# TYPICAL KITCHEN EXTRACT SOLUTION

We have set out below a recommendation for the control of grease, smoke and odour from a fast food outlet using a char grilling process. There are varying degrees of pollution created by restaurants dependant on the type of cooking. A char grilling operation provides a high level of smoke, grease and odour and will typically need more equipment than other types of systems.

The cooking will take place under combined or in some cases separate canopies. The canopies will be fitted with conventional grease filters.

### Particulate Phase Control

A double pass Electrostatic Precipitator should be installed within the ducting. The use of a double pass system greatly increases efficiency and provides minimal breakthrough as the filters become contaminated in between service visits. The unit should be located as close to the canopy as possible, taking into account operational fume temperature, this should reduce grease build up within the ducting and in turn reduce the need for duct cleaning. These units should always be installed prior to the fan and on a straight length of ducting to ensure uniform airflow.

### Gaseous Phase Control

A UV-C system should be installed directly after the Electrostatic Precipitator. This should also be before the fan to ensure uniform air velocity and distribution throughout the unit. It is important to have a reasonable length of ducting after the UV-C system as the oxidisation process continues after leaving the unit. In applications where a high level of control with minimal breakthrough is required a Mixed Media or Carbon filter system may be used as a final odour / gaseous phase control stage.

### Maintenance

Typically a four weekly maintenance will be required which will involve an engineer attending the restaurant to exchange the ionisers, filters and collector cells in the Electrostatic Precipitator. The exchange components are cleaned at our works using an industrial centrifugal washing process, all components are rotated and the client does not need to purchase spares. The UV lamps are protected by the Electrostatic filter but they will be cleaned using an alcohol based product during the service visit. UV lamps are normally changed annually and mixed media or carbon filters are typically changed every six months.

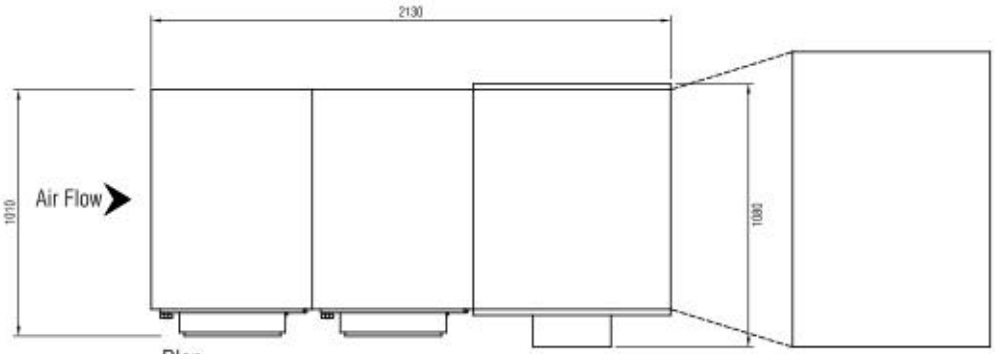
See technical drawing overleaf

All dimensions in millimeters
Do Not Scale

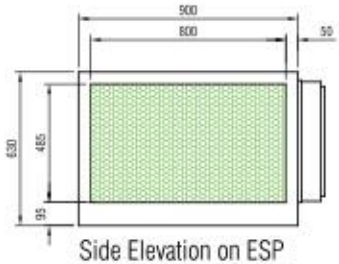
# Purified Air Ltd

Title:
ESP 3000E-DP + UVc 3000 + 2 x MMF

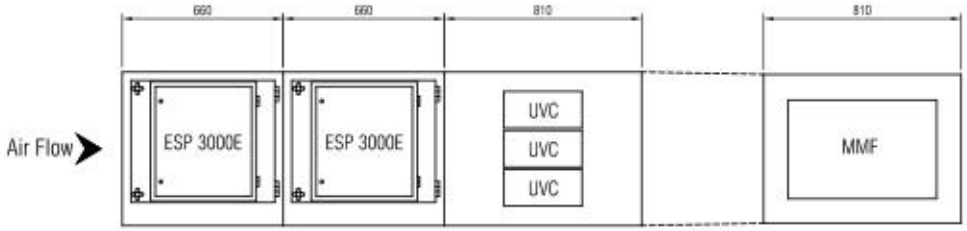
| Weight: | Power Supply: |
|---|---|
| 425kg + 16kg/Rack | 220/240v-50Hz-1 Phase |
| Maximum air flow through system: 1.4m³/s | |



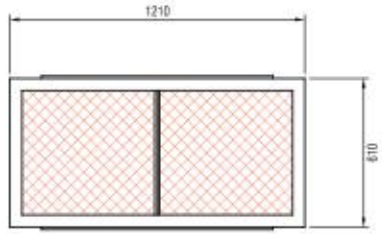

Plan




Side Elevation on ESP




Front Elevation




Side Elevation on MMF

Note
The system can be reconfigured if air flow direction is different to that shown.
Transition and ducting sections in between units drawn for indication purposes only.
All transition pieces and ducts to be designed, supplied and installed by others.

# DESIGN GUIDE

## General

The different products supplied by Purified Air can be used to provide a suitable odour nuisance solution for all commercial cooking applications. The products are generally modular so that they can be easily selected to meet the requirements of large or small kitchens and different types of cooking.

When specifying filtration equipment for a kitchen the type of equipment used will be determined by the ventilation rate for the kitchen extract system, what type of cooking is being under-taken and the location of the discharge point.

## Ventilation rate

The ventilation rate for the kitchen will be determined for the kitchen by the type of appliances in use and the level of cooking taking place. It is usually calculated by the kitchen extract system designer. All of Purified Air's products are designed to filter a given air volume so it is necessary to determine the ventilation rate so that appropriately sized equipment can be selected. As mentioned previously, all the systems are modular so for large systems multiple units can be used. Figure 1 shows a system that has been designed for a larger kitchen incorporating ESP, UV and Mixed Media filter.

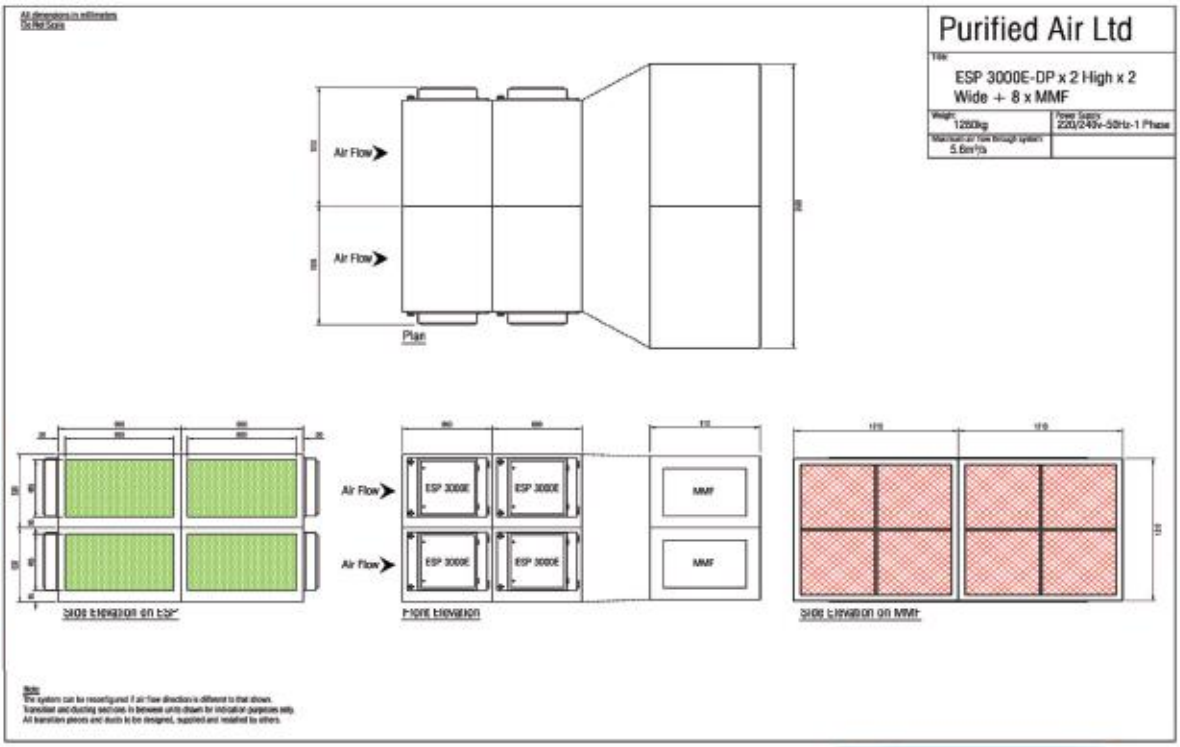



Figure 1

## Cooking Type

Different types of cooking will generate different types of pollution. Some cooking processes will generate a lot of smoke and grease and others will produce a lot of odour. The type and level of pollution will determine the Purified Air equipment that should be selected to provide an effective control system. Table 1 has been produced to help with selection of equipment – different types of cooking have been evaluated for smoke, grease and odour and a scoring system used to select equipment.

## Discharge point

The location of the discharge can play a major role in odour nuisance from premises. If the stack has adequate height good dispersion can be achieved and the odour nuisance reduced. If the discharge is at low level and in close proximity to residential properties or businesses very little dispersion will take place and it is necessary to filter the extracted air to a much higher level.

| TYPE OF CUISINE | SMOKE SCORE | GREASE SCORE | ODOUR SCORE | AGGREGATE |
|---|---|---|---|---|
| African | 2 | 3 | 3 | 8 |
| American | 2 | 4 | 4 | 10 |
| Caribbean | 2 | 3 | 3 | 8 |
| Char Grilling | 5 | 4 | 4 | 13 |
| Chinese | 2 | 5 | 3 | 10 |
| European | 2 | 2 | 3 | 7 |
| Fish & Chips | 1 | 4 | 3 | 8 |
| French | 1 | 3 | 3 | 7 |
| Fried Chicken | 2 | 4 | 4 | 10 |
| Greek | 4 | 3 | 3 | 10 |
| Indian | 2 | 4 | 5 | 11 |
| Japanese | 4 | 3 | 3 | 10 |
| Korean | 4 | 3 | 3 | 10 |
| Lebanese | 5 | 4 | 4 | 13 |
| Malaysian | 2 | 4 | 4 | 10 |
| Mexican | 2 | 3 | 4 | 9 |
| Pizzeria | 1 | 2 | 2 | 5 |
| Pub Fayre | 3 | 3 | 3 | 9 |
| Seafood | 1 | 2 | 4 | 7 |
| Spanish | 2 | 1 | 3 | 6 |
| Thai | 3 | 4 | 4 | 11 |
| Traditional Italian | 2 | 2 | 3 | 7 |
| Turkish | 4 | 3 | 3 | 10 |
| Vietnamese | 3 | 4 | 4 | 11 |
| Warmed Food | 0 | 1 | 2 | 3 |

| Extract Air volume | ESP | ON 100 | UV-C | Mixed Media |
|---|---|---|---|---|
| 0.3 to 0.7 $M^3$/Sec | 1 No ESP 1500E | 1 No | 1 No ESP UVC 3000 1 Rack | 1 No 451 Cube |
| 0.7 to 1.4 $M^3$/Sec | 1 No ESP 3000E | 1 No | 1 No UVC 3000 2 or 3 Rack | 1 to 2 No 597 Cube |
| 1.4 to 2.1 $M^3$/Sec | 1 No ESP 4500E or 2 No ESP 3000E | 1 No | 1 No UVC 4500 3 Rack or 2 No UVC 3000 2 Rack | 2 to 3 No 597 Cube |
| 2.1 to 2.8 $M^3$/Sec | 2 No ESP 3000E | 1 No | 2 No UVC 3000 2 or 3 Rack | 2 to 4 No 597 Cube |
| 2.8 to 4.2 $M^3$/Sec | 2 No ESP 4500E or 3 No ESP 3000E | 1 No | 2 No UVC 4500 3 Rack or 3 No UVC 3000 2 Rack | 3 to 4 No 597 Cube |
| 4.2 to 5.4 $M^3$/Sec | 3 No ESP 4500E or 4 No ESP 3000E | 2 No | 3 No UVC 4500 2 or 3 Rack or 4 No UVC 3000 2 or 3 Rack | 4 to 6 No 597 Cube |
| 5.4 to 6.8 $M^3$/Sec | 3 No ESP 4500E or 5 No ESP 3000E | 2 No | 3 No UVC 4500 2 or 3 Rack or 5 No UVC 3000 2 or 3 Rack | 6 to 8 No 597 Cube |
| 6.8 to 8.2 $M^3$/Sec | 4 No ESP 4500E or 6 No ESP 3000E | 2 No | 4 No UVC 4500 3 Rack or 6 No UVC 3000 2 or 3 Rack | 8 to 10 No 597 Cube |

| NB FOR SENSITIVE SITES ADD 5 TO THE AGGREGATE SCORE BEFORE CHOOSING EQUIPMENT | |
|---|---|
| Score 3 to 5 | ON 100 or Mixed Media Filter designed with dwell time of 0.1 seconds |
| Score 6 to 10 | Single Pass ESP with ON 100 or Mixed Media Filter or UV-C designed with dwell time of 0.15 seconds |
| Score 11 | Single Pass ESP with Mixed Media Filter or UV-C designed with dwell time of 0.25 seconds |
| Score 12 to 13 | Double Pass ESP with UV-C designed with dwell time of 0.25 seconds |
| Score 13 plus | Double Pass ESP at 2.3rds design with UV-C and Mixed Media Filters with dwell time of 0.25 seconds |

**PLEASE NOTE THIS SHEET IS INTENDED AS AN INDICATIVE GUIDE, ODOUR CONTROL IS NOT AN EXACT SCIENCE, WE HAVE ENGINEERS ON HAND TO ASSIST WITH DESIGN AND EQUIPMENT SELECTION SO PLEASE CONTACT US ON 0800 0184000**

Table 1

## Important Design Criteria.

### Design Air volume

In order to provide the best results where possible select equipment which will provide a capacity between 70% and 90% of design. This is particularly important for sites with high sensitivity. E.g. an ideal ESP selection for an air volume of 2.3m3/s would be 2 No ESP 3000E; the maximum design volume through this system would be 2.8m3/s so at 2.3m3/s the system would be operating at just over 80% of maximum design.

### Air Velocity

The spread of air onto the face of the equipment must be uniform. Areas with high air velocity must be avoided as these will result in smoke, grease and odour breakthrough. Ideally tapers on and off of the equipment should be designed to sufficiently spread the air uniformly. Where taper design is limited by space constraints; turning vanes, baffle plates and other similar items must be used to spread the air evenly.

### Access

It is vital that all equipment is serviced regularly, which means filter cells, UV lamps, carbon and mixed media filters all have to be accessed regularly. Access to the equipment should be provided in a safe manner and with consideration to the frequency of access. Basic service space requirements are given the drawings in this section.

### Control

It is recommended that equipment is controlled in conjunction with the extract fan. With UVC systems this is imperative and failure to do so can cause ozone to build up to dangerous levels.

### Resistance to Airflow

Graphs are provided for the different Purified Air units so that the resistance to airflow can be calculated. It should be noted that the figures given are for clean equipment and allowance should be made for increase as the equipment becomes dirty.

## Order of equipment

Equipment is usually installed so that particulate contaminates are removed first before the gaseous phase of the pollution is dealt with. It is also advisable to install the equipment prior to the extract fan. Figure 2 shows a typical set up.

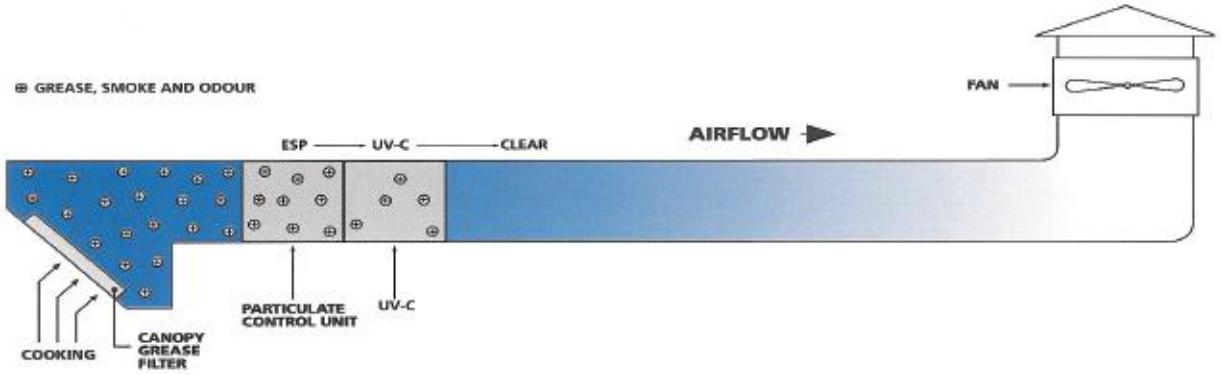



Figure 2

## Heavy particulate applications

Where a lot of smoke will be present in the air stream e.g. systems with a char grill; it is recommended that a double pass ESP system is used designed at no more than 80% of maximum design. A double pass system refers to two units being arranged in series which achieves a very high level of filtering efficiency.

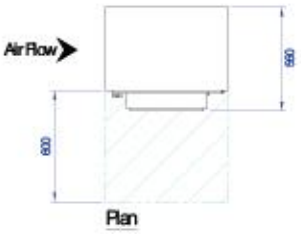
# Dimensions ESP1500E/ESP3000E

All dimensions in millimetres
Do Not Scale

## Purified Air Ltd

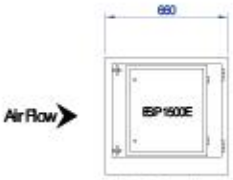
Title:
ESP 1500E

| Weight: | Power Supply: |
|---|---|
| 60kg | 220/240v-50Hz-1 Phase |
| Maximum air flow through system: 0.7m³/s | |




Plan

Service Space
Note: If access equipment is necessary service requirements may vary.




Front Elevation


Side Elevation

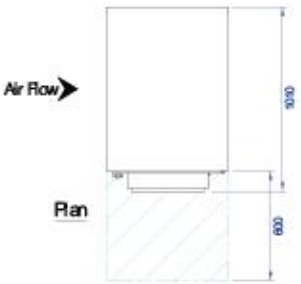
Note
The system can be reconfigured if air flow direction is different to that shown.

All dimensions in millimetres
Do Not Scale

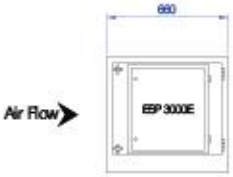
## Purified Air Ltd

Title:
ESP 3000E

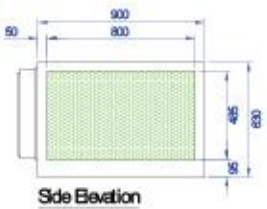
| Weight: | Power Supply: |
|---|---|
| 100kg | 220/240v-50Hz-1 Phase |
| Maximum air flow through system: 1.4m³/s | |




Plan




Front Elevation

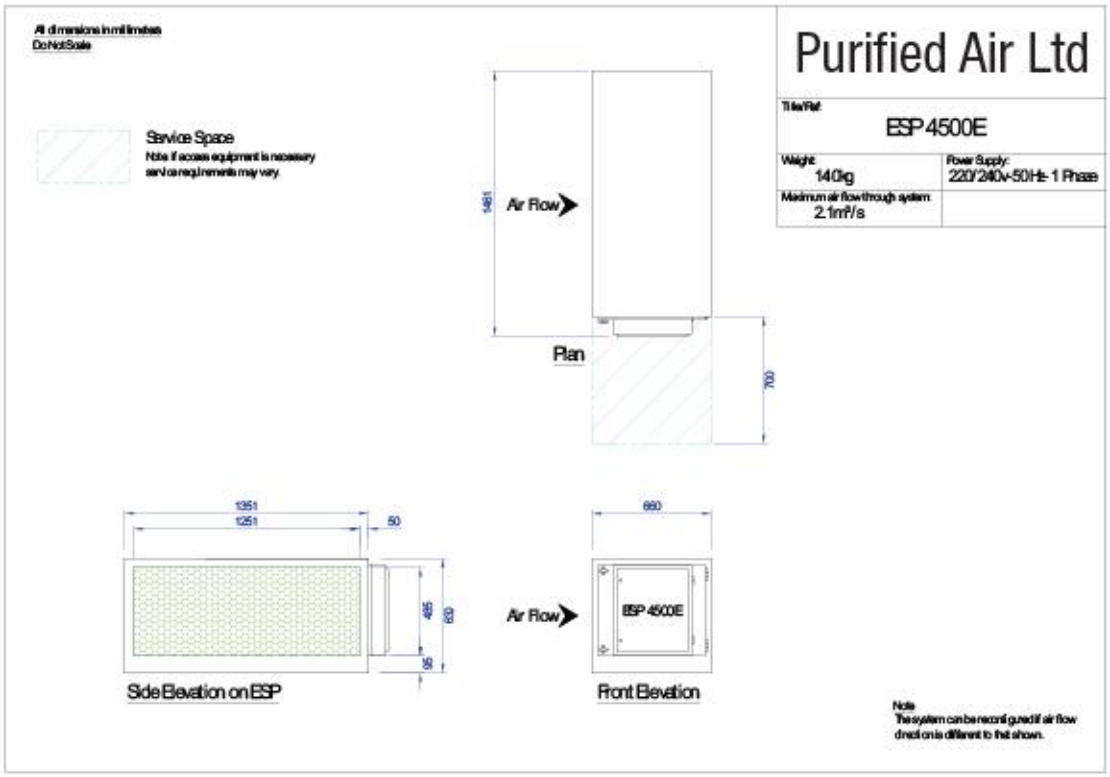



Side Elevation

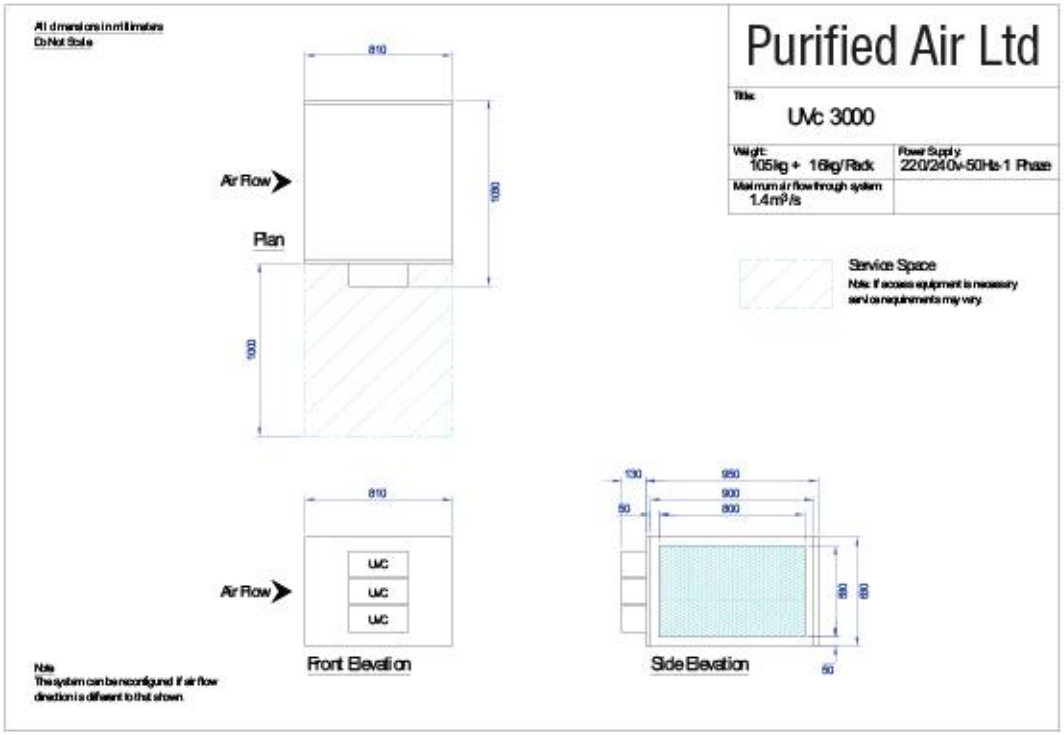
Note
The system can be reconfigured if air flow direction is different to that shown.

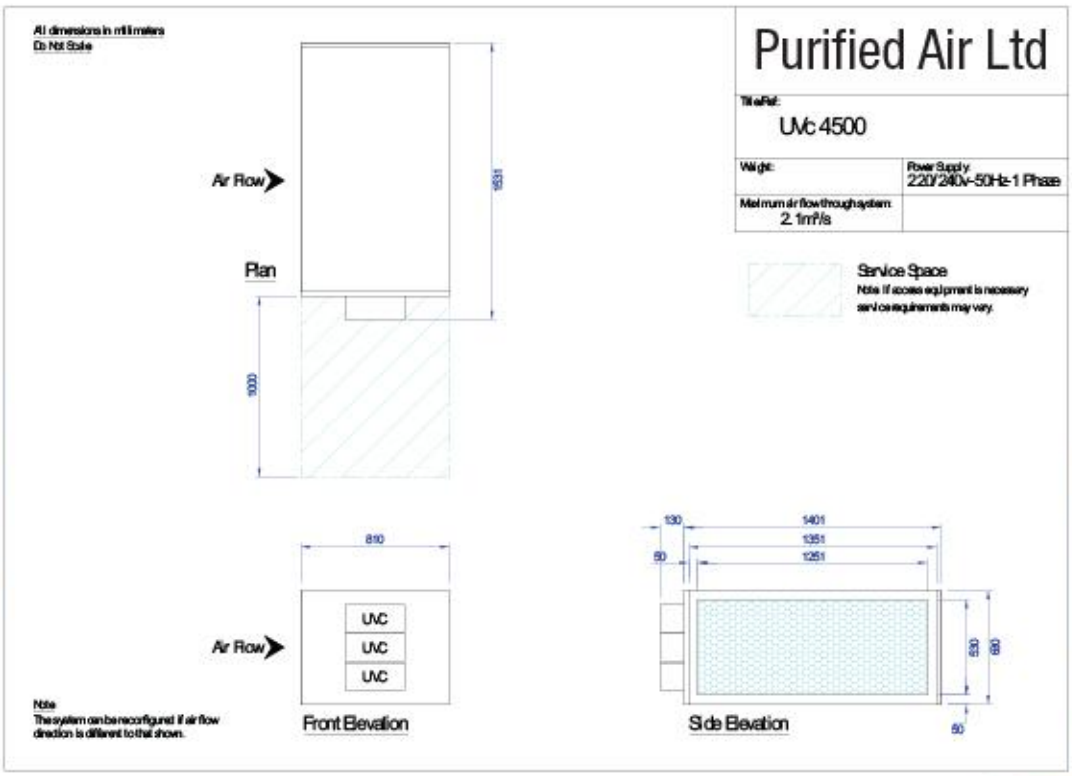
Service Space
Note: If access equipment is necessary service requirements may vary.

# Dimensions ESP4500

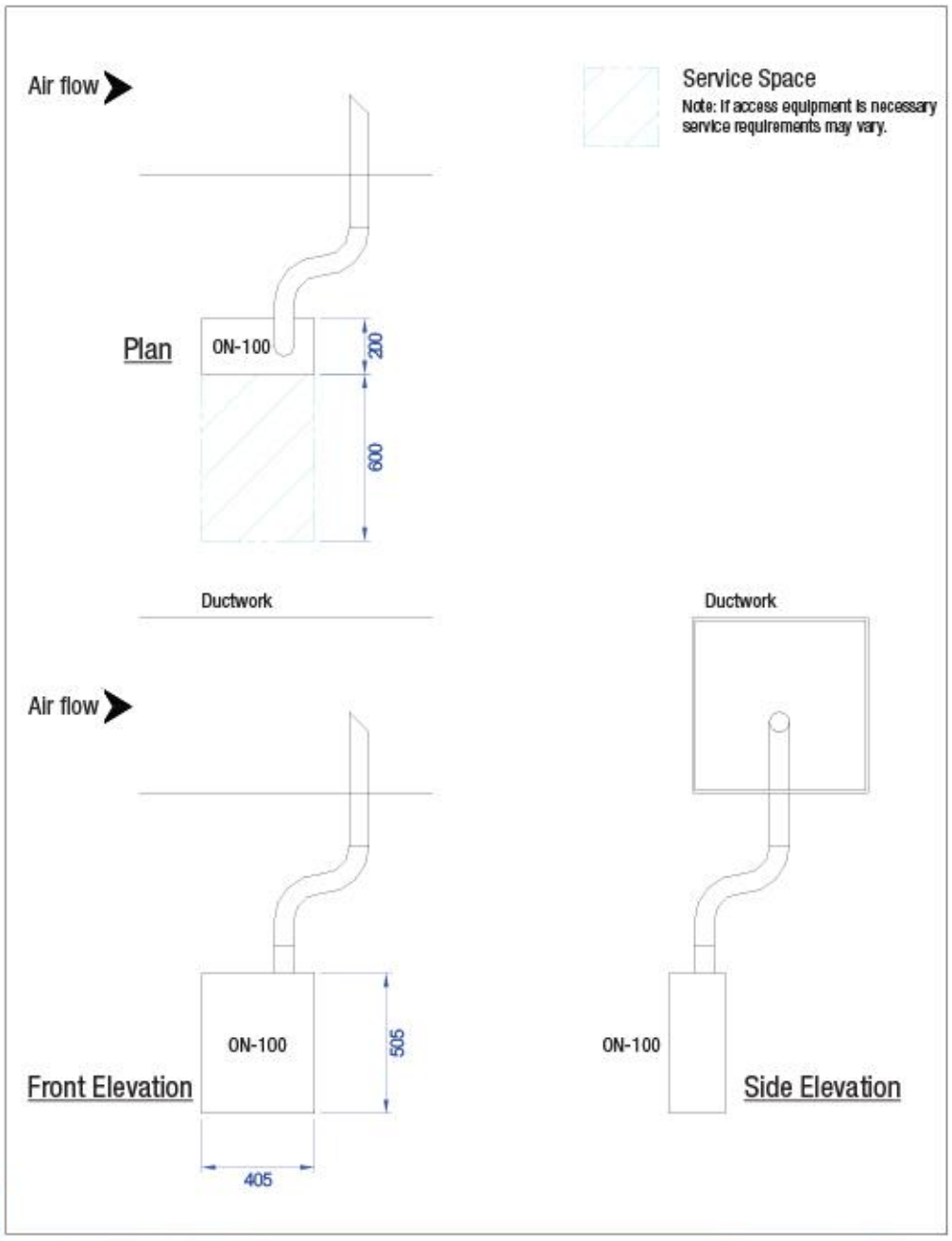


# Dimensions UCV3000/4500

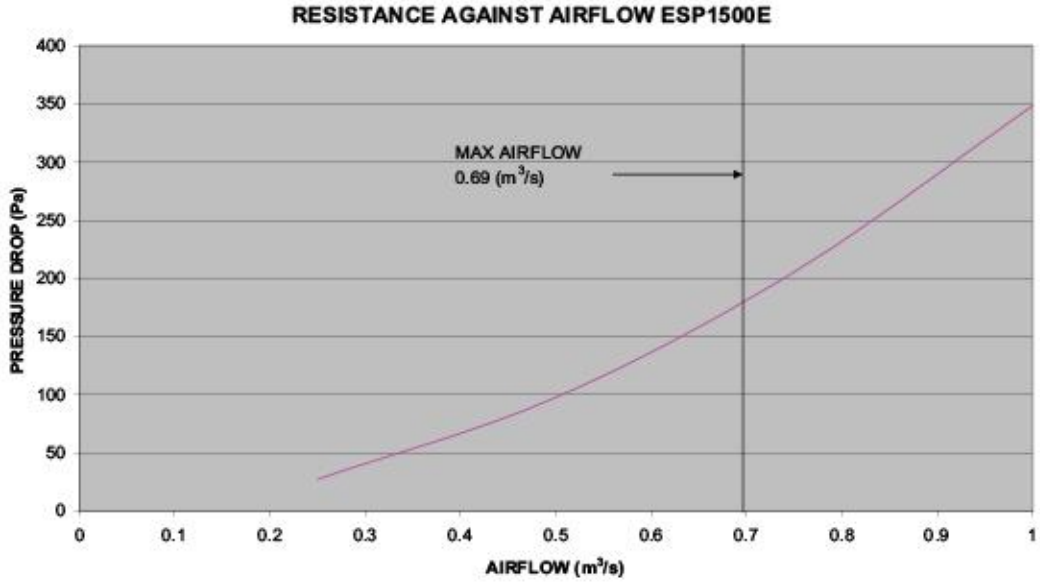


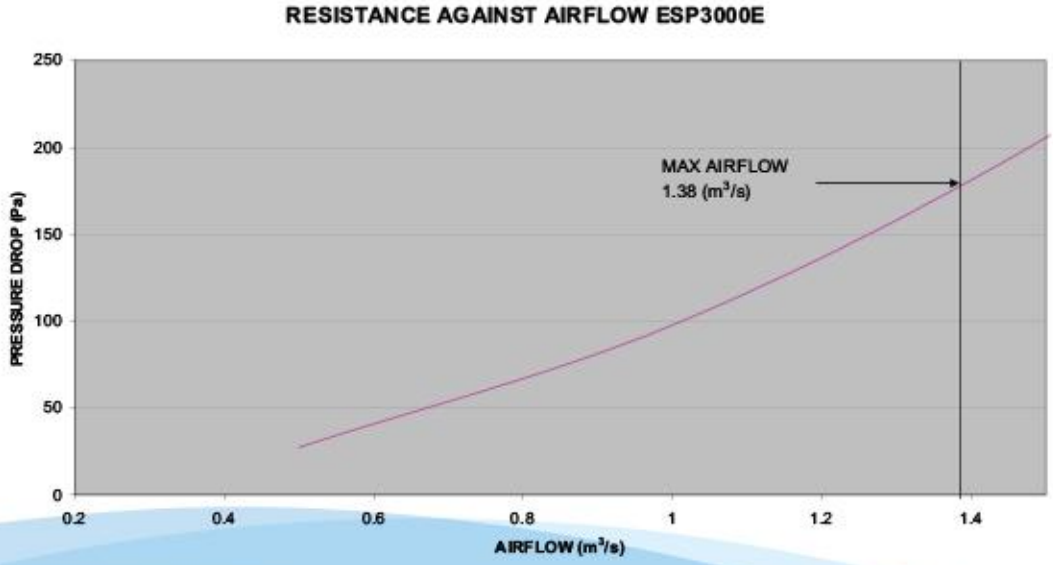



## Dimentions O.N.100

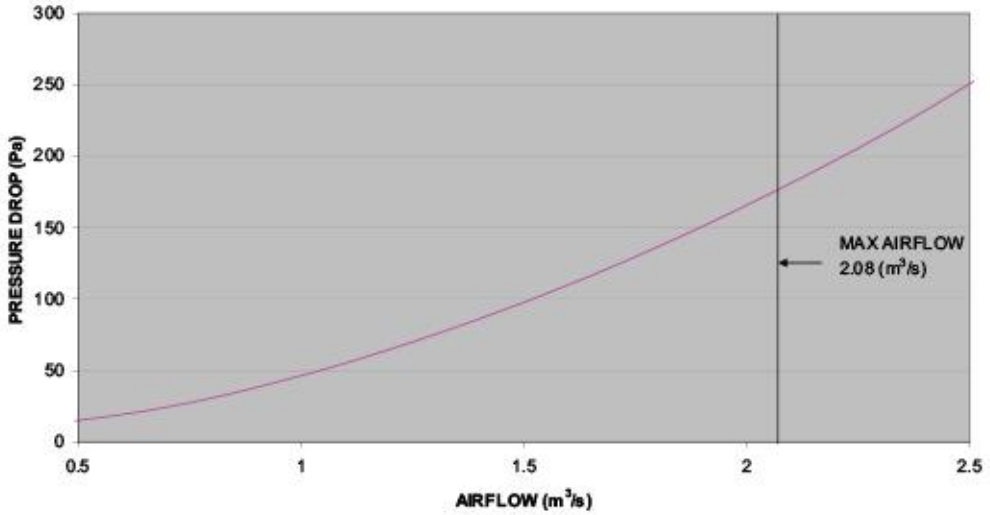


## ESP Pressure Loss Graphs



## RESISTANCE AGAINST AIRFLOW ESP4500E



# UVC Pressure Loss Graphs