

we do more with air...



compact service units | air-water heat pumps | central vacuums | heat pump ventilation | heat recovery ventilation

Heat Pump Heat Recovery Ventilation:
Whole House Ventilation, Heating, Comfort
Cooling & Domestic Hot Water Solution

Total Home Environment – HPV Series

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Contact Point

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HPV HEAT PUMP HEATING, COOLING & VENTILATION FROM FRESH AIR

Your Proposal

Total Home Environment Ltd is delighted to submit to you a proposal for the design, installation, and commissioning of a heat pump ventilation system (HPV), providing a highly efficient primary heating solution via the whole-house ventilation system itself. The system also provides active summer cooling delivering the very best comfort levels and air quality all year round.

We propose an HPV 1 unit from our range which will comfortably meet the 229m³/hr ventilation requirement, with plenty of room for boosted ventilation when in cooling mode and boost extract ventilation when bathing.

The proposal also includes an air-to-water heat pump featuring a 300-litre hot water cylinder (HPW300), serving all of your domestic hot water needs.

With an airflow of 229m³/hr, the HPV 1 will provide up to 3.5kW of heat via the airstream and up to 2.2kW of cooling (on the maximum airflow). Based on building a well-insulated near Passivhaus home, we anticipate the HPV 1 along with a duct heater and a small amount of ancillary heating would comprise your full heating solution.

The final design solution will be informed by the results of a detailed room-by-room heat loss appraisal bespoke for the HPV system.

Here are some of the types of ancillary heating we use to complement the system. On completing the heat loss appraisal we will recommend the best suited; whether it be one of these options or a combination.

- **Inline Duct Heater.** Heated element providing further heat via the air stream to a particular branch or to a whole zone.
- **Infrared Heating.** Can be wall or ceiling mounted. Radiant heat like the sun! Heats surfaces and objects in the room. Especially useful in areas of large fenestration to provide optimum comfort.
- **Electric Underfloor Matting.** Provides radiant heat and comfort. Especially useful in areas of large fenestration and vaulted areas to provide optimum comfort.

We also recommend electrically heated towel radiators, thermostatically controlled on a 2-hour drying function.

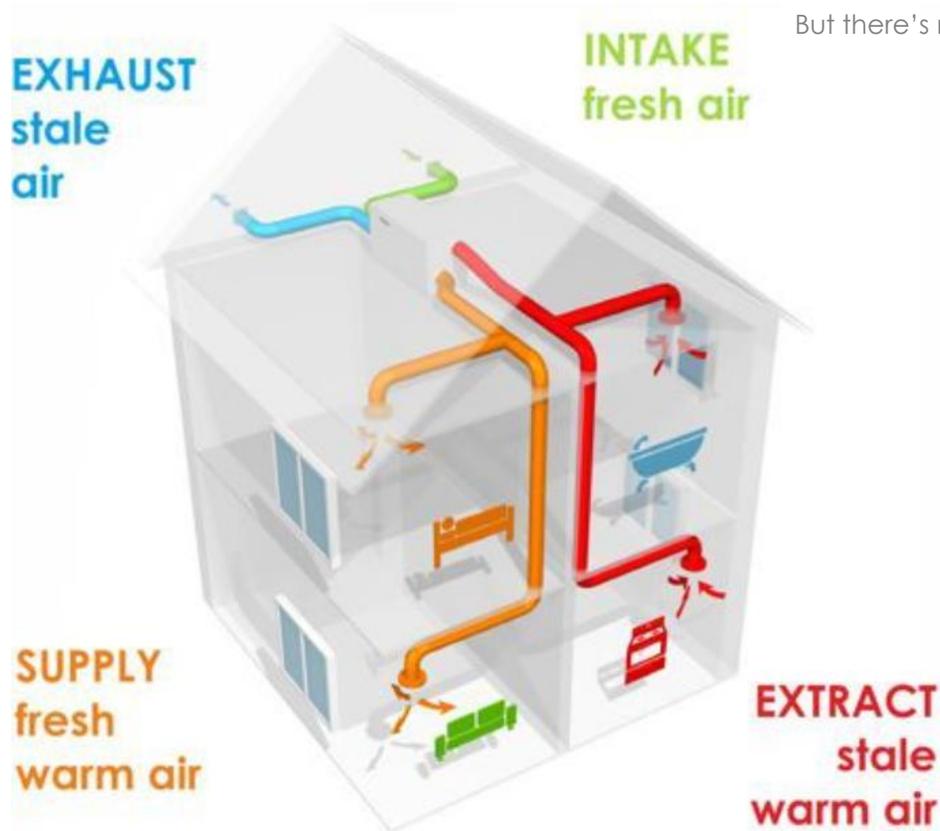
Ventilation Concept

The concept of Mechanical Ventilation with Heat Recovery (MVHR) is very simple: Bring in all the fresh air required to ventilate your home through a single pipe (duct); extract all the stale and polluted air from within the home through a second; and allow both air streams to pass across one another (without mixing), to transfer as much of the heat energy from the warm 'extract' to the cold fresh air 'supply' as possible.

The extract and supply ventilation rates are balanced, with the stale air being extracted from the moisture and/or odour producing rooms (kitchens, bathrooms, WC, etc) at the same rate as the pre-warmed fresh air being delivered to the remaining areas.

The system is driven by two highly efficient EC fan motors within the appliance.

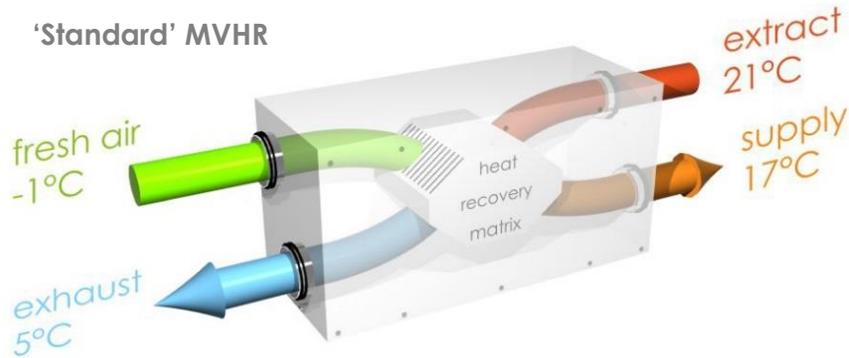
But there's much more to it than that....



Doing even more with air...

Standard MVHR units are very efficient, typically recovering 80% of the heat that would otherwise be lost by cold air sinking in via trickle vents and warm air being expelled directly to the outside via extract ventilators (within bathrooms, kitchen & WCs, etc). However, even with a well-designed MVHR system, there remains a significant heat loss.

Image top left: a standard MVHR unit in the winter with an outside temperature of -1°C. The stale air is exhausting at around 5°C, fresh air is returned to the house at 17°C.

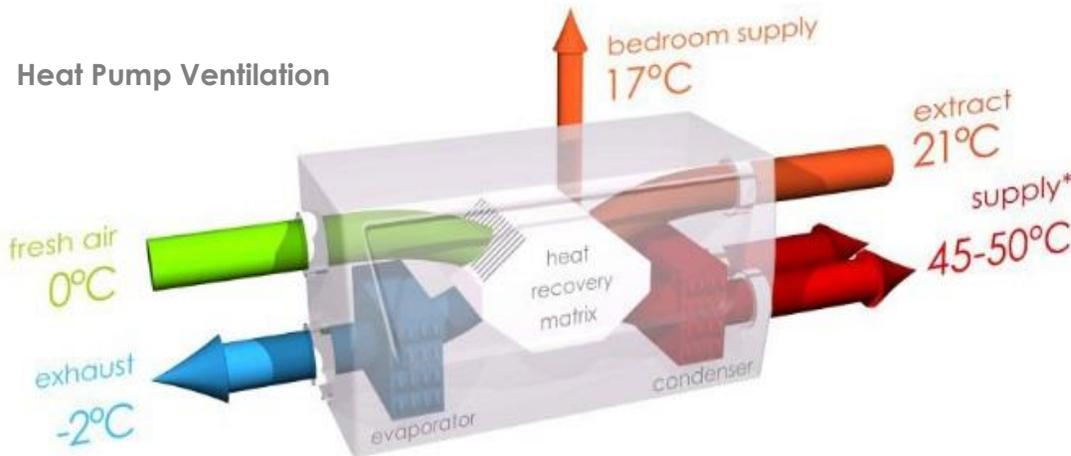


Introducing Heat Pump Ventilation..

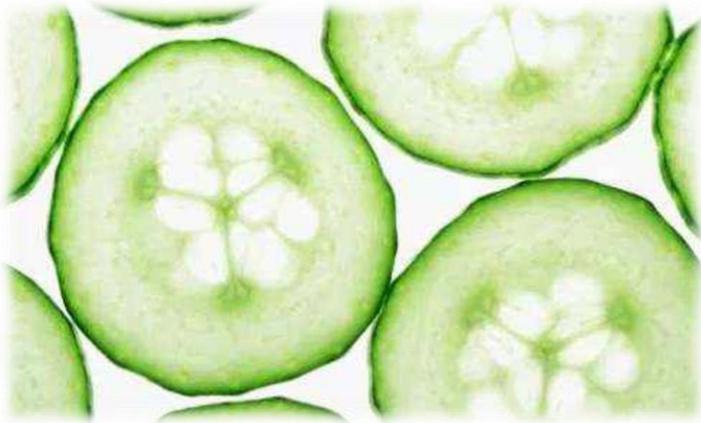
Air-to-Air Space-Heating

The HPV series features an integrated heat pump and achieves far more: It not only recovers all the heat energy but further heats the supply air to provide a highly efficient whole-house heating system.

Image bottom left: typical likely airflow temperatures from the HPV with an outdoor air temperature of 0°C, under normal atmospheric conditions.



* three heating zones excluding individual room control



Air-to-Air Comfort Cooling

During the summer, the heat recovery process will be bypassed automatically. The system will continue to purge the warm stale air from the wet rooms and provide fresh filtered air. When the evening air is cooler, this will contribute to lowering the temperature of the internal environment.

Additionally, the heat pump can also 'run in reverse' to actively cool and dehumidify the air. For hotter days and particularly warm tropical evenings, the comfort cooling will provide additional comfort, both tempering the ambient temperature by 3-5°C and, reducing the relative humidity to lessen stuffiness.

The "overheating lopping" provided by the HPV-1 will contribute to the overall cooling strategy by introducing up to a further 2.2kW of active cooling via the gentle airflow. This is not a full targeted air conditioning solution, but it will usefully help mitigate instances of overheating.

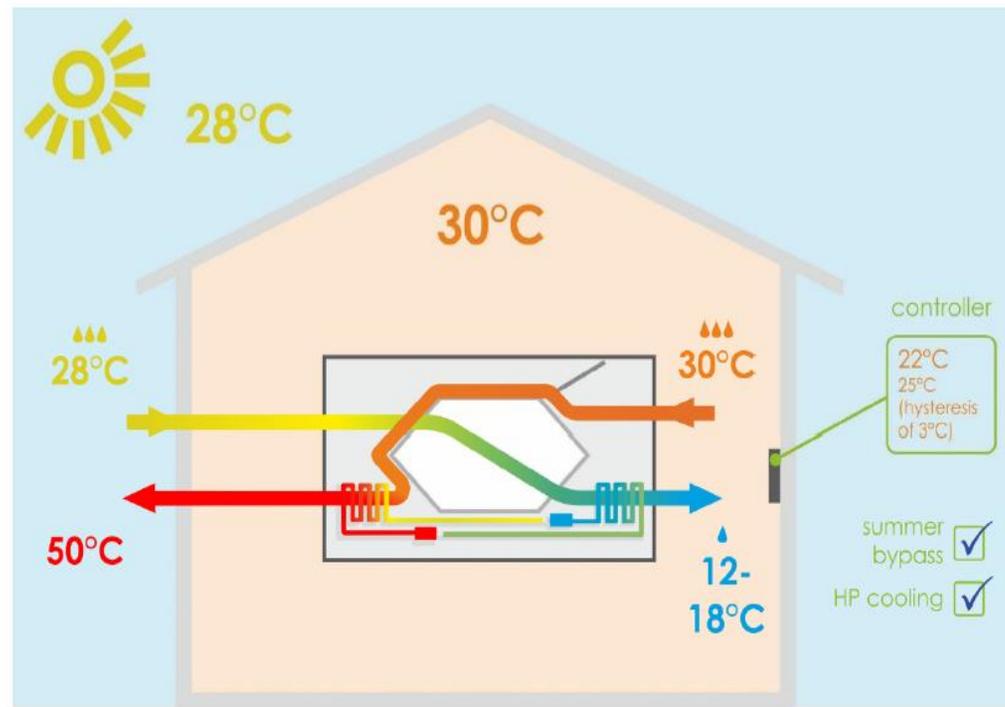


Image: illustration of airflow temps from the HPV in comfort cooling mode

Outline Specifications

HPV 1



- F7 Pollen filter cleans the fresh air before introducing it into your home. Option to upgrade to electrostatic filter on the fresh intake for enhanced purification
- Counter-current heat exchange matrix with up to 90% heat recovery
- A fully integrated exhaust air source heat pump for additional heat recovery and the introduction of an extremely efficient low-energy heating system, providing up to 3.5kW of heating (airflow 229m³/h, outdoor temp -3°C)
- An automatic summer bypass and reversible heat pump provides comfort-cooling in the summer. A *bedroom bypass* can be utilised for optimum control of heat distribution
- 'Smart' touch-control panel with LAN connection to facilitate remote log-in capability for system control, diagnosis, and support
- Frequency modulated compressor for low energy consumption and 2 no. supply outlets for precise delivery of heat and ventilation flow rates
- Dimensions: 1,346mm x 640mm x 682mm (L x D x H), excluding service area & ductwork.
- 2no. variable speed EC fans with a maximum power consumption of 83 W each

HPW300



- 300-litre water storage capacity within a special enamel coating with a magnesium protection anode fitted for maximum corrosion protection
- Integrated roll banded wrap-around condenser providing efficient water heating without direct contact with the water
- A heat pump heating capacity of 1.5 kW with a power consumption of 0.43 kW (achieving a Co-efficient of Performance of 4)
- A full tank can be heated from 15-50°C in 7-8 hours (using the heat pump only)
- 2kW immersion heater, reducing full tank heat-up cycle in under 6 hours
- Stand-by heat loss only 2W/°C
- Weight: 120 kg unfilled / 420 kg filled
- Dimensions: 1,874mm x 655mm x 660mm (H x W x D)



HPV Control Panel

“Excellent control and perfect indoor environment”



The touch-screen control panel, located within the main living area, displaying the menu page with its easy-to-read icons



A slave controller, located within other living areas where independent heating can be provided – e.g. duct terminal heaters



Mobile app for easy control at your fingertips

Once set up and commissioned, by and large, the system can be left to run by itself - various sensors† within the infrastructure feed data back to the control board, which in turn, will finely adjust the system's operating parameters to target pre-defined healthy and desirable environmental conditions. Most people, however, will want at least some level of control to vary what those targets are to suit their needs ...

The proposal includes a central touch-screen control panel, which will be located within the main living area of the house. The panel allows the user to adjust all the important functions such as selection of the 'operating mode' (e.g. ECO Summer which, during very warm periods, can reduce fan speeds during the day and facilitate greater and simultaneous use with the heat exchange bypass during the night to provide passive night-time cooling‡).

The main control panel will allow the user to control: the target room temperature for the main living area and for rooms with localised ceiling-mounted heater terminals; time settings and the 24 hr 7-day timer programme for specific temps and airflow rates throughout the week; display only of general system information, measured readings and reported errors; ventilation rates (essentially vacation, setback, standard and boost); domestic hot water heating settings; and system configuration settings for the administrators within the household.

The data bus, which is integrated into the system, provides a 2-way communication link between the main control panel and 'slave' controllers within other living (supply air) areas, via the motherboard inside the HPV 1 appliance. This allows the room temperatures to be monitored and adjusted centrally from the main control panel.

Furthermore, a LAN port is fitted to the motherboard which can connect to the household modem, which means the system can be accessed, viewed, and controlled via the mobile app provided.

- † There are numerous sensors throughout the system that measure, for example, airflow temperatures, fan speeds and airflow rates, individual room temperatures (to control localised ceiling-mounted heater terminals),
- ‡ Passive night-time cooling is not the same as active cooling, using the heat pump, which is activated separately or by a pre-defined limit temperature (28°C default)

Unit Location & Ducting



We use the very best – rigid metal spiral duct with 'safe seal' fittings. Sized and designed correctly, rigid metal ensures the air is being circulated via robust, smooth, and therefore free-flowing ducts, with fixed diameter bends, ensuring minimal resistance and less duty imposed upon the fans within the appliance. Ultimately, this results in lower running costs, better and quieter ventilation, and many more years of trouble-free operation. Metal sheet ducting is proven to have intrinsic dirt and mould-resistant properties, with the smooth inner surface providing little opportunity for dirt particles and fungal spores to take hold.

Total Home Environment does not advocate incoming supply air being ducted through any type of plastic pipe, either rigid or flexible, due to the potential harm caused to health from 'off-gassing' chemicals and particularly so, when considering a warmer airstream.

Location & Design

The HPV 1 ventilation unit is likely to be located within the plant room on the ground floor. From here, the ducting will connect to the ceiling void and run within the joists to the ceiling terminals serving that floor.

With a few discrete vertical duct risers, perhaps alongside a soil pipe or in the back corner of a built-in wardrobe, the ducting will run to the ceiling voids of the other floors serving the rooms below in the same way.

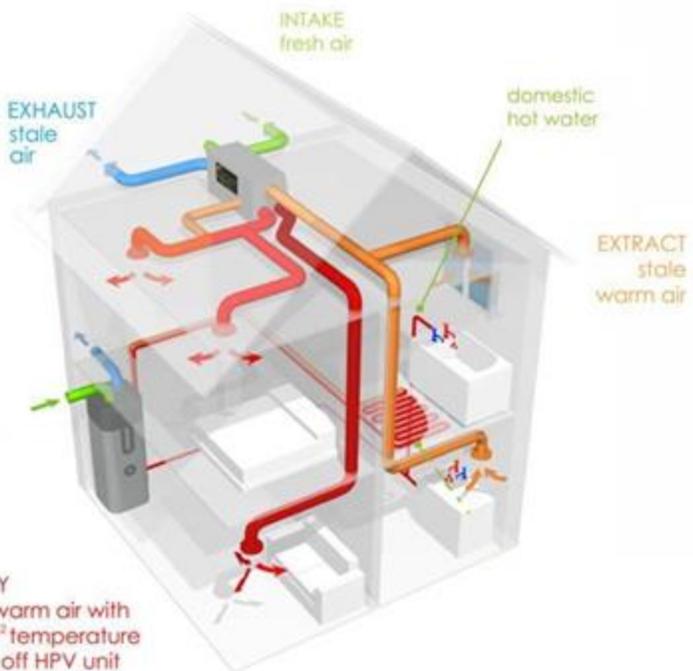
The HPW300 is best located in the ground floor utility/plant room, where the intake and exhaust ducts can reach the atmosphere via the external wall.

The size of the ducting ranges from 200mm to 125mm. All the duct runs except the extract routes back to the ventilation unit, are sealed and insulated with a 25mm isosleeve to minimise heat loss and prevent condensation within or outside the ducts.

The ducts to the atmosphere will be fitted with a higher performing 50mm insulation.

If there are any unavoidable obstructions which require alternative ducting, small sections of rectangular rigid metal ducting may be utilised. Depending on the airflow this could be 200mm x 80mm or smaller, however the supply lines will still need 25mm of Isosleeve insulation. This can allow navigation of some steels or for us to rise vertically in a stud partition.

It is important to recognise that a well-considered ducting solution will always be properly coordinated with the architect or other lead designer **as early on in the design process as possible**, avoiding unnecessary bends, lengths of pipe, and other compromises.



SUPPLY
fresh warm air with
threerd temperature
zones off HPV unit

Floor Structure

The type of floor structure you are considering will affect how the ductwork is installed and where it can travel so ideally we need to be on board at an early stage, (especially given the size of the ducting required) to ensure the feasibility of the HPV solution for your project.



Traditional joists – ducting can only run in-between or 'with' the joists as holes cannot be cut to allow the ducting across the joists without affecting the structural integrity.



Beam and block floor – ducting can run anywhere below the floor, as long as the void is at least 230mm in depth.



Posi/webbed joists – ducting can run with or across the joists. Ensure the webs line up. We require a 304mm sized posi joist, 254mm at very minimum.



Engineered/I-beams/TJI's – ducting can run with the joists and only across where the structural engineer has been consulted on hole size and positioning.



Above: Standard ceiling terminal



Above: Premium Airy ceiling terminal



Above: Zehnder Luna ceiling terminal

Other Considerations

Should you go ahead with a an order, upon system design we will provide you with specific wiring diagrams for your project, but you will need to obtain a quote from:

1. an **ELECTRICIAN** for supply, install, and connection of:
 - a. mains cabling to the units and any duct heater or radiant heating system, where specified
 - b. CAT 7 cabling to all controllers & sensors
2. a **PLUMBER** to supply, install and connect:
 - a. dry-traps to the HPV series unit
 - b. connection of the HPW to house plumbing
 - c. G3 water kit (incl. 25L expansion vessel & 22mm non-return valve)
3. a **JOINER** to
 - a. under-cut all internal doors by 10mm
4. a **SUITABLY QUALIFIED PERSON** to:
 - a. perform drilling/chasing of walls/floors for intake/exhaust vents to atmosphere
 - b. fit exterior vents if above 3m in height
 - c. boxing in of exposed ducting if required.

Building Management System

If a BMS is being proposed for home automation, we can provide the necessary information for the standard integration of the ventilation and hot water system. Upon request, and at an agreed chargeable rate, we can provide further assistance to your home automation provider for greater integration and accommodation.

Ceiling Terminals

We automatically provide supply and extract terminals as a low-profile, white metal valve, usually located within the ceiling. As an alternative, we can also supply our premium Airy terminals which feature both a discreet flat metal front plate which can be painted and an acoustic trim for optimal silencing, or the Zehnder Luna terminal with flat plastic front plate, minimal 30mm height, tool-free push-fit installation and airflow locking mechanism.

External Grilles

A wide range of external grilles are available, from wall-mounted weather louvers and cowls to soffit grilles and roof vents. Some external grilles can be RAL colour matched if required.

Pricing Estimate

The pricing below provides for the supply of the HPV 1 Heat Pump Heat Recovery Ventilation system together with the HPW300 Hot Water Cylinder and all associated ventilation ducting and fittings, insulated to and from the outside and on all supply ducting throughout the property.

House Type: Two Storey, 212m², Roof Type: Warm

Building Regs Approved Ventilation Rate Requirement: 229 m³/hour

- ✓ HPV 1 Heat Pump Heat Recovery Ventilation Unit
- ✓ Touch-screen, smart controller & secondary controller
- ✓ Inline duct heaters for each supply zone
- ✓ HPW300 Air to Water 300L heat pump unit & pressure reducing & relief valve
- ✓ Safe-seal rigid metal ducting
- ✓ Armaflex 'closed cell' on ducts to/from the atmosphere
- ✓ 25mm Isosleeve insulation on all internal 'supply' ducts
- ✓ High-performance silencers, including sound attenuation to bedrooms
- ✓ External grilles / vents
- ✓ Low-profile, white, metal ceiling terminals
- ✓ Predicted ancillary heating – HLA dependent. 2 no. 300W infrared panels allowed for at this stage.
- ✓ Heat loss appraisal
- ✓ Detailed 3D CAD design
- ✓ Delivery

What is Excluded:

- G3 Water Kit (including 25L expansion vessel & 22mm non-return valve)
- Fire Dampers (not anticipated, but if required)
- Plumbing, building, and electrical work as well as all electrical cables (incl. for Duct Heaters)*
- Installation and wiring of ancillary heating systems (InfraRed panels/matting, UFH, etc.)*
- Condensate drain from unit*
- Low voltage wire to control panel*
- VAT

*see Other Considerations page & T&C's for more details

Quotes are valid for 30 days
A 25% deposit will secure the price for 9 months

Total Supply, Design & Delivery: £ 25,775.00

Extras:

Optional Installation Service & Commissioning:	£ 5,480.00
Single Day Installation Training & Commissioning	£ 1,931.00
Commissioning only for DIY install:	£ 1,281.00

For terminal upgrade options and prices, please ask your Sales Consultant for further details.

This is an estimate only based on u-values - walls <0.15, floors <0.14, roof <0.11, windows <0.85, heat loss 20W/m².