels (TLV).
 - c) A micro-organism, which creates a health hazard.
 - d) Dust at a substantial concentration in air.
 - e) Any substance, which creates a hazard to health, similar to the hazards created by the substances in a-d.


Note that paragraph 4e is a "catch-all" section.


5. The employer is responsible for assessing the risk to an employee.
6. The employer must prevent or control the exposure of an employee to hazardous substances.
7. The control of exposure "shall be secured by measures other than the provision of personal protective equipment". This means the fumes must be contained, rather than providing protective suits and masks to staff.
8. OEL values must not be exceeded.
9. The employer must ensure that safety equipment is properly used.
10. The employee must use safety equipment provided correctly.
11. The employer must maintain safety equipment in good working order. In particular:-
 - a) Exhaust ventilation equipment must be examined every 14 months.
 - b) Other safety equipment must be examined at "suitable intervals".
 - c) Records of checks, tests and repairs must be kept for 5 years.
12. Monitoring of exposure to hazardous substances must occur "in accordance with a suitable procedure". Records of results must be kept for 5 years for general monitoring, and for 30 years when they relate to a specific employee.
13. Regular medical checks are required when working with certain listed substances, or where an identifiable disease is associated with a certain substance.
14. An employer must provide suitable instruction and training to employees regarding risks of substances and precautions to be taken.
15. Certain other regulations take precedence, such as Control of Lead at Work, Control of Asbestos at Work, radioactive, explosive or flammable regulations, Mines and Quarries Act, and medical treatment regulations.

APPENDIX 2

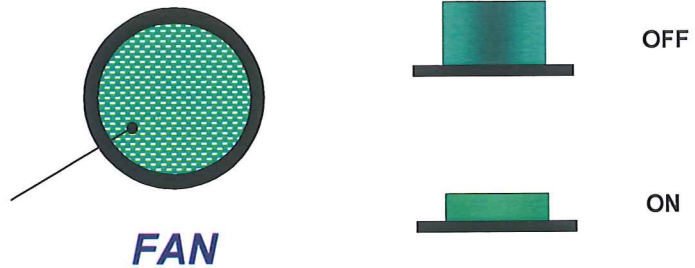
EQUIPMENT LABELLING

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RATING	<input type="text"/> AMPS		
DATE	<input type="text"/>		

 **BIGNEAT LIMITED**
Units 4 & 5 Pipers Wood
Waterlooville Hampshire PO7 7XU
Tel: +44 (0)23 9226 6400 Fax: +44 (0)23 9226 3373
www.bigneat.com



CE MARK & RATING LABEL



FAN SWITCH LEGEND & SWITCH OPERATION

FILTER TYPE IDENTIFICATION

This cabinet is fitted with
Chemcap™ Filter
for use with particulates

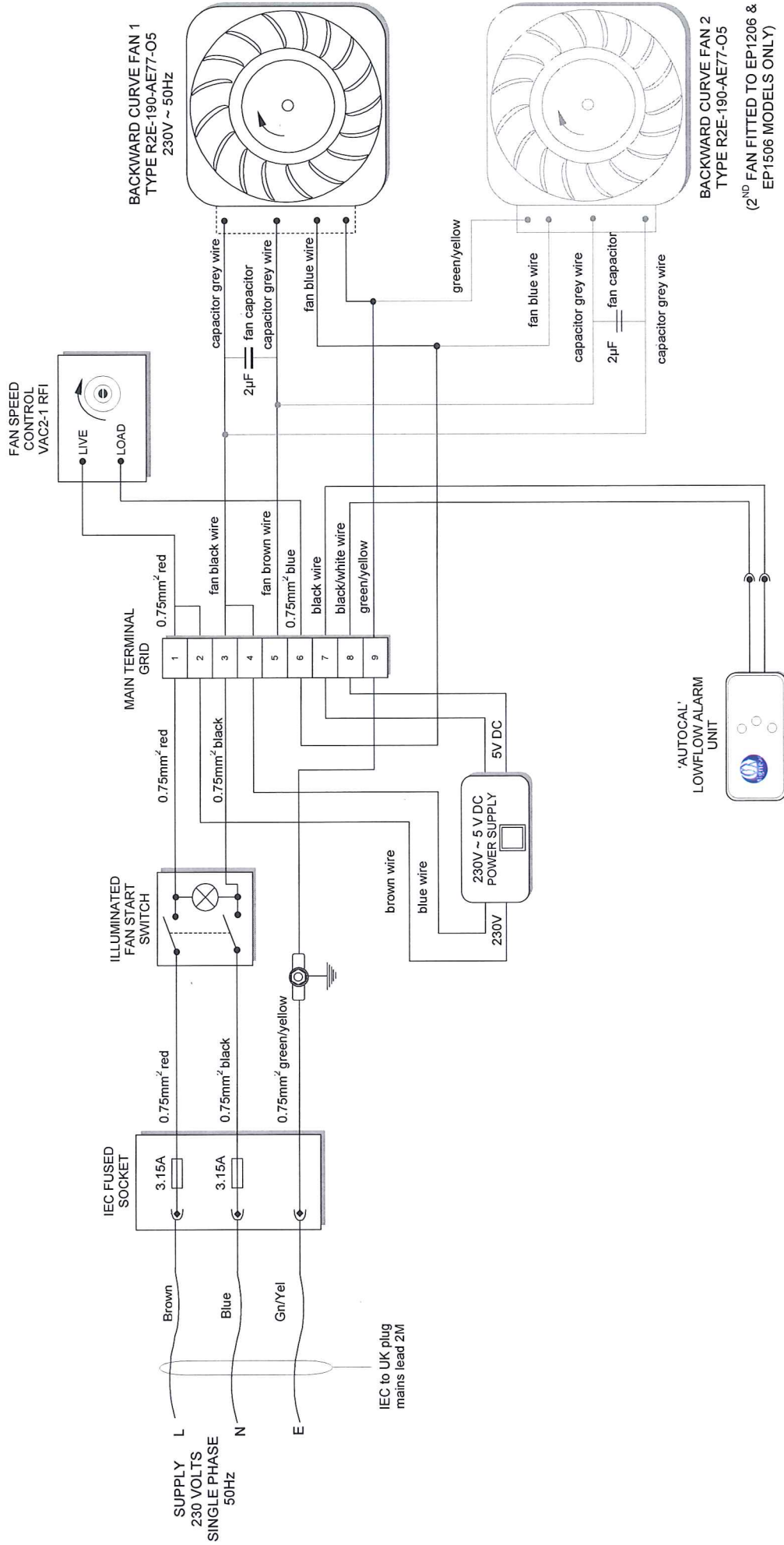


SHOULD YOU HAVE ANY QUESTIONS CALL +44 (0)23 92 266400

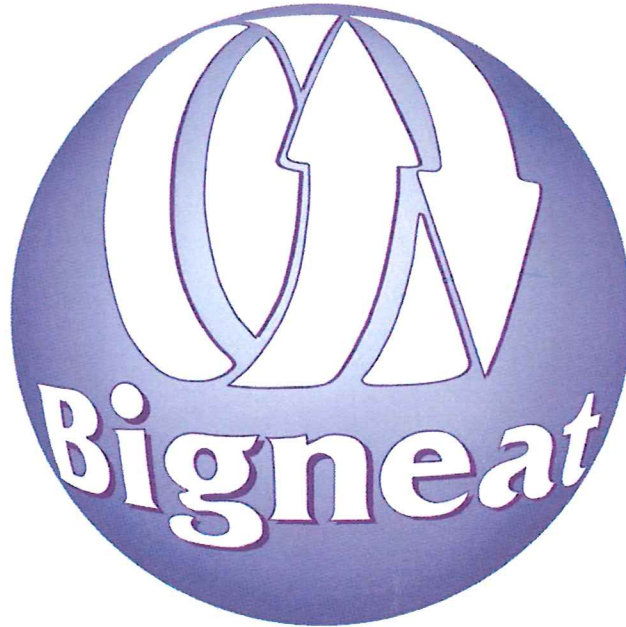
FILTER IDENTITY LABEL (EXAMPLE)

APPENDIX 3

ELECTRICAL SCHEMATIC DIAGRAM



BIGNEAT CHEMCAP™
DUCTLESS FILTRATION
EXCEL-PLUS POWDER RANGE
ELECTRICAL SCHEMATIC DIAGRAM



Printed and Published by
Bigneat Limited
4 & 5 PIPERS WOOD INDUSTRIAL PARK
WATERBERRY DRIVE
WATERLOOVILLE
HAMPSHIRE
PO7 7XU

TEL: +44 (0) 23 9226 6400 FAX: +44 (0) 23 9226 3373

E-MAIL: information@bigneat.co.uk

WWW.BIGNEAT.COM