Heat Recovery Ventilation Systems

Data Sheet PA600LI

The PA 600LI Heat Recovery Ventilation unit has been designed to serve the following small scale applications

- Houses ranging in size from 100 – 300 M2 in floor area.
- Small office spaces (up to 8 people).
- School classrooms.
- Crèches.
- Care-homes.
- Doctors/Dentists clinics
- Private swimming pools

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If the applications are larger such as a 500M2 house two or more units can be used. It utilises a counter-flow plate exchanger at its core and consequentially has a high sensible efficiency. This means that the supply air temperature will always be within 2^{o} C of the exhaust air temperature even at a very low sub-zero temperature of the incoming fresh air.

The PA 600LI is of the highest efficiency in its class, achieving up to 94% in non-condensing conditions and achieving a specific fan power down to 0.57ws/l of air.

In condensing conditions (colder) this can increase to over 97%.

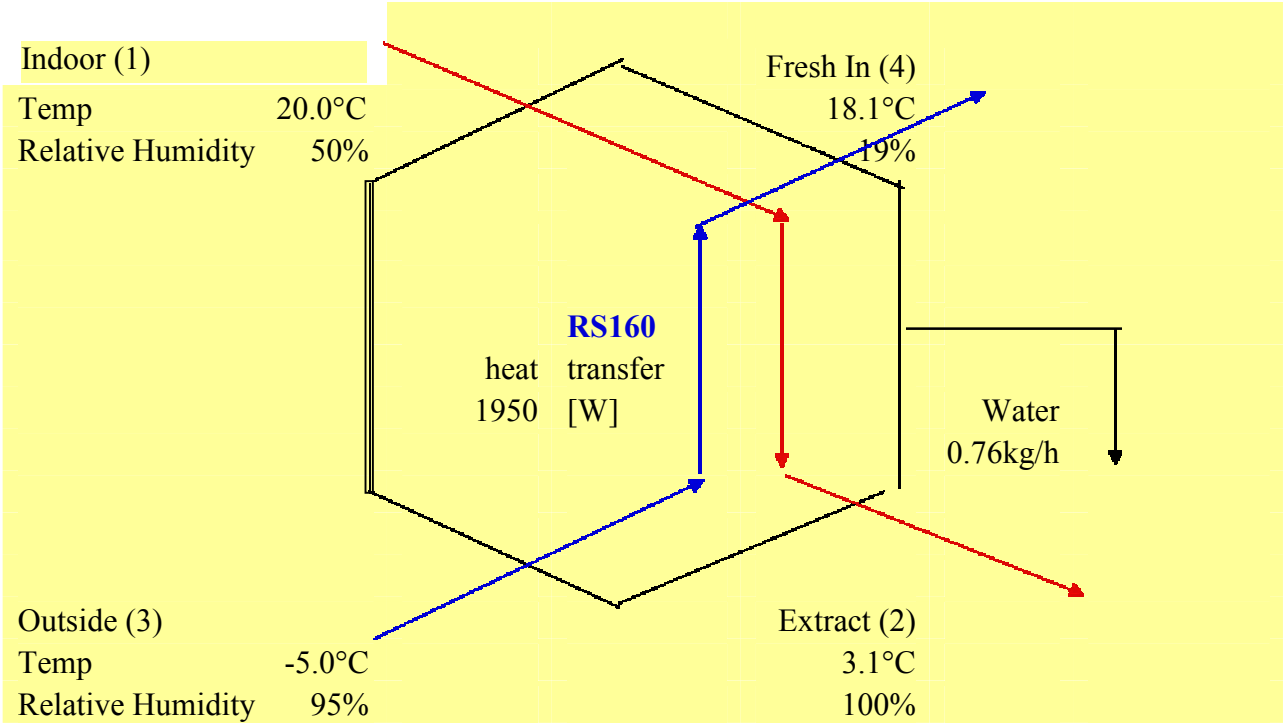


Figure 1.

Figure 1 shows a typical winter scenario. Here almost 2Kw is transferred from the outgoing air to the incoming air when 250m^3 /hr is moved through the system in both directions.

The main components of the ProAir PA600LI unit are

1. Heat Exchanger 1of
2. Fans 2of
3. Filters 2of
4. Control circuitry 1of
5. AHU casing 1of

Heat Exchanger

The heat exchanger is the heart of the unit. It is an air to air counter flow heat exchanger and its thermal effectiveness is extremely high. This is achieved by having

The two air flows in a pure counter flow arrangement,
Balanced airflow in both directions.
No leakage between the airflows,
The airflows directed uniformly at the intakes of the heat exchanger
Having minimum heat conducted along the length of the duct wall.

The eskremo version of pure polystyrene used for the plates is inert in most applications and is suitable for air temperatures between 50°C and +50°C.

Material	Height	No. of plates	Surface area	Plate thickness
Pure polystyrene	394 mm	164	34.686 M2.	0.2 mm

The performance of the heat exchanger is dependent on the temperature difference between the two air streams. This explains why the supply air into the space is still 17.7°C even though the air entering (outdoor temperature) is -20°C as shown in the table.

Outdoor Temp °C	Supply Temp °C	Recovered Heat watts	Return Temp °C	Airflow m3/hr	Condensate l/hr	Return RH	Exhaust Temp °C
-20	17.7	2547	20	200	1.16	50%	-6.0
-15	18	2228	20	200	1	50%	-2.9
-10	18.2	1906	20	200	0.82	50%	0.1
-5	18.4	1583	20	200	0.62	50%	2.9
0	18.6	1257	20	200	0.4	50%	5.4
5	18.7	928	20	200	0.16	50%	7.9
10	19	607	20	200	0	50%	11.0
15	19.5	303	20	200	0	50%	15.5
20	20	0	20	200	0	50%	20.0

Fans

The fans are high efficiency backward curved 190mm light-weight plastic impellors mounted on external rotor, electronically commutated, medium voltage, DC motors, all fitted into a customised sound absorbent dense polyethylene scroll.

Figure 2 shows the performance of these fans when fitted into the PA600Li unit with pressure absorbed by the heat exchanger, filter and inlet spigot. The Y axis shows the amount of pressure that these exert on the fan across the range of airflows.

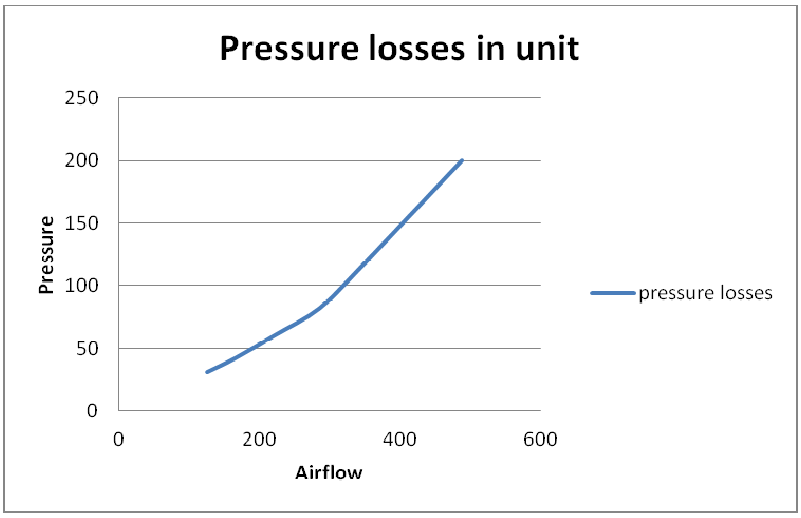


Figure 2.

The performance of the unit will be further affected by connected components such as ducting, air terminals, inlet/exhaust terminals, etc. The pressure exerted on the fans by these components is known as the external pressure.

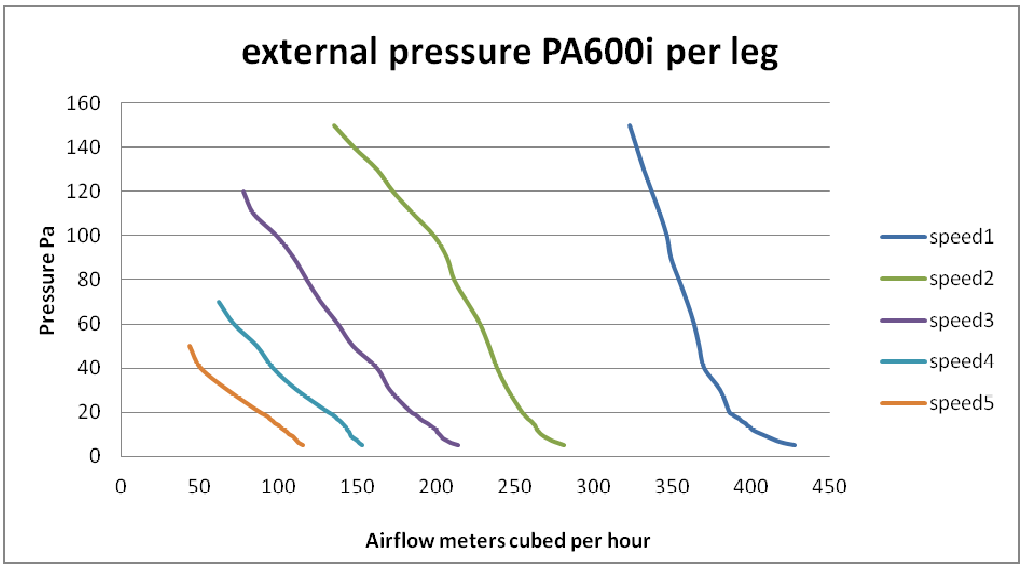


Figure 3.

The PA600LI has been connected to a simulated installation network in the ProAir test laboratory and Figure 3 shows the result at various speeds. A typical HRV installation should develop an external pressure of between 15 and 50 Pa per leg, (extract - exhaust and Fresh – supply) depending on speed.

A related aspect of fan performance and airflow is the power used in various situations.

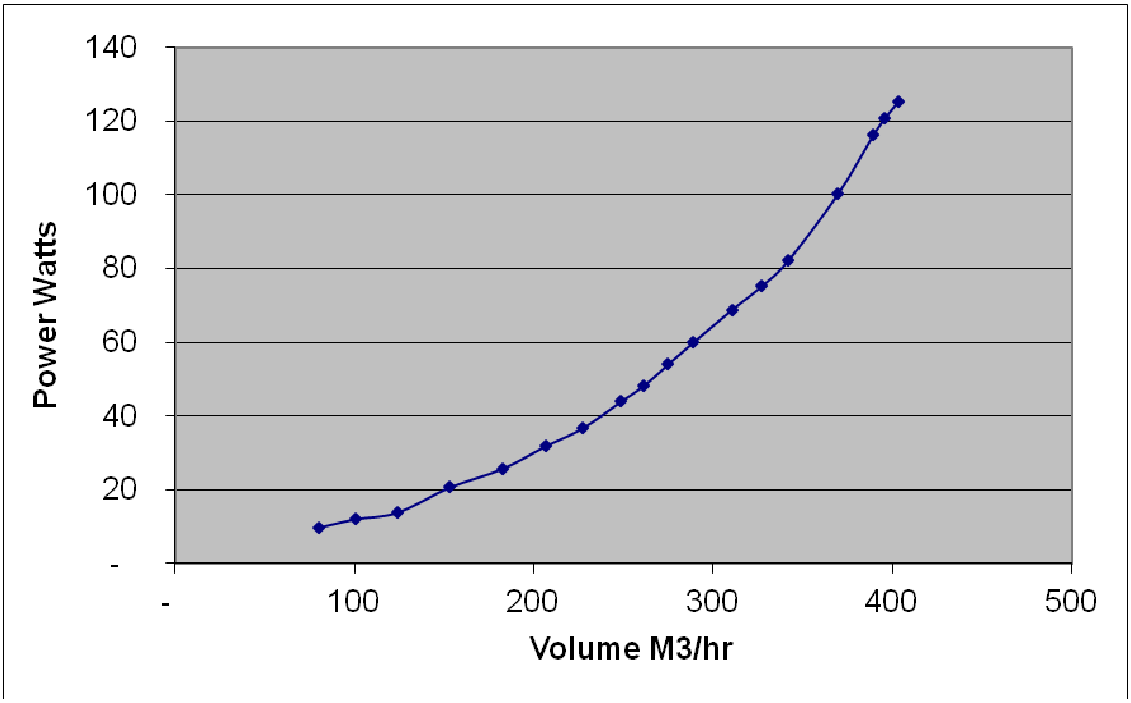


Figure 4

In Figure 4 we can see that the unit uses considerably less power on a proportionate basis when smaller volumes of air are being moved. Correct sizing of the unit for the application ensures that the motors driving the fans, which are running continuously, are within their comfort zone. This allows them to run very efficiently at lower speeds. The target is to move the required amount of air at the lowest fan speed and hence achieve high efficiency with the resulting low sound levels. This is addressed at design and commissioning stages.

Filters

The PA600LI unit has filters in both the supply and return legs. Both filters have the primary function of protecting the working parts and surfaces of the ventilation unit - the fans and the heat exchange surface. They also perform the very important job of ensuring that the air supplies are kept clean. The he supply filter also collects finer particles which might be detrimental to the health of the users.

Figure 5 is a guide to the common particles and their size ranges, found in everyday life.

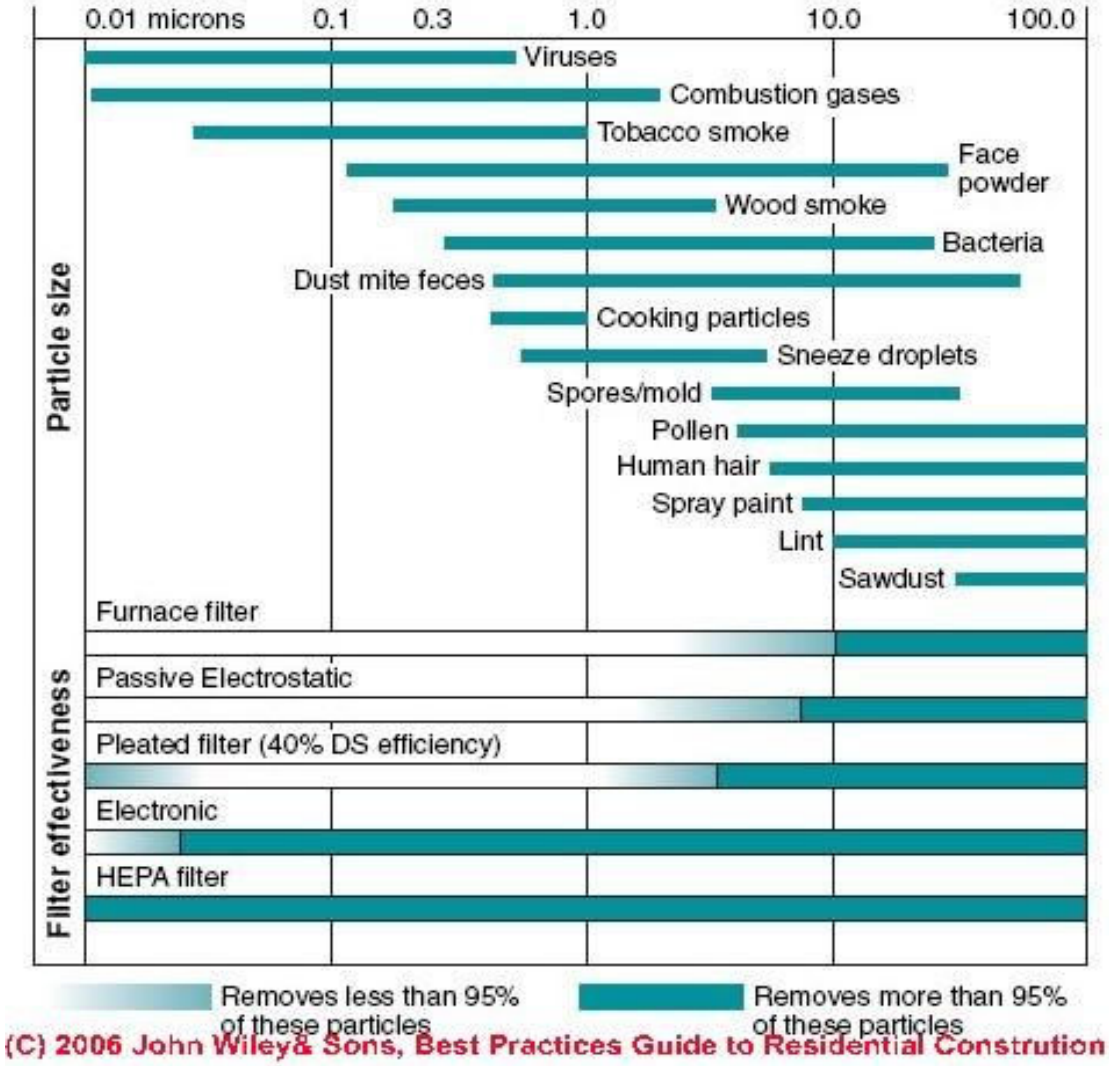


Figure 5.

Figure 6

The F7 filter lies between the electronic and the pleated filter on the above chart.

The filters are easily accessible. Checking and replacing them is a relatively easy task.

Controls

The HRV system is normally run at a speed to suit the application which is set during commissioning, with a facility for a timed boost over-ride. This timed boost is manually operated by means of one or more push-to-make switches located at wet areas (shower areas). This switch line as shown in Figure 7 sends a low voltage signal to the unit, to go to a higher speed for a pre-set time.

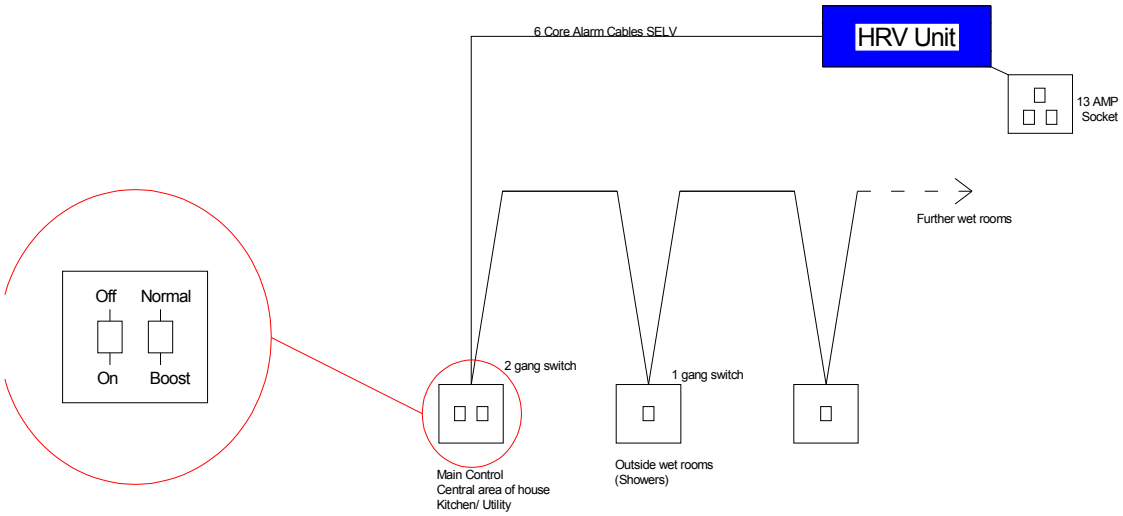


Figure 7.

Where Heat Recovery Ventilation is used to help conserve energy in Winter time some users may decide that it is not useful outside of the heating period and may switch it off. At this time, windows and doors will be open and the heat recovery feature will not be used. However the system will still be required periodically to deal with odours and water vapour. This is why the ProAir system incorporates a wake-up facility, where by pressing a boost switch, the unit will run on boost for the timed period, even when the on/off switch is in the off position.

As shown in Figure 7, the power for the system is by means of a standard socket.

The layout of the Control Board is shown Figure 8. Adjustment to the system is made by the manipulation of Dip switches on the control board. The following items can be adjusted by means of the dip switches.

1. Fan speed; using range and range divider switches.

2. Max speed setting, labeled, boost power, on board layout drawing below. This is a facility for use in smaller applications where it is not necessary to run the system at full speed on boost.
3 Boost time allows adjustment of time on boost.

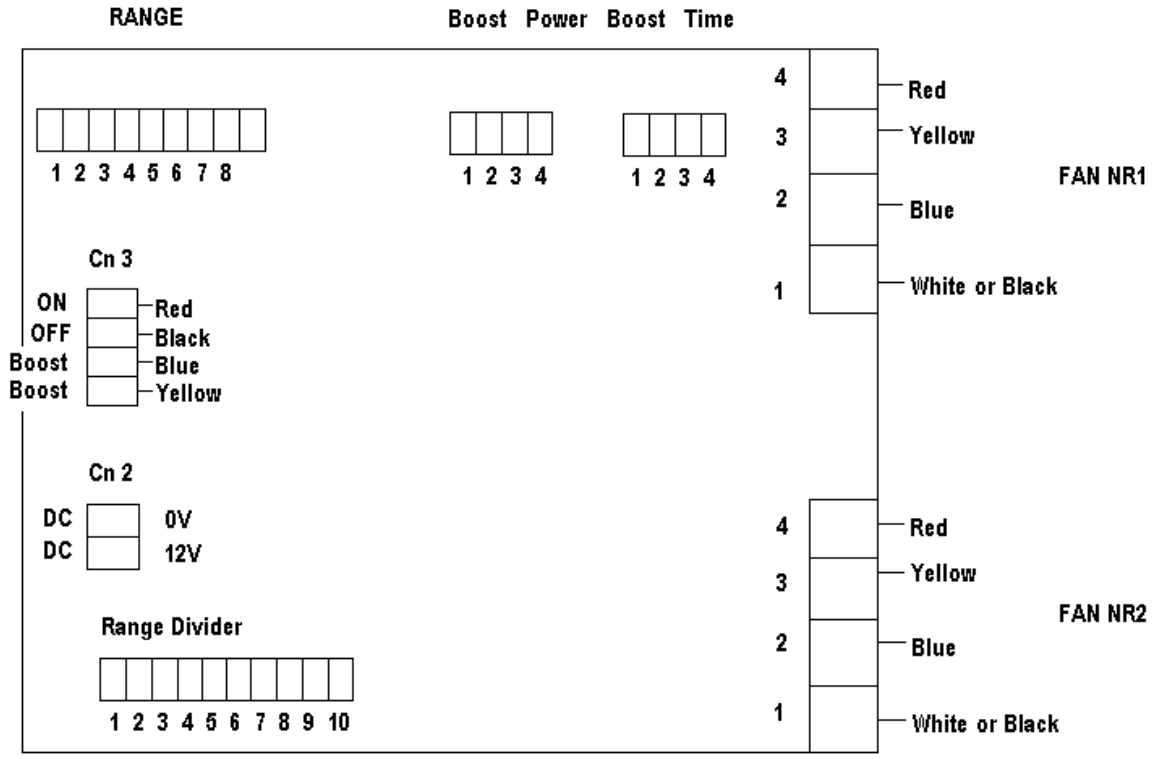


Figure 8

The range divider settings shown in Figure 9 indicate how to control the fans to move certain volumes of air. There is an option of 10 control points within the range. This means that each installation can be commissioned to match the application exactly with the required air-flows. The ProAir technician will programme the two speeds suitable for your house size.

		Range Divider (V) Speed (m/s)							
RANGE		1	2	3	4	5	6	7	8
1	Control voltage	1.3V	1.1V	0.9V					
	m/s	0.6	0.5	0.3					
	m3/hr	38	32	19					
2	Control voltage	1.9V	1.6V	1.3V	1.1V				
	m/s	1	0.8	0.6	0.5				
	m3/hr	64	51	38	32				
3	Control voltage	2.5V	2.1V	1.8V	1.5V	1.2V	1.0V		
	m/s	1.5	1.2	0.8	0.7	0.5	0.4		
	m3/hr	95	76	51	45	32	25		
4	Control voltage	3.2V	2.7V	2.2V	1.9V	1.6V	1.3V	1.0V	
	m/s	2.2	1.8	1.2	1	0.8	0.6	0.4	
	m3/hr	140	115	76	64	51	38	25	
5	Control voltage	4.2V	3.4V	2.9V	2.4V	2.0V	1.6V	1.3V	0.9V
	m/s	3.7	2.4	1.9	1.3	1.1	0.8	0.6	0.3
	m3/hr	235	153	121	83	70	51	38	19
6	Control voltage	5.5V	4.5V	3.7V	3.1V	2.5V	2.1V	1.6V	1.2V
	m/s	4.8	3.9	3	2.1	1.5	1.2	0.8	0.5
	m3/hr	305	248	191	134	95	76	51	32
7	Control voltage	7.7V	6.0V	4.9V	4.0V	3.3V	2.6V	2.0V	1.4V
	m/s	6.8	5.3	4.2	3.3	2.4	1.7	1.1	0.7
	m3/hr	433	337	267	210	153	108	70	45
8	Control voltage	7.7V	6.0V	4.9V	4.0V	3.3V	2.6V	2.0V	1.5V
	m/s	6.8	5.3	4.2	3.3	2.4	1.7	1.1	0.7
	m3/hr	433	337	267	210	153	108	70	45
		1	2	3	4				
Boost	Control voltage	10.4V	7.2V	5.2V	4.2V				
	m/s	7.9	6	4.7	3.7				
	m3/hr	503	382	299	235				

Figure 9

Unit Size

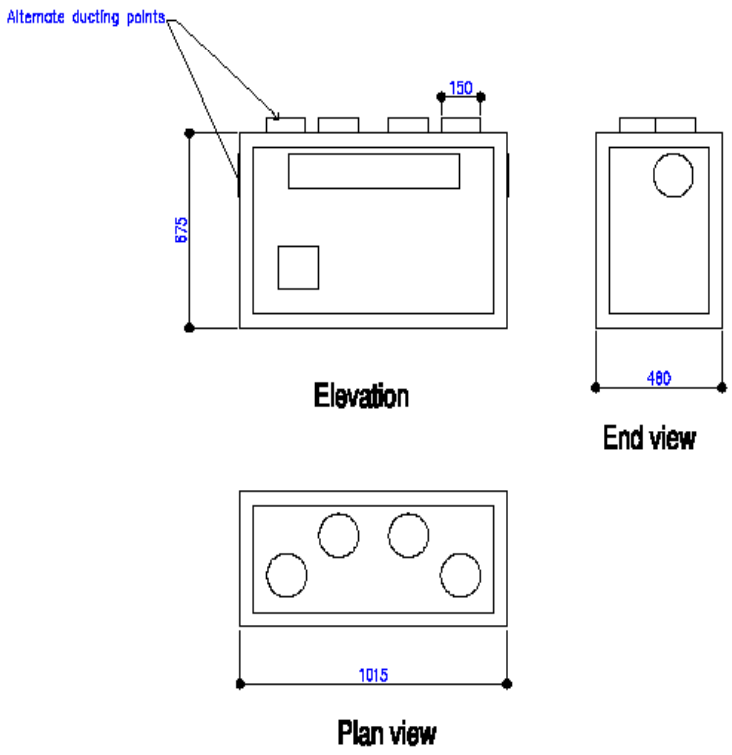
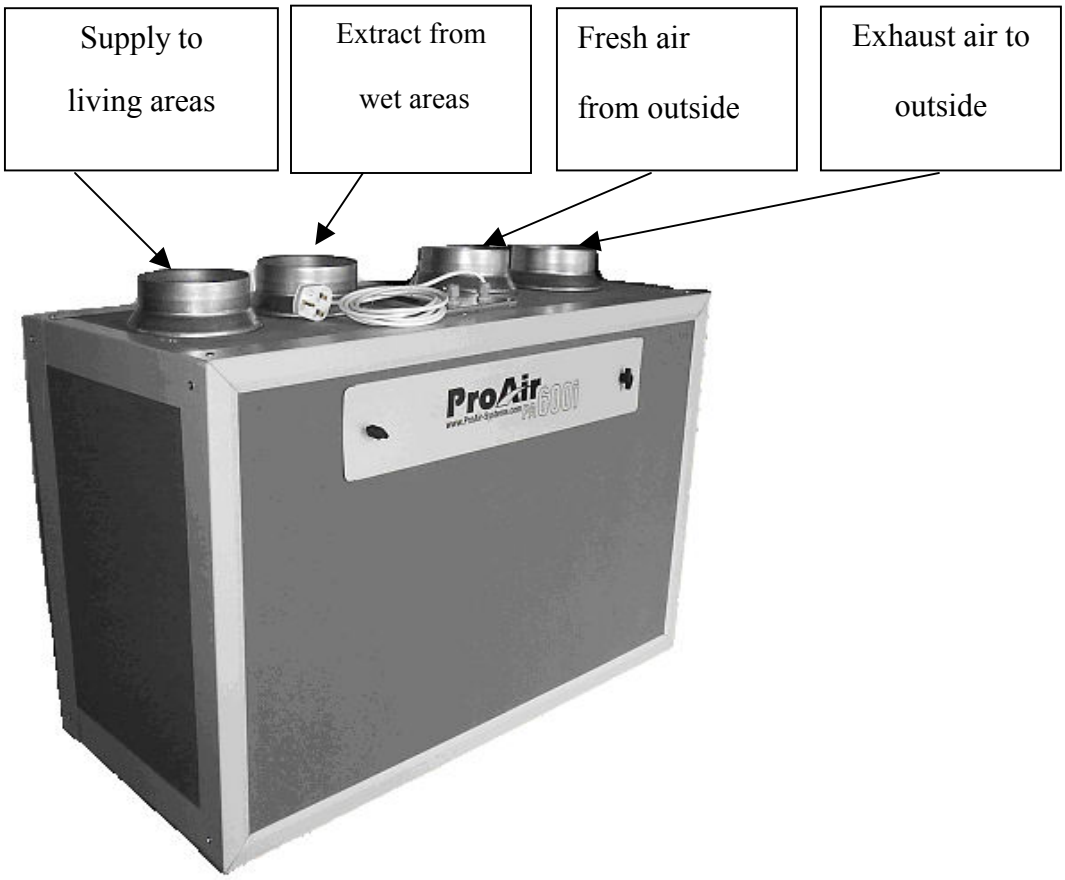


Figure 10

Duct Connections

There are 4no 150mm connections on the unit. There are 2 options for connection to the outside and the house.

Option 1



Option 2 enables the connections to be exactly the reverse of those in Option 1. This means that Exhaust and Fresh air connection to the outside is the on the left, with Extract from wet areas and Supply to living areas on the right hand side.

Furthermore, in both options there is a side-entry connection where the exhaust and/or supply connections can be availed off for certain installation situations. This removable plug can be re-inserted on the top of the unit to facilitate this side connection configuration.

Technical Specification.

Length	1.025 m
Width	0.485 m
Height	0.680 m
Weight	28 Kg
Casing:	Expanded polyethylene fire-rated class O
Heat exchanger	**Type** Counter-flow plate exchanger

Material Pure Eskremo Polystyrene.

Filters

Exhaust air	G4 grade media in cardboard panel 390*210*50mm
Fresh air	G4 grade media in cardboard panel 390*210*50mm
Fans:	2no FB190C Backward curved centrifugal impellors
Duct Connections	4no 150mm Round
Specific Fan Power (SFP)	Down to 0.57 ws/l
Heat Exchanger Efficiency	over 90%
Power	220V AC
Cable Lengths	Mains cable (230V AC) 2m
	Control cable lengths variable. Site dependent
Condensate Drain	Connection required to waste pipe within house.

SAP Appendix Q listed

Installation	Left or right hand options.