



INTELLIGENT VENTILATION CONTROLS

NATURAL AND HYBRID PLUS SYSTEMS





PASSIVENT NATURAL VENTILATION CONTROL SYSTEM

Passivent's intelligent control system has been developed specifically to meet the requirements of the company's natural ventilation and Hybrid Plus ventilation systems. This ensures it goes beyond just maintaining indoor air quality but also helps to promote a comfortable environment by reducing the internal building temperature using a night cooling strategy.

- **Energy efficiency**
Can reduce the amount of mechanical heating and cooling needed to maintain a comfortable indoor environment.
- **Occupant comfort**
Monitors the indoor climate through installed sensors and automatically controls the ventilation system to ensure a comfortable environment.
- **Intelligent control**
Can incorporate an array of sensors and also communicate with a building management system (BMS), providing the user with full building control.
- **Operational efficiency**
Simple and easy to use and configure through a simple intuitive controls interface with override facility.
- **Installation efficiency**
Can dramatically reduce installation time compared to systems with centrally mounted control panels.

Contents	
Passivent natural ventilation control system	3
Features and benefits	4
The system	
Background	6
How it works	7
What makes up a system	8
Typical systems	10
Stand-alone controls	11



FEATURES AND BENEFITS

iC8000

Passivent iC8000 is a comprehensive multi-zone controller which comes pre-loaded with Passivent's own proven natural ventilation software. It can be used as a stand-alone system, working independently, or it can be integrated with the BMS using the on-board BACnet communications.

The intelligent control can incorporate multiple sensors to promote a fresh, comfortable internal environment. The system can monitor internal and external temperatures, carbon dioxide levels, time, date and precipitation to modulate the natural ventilation system and boost fans if necessary.

What does it do?

Depending upon the data received from the installed sensors, the iC8000 regulates airflow as needed to the required zones of the building.

To achieve this it controls the various natural ventilators in the system such as Passivent's Aircool® wall and window units, Airscoop®, Airtract® and Litevent ventilators and window actuators. Furthermore, the intelligent controller can be used to control the Passivent Hybrid Plus and Mixed Mode ranges incorporating mechanical boost fans and local air conditioning units.

The controlled ventilation system does not only ensure that good air quality is maintained, but can reduce the burden on building services by modulating airflow as required, using CO₂ and temperature-based demand control.

- **Multiple zone controllers**

Typically reduce wiring cable lengths by up to 70% compared to centrally mounted control panels, reducing installation costs.

- **BACnet communication enabled**

BACnet compatibility enables open protocol communication between the system and the BMS or other devices, allowing an expandable future-proof system.

- **Simple local room override**

Wall-mounted zone control units include user-friendly, touch-sensitive buttons to override automatic functions. Includes LED mode selection display to provide the user with positional information.

- **Portable interface display**

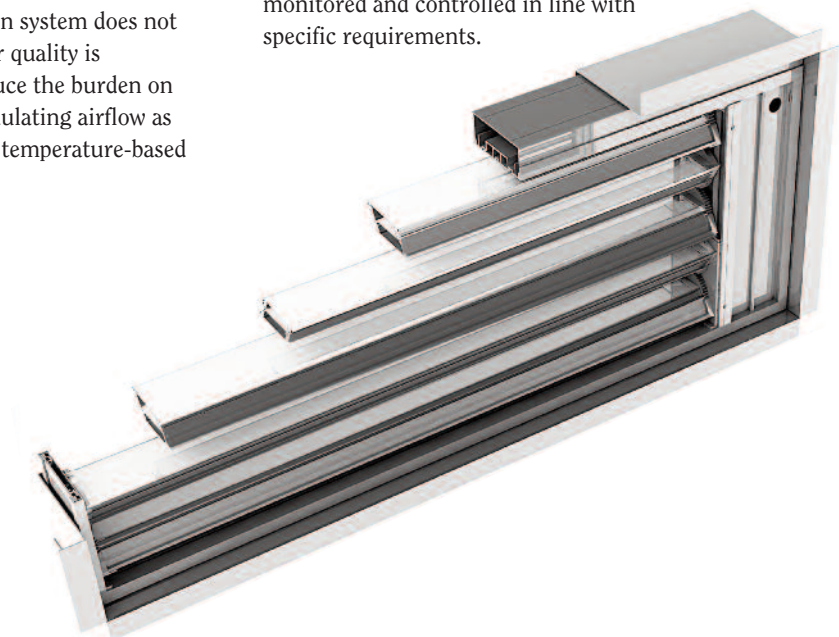
Plug-in LCD display allows configuration of the ventilation system by the site services team without the need for connection via laptop or a site visit by specialist engineers.

- **Night time cooling**

Comprehensive energy-efficient, night cooling strategy purges excess heat gains built up during the summer days and reduces the need for mechanical cooling.

- **Enhanced CO₂ control**

Where specified, ensures CO₂ levels are monitored and controlled in line with specific requirements.



- **Compensated internal temperature adjustment profile**

Alters the internal temperature setting on a linear profile as the external temperature changes, maximising occupant comfort within the space.

- **Heating interlock**

Forces the natural ventilation system to minimum CO₂ control (when present) which reduces energy demand and emissions.

- **Tailored software setting**

Passivent proven natural ventilation software is pre-loaded on the controller, with set points and operating configurations tailored for the application, providing the most effective and efficient solution for each and every building.

- **Holiday and event scheduling**

Allows automatic operation of the system whilst building is vacant or unattended, reducing unnecessary energy usage. This can be set through the portable interface display unit.

- **Standard sensor cases**

Unassuming casings so that room aesthetics are not affected yet each sensor is immediately identifiable by sight.

- **Separate room sensors and overrides**

Allows the local room overrides to be positioned out of sight or in a separate room so they are not tampered with or harmed; this is often required (e.g. in sporting venues) to avoid damage and allow access to the override during occupancy.

OPTIONAL FEATURES

- **Sequence control of boost fan**

Ventilation can be aided by the automatic activation of the boost fan if required.

- **Control of a local air conditioning unit**

Allows control for cooling, heating, or cooling and heating functions where required in higher heat gain spaces, such as ICT suites.

- **Window actuators**

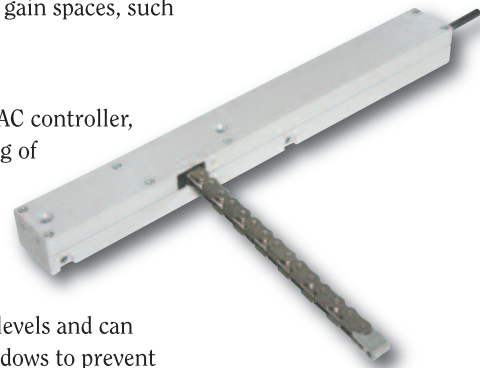
When used with the iWAC controller, allow automatic opening of windows to increase ventilation rates when required.

- **Rain sensor**

Monitors precipitation levels and can automatically close windows to prevent rain ingress.

- **Wind speed sensor**

Monitors the wind speed and can automatically close or reduce the opening of the ventilators in high wind speed conditions.



THE SYSTEM

Background

37% of CO₂ emissions in the UK derive from energy consumption in our buildings.*

To combat this, and reduce energy requirements and emissions, regulations will drive energy efficiency even further. Part L of the Building Regulations, which is primarily aimed at reducing emissions and improving energy efficiency, will reduce emission threshold levels further, meaning we have to find the optimum and most efficient building systems in order to comply.

A key way to reduce emissions is by limiting the amount of energy used by building services. Heating and cooling systems are significant consumers of energy and emitters of CO₂, so minimising the need to heat and cool a building is paramount in reducing our environmental impact.

However, heating and cooling are important in maintaining a comfortable indoor environment, together with the provision of good air quality and the removal of pollutants.

The primary aim of a ventilation system is to ensure that there is air movement throughout the building, circulating air so that it does not become stale and ridding the building of pollutants. As a ventilation system is about bringing fresh air in and stale air out of a building, the system can work in conjunction with other building services to maintain that comfortable environment by aiding the heating and taking cooling of the building through controlling airflow.

Passivent natural ventilation and hybrid plus ventilation systems – combining natural ventilation with boost fans as required – are an energy-efficient means of maintaining that comfortable environment.

* www.carbontrust.com/news/2014/10/breaking-circle-of-inertia-on-energy-efficiency-commercial-buildings-sector



The SSE Hydro entertainment venue, Glasgow.

© Nigel Young, Foster & Partners.

How it works

Sensors are installed in different zones of the building, sensing the most important factor for that particular zone. For example, an office space would typically have both internal averaging temperature and CO₂ monitoring, and the two control profiles would run side by side in warmer weather, with the highest call setting the position of the louvres.

The opening/closing position of the natural ventilation louvres is calculated using a proportional-integral (PI) control function for each profile, targeting the system set points. The user can override the system at any time, opening or closing the louvres for a pre-determined period, with a visual display showing the override function in use.

As the external temperature reduces, the louvres would operate using the CO₂ PI control function, and only supply enough air to ensure levels of CO₂ are kept within the specified set point range.

Reducing burden

The control system can reduce CO₂ emissions by reducing the burden on building services, for example to cool a building in the summer. During the summer, a building can attract and hold heat (thermal mass) and release it throughout the night and following day. This can cause excessive temperatures in the building and require mechanical cooling to be used. This of course consumes substantial energy and is a high emitter of CO₂.

A natural ventilation system combining Passivent's *iC8000* control can allow the system to open during the night at a lower set point when the air is cooler. This is controlled by internal and external temperature, season, and unoccupied time periods, with a lock if the heating was operated during the past 24 hours. This can reduce the temperature of the thermal mass overnight and reduce air temperature within the room or building. The following day, the room is at a lower temperature and less heat will be released from the structure, thus reducing the amount of mechanical cooling required.

The software also contains a regime which forces operation to CO₂ control (when present) if the building heating system is enabled. This reduces the ventilation rate to operate via demand control for indoor air quality purposes, reducing the ventilation heat loss to a minimum.

The software has a compensated internal temperature adjustment profile. As the external temperature reduces, the internal temperature set point starts to rise on a linear profile. This avoids a single summer/winter change-over temperature, increasing occupant comfort and allowing the temperature profiles for winter and summer to be extended, ensuring maximum energy efficiency.



WHAT MAKES UP A SYSTEM

The control system is made up of a range of components.

Panel modules

The panel modules house the 'brains' of the system and send and receive data and control signals through multiple sensors and actuators.

The panel modules are supplied as a single stand-alone unit for a small number of zones, or as multiple units configured to communicate with each other to control a larger system

Individual panel modules are supplied in two or four zone configurations depending on the project requirements.

In systems using multiple units, the common heat, fire, external temperature, and optional rain or wind speed data is passed from the master panel to the other panels in the system to form a networked controller capable of operating up to 40 zones as a single group.

Local room overrides

The local room override allows the occupant to manually override the automatic settings and switch to the open or closed ventilator position as desired for a predetermined period. The system then reverts to auto mode, as recommended by BSRIA guidance (BG 2/2005).

A visual position indication is provided by LEDs. A range of overrides are available including those for window or wall louvres, window opening and boost fan usage (optional).



Portable interface display

A portable interface display is supplied as standard with each iC8000 control system to allow maintenance staff to change the software set points as required. This allows the settings to be changed without the need for an engineer's site visit. The software is password-protected so can only be altered by permitted persons.



Room sensors

There are different sensors available including temperature, averaging temperature, combined temperature and CO₂, and combined averaging temperature and CO₂. These are located in rooms (or zones) of the building. They feed data about the zone back to the panel module.



External sensors

There are options to detect external temperature, external precipitation, and wind speed. These signals are fed back to the panel module to allow it to make relevant decisions according to the software program.



Weather station

An optional sensor which measures wind speed and detects rainfall in one combined unit. It is fixed on the roof of the building, either directly or mounted on a pole, to allow monitoring of external weather conditions.

It is often used for buildings in exposed locations or where window actuators are fitted, enabling the windows to be closed automatically to exclude high winds or heavy rain.



Actuators

The modulating actuators are generally housed in the Passivent natural ventilation products and are controlled by the iC8000 controller. They open and close as required to reduce CO₂ levels, lower and maintain internal temperature or prevent rain ingress into the building through windows. They allow modulated controlled opening and closing as opposed to a simple open/close only action. The window actuators are controlled by a specially developed step function to minimise their running time.



Protective covers

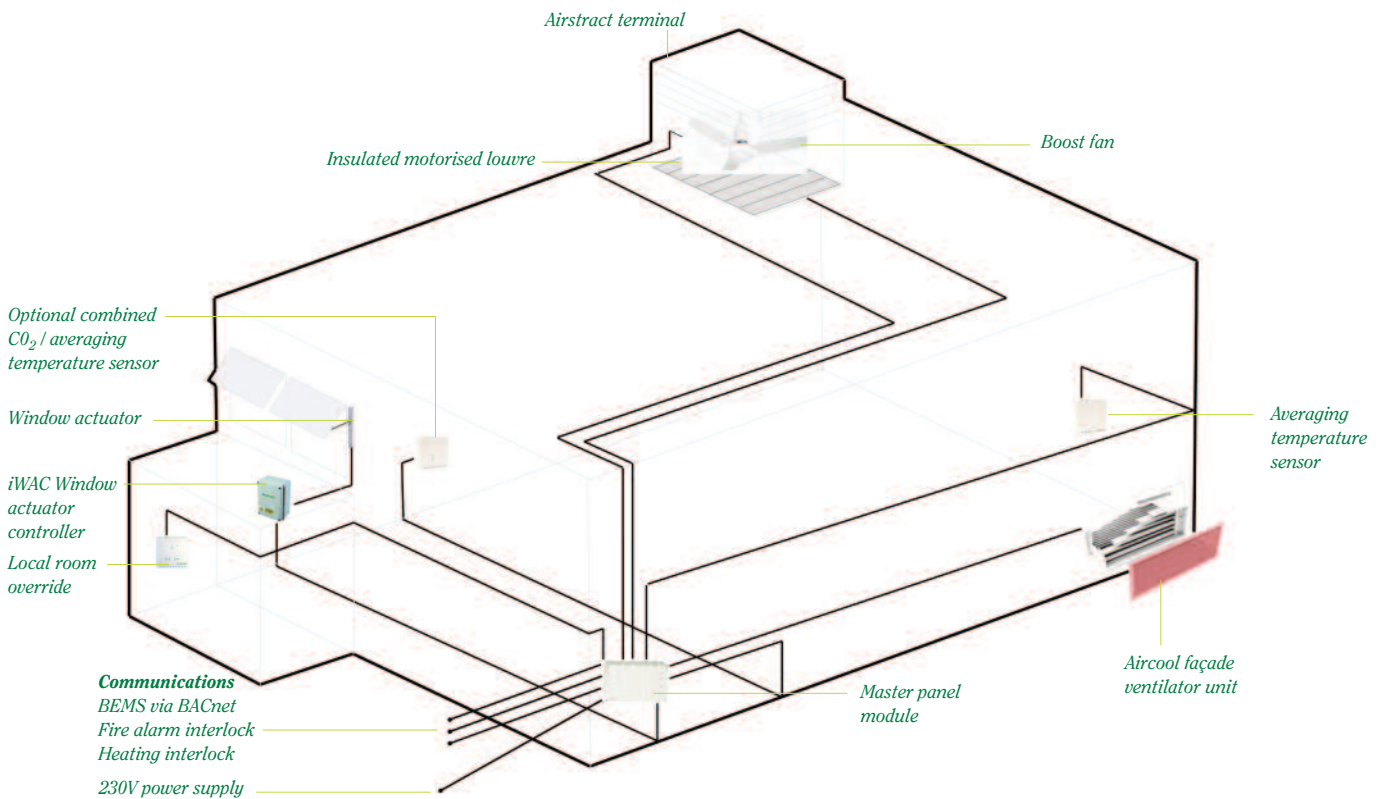
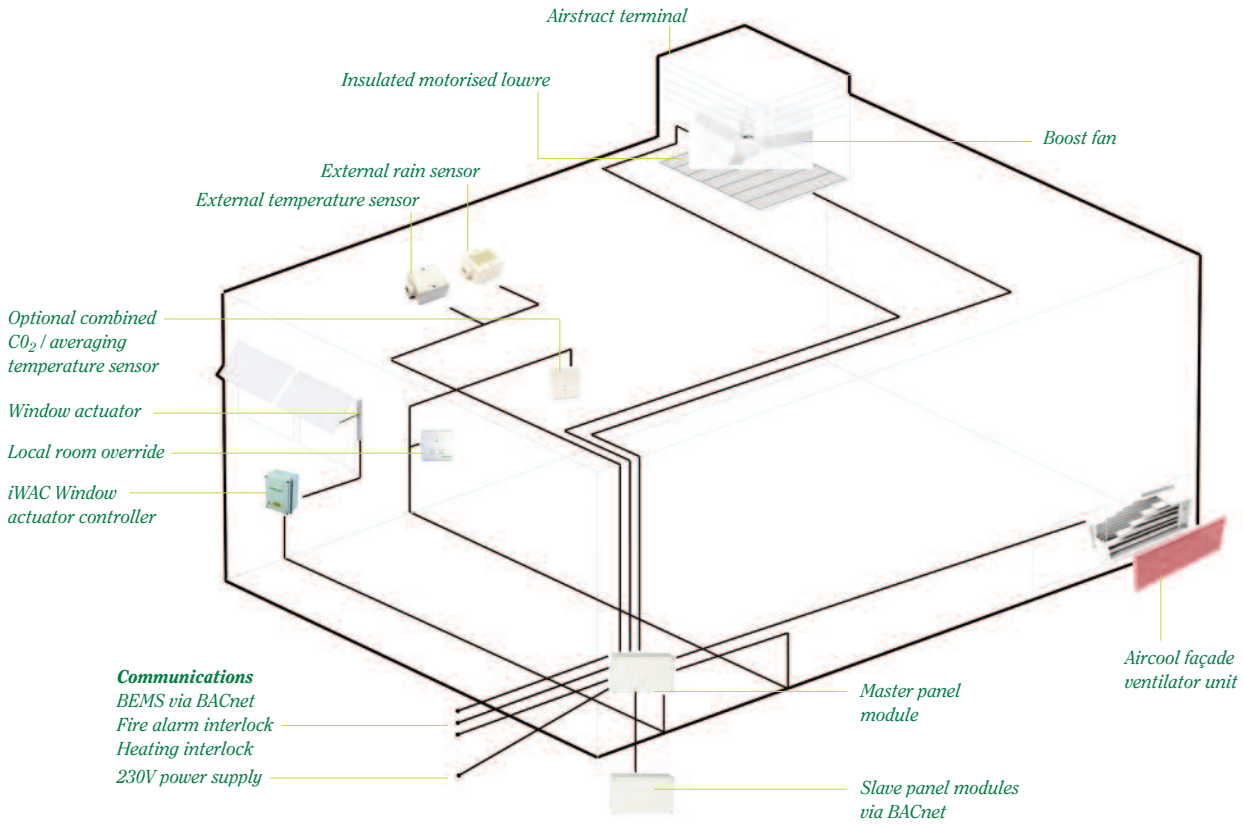
For areas of high traffic or where sensors could be liable to damage, such as in a sports hall, covers are fitted to protect the sensors and ensure that the operation and performance of the units is not hindered.

Local operating controllers

Some items of the natural ventilation system require local controllers that receive signals from the iC8000 Panel Modules, such as window actuator controllers (iWACs) and boost fan enabled controllers.



TYPICAL SYSTEMS



STAND-ALONE CONTROLS



EC range

Passivent also offers a range of stand-alone controls for controlling individual elements of a natural ventilation system. These allow the user to manually choose the operation of the various elements of the system.

Not all situations require a fully linked control system. Some ventilation strategies use manual opening louvres and windows, instead of fully automated units. Stand-alone controllers still allow motorised windows and louvres to be used, providing modulated opening, but without the need for the occupant to physically open and close units which may be out of reach. The controllers are also available with auto close functions so that any security risk of apertures being left open are allayed.

eC100

Designed for controlling louvre systems as part of a natural ventilation system. It allows manual positioning of the louvres, which may be either Aircool louvres through the building façade or insulated louvres as part of a roof terminal. Allows up to six positions be chosen.

eC200

Designed for controlling window actuators as part of a natural ventilation system. It allows the occupant to choose the position of the window, with up to six positions, to allow fresh air into the room. The unit can control up to three actuated windows, with either single or double actuators for each window.

eC300

Designed for controlling louvre units as part of a natural ventilation strategy, with a temperature controller. Allows the position of the louvres to be controlled based on room temperature, but with the option of a manual override if required.

FURTHER INFORMATION



Operational commitment

At Passivent we are committed to minimising our impact on the environment, and to continuous improvement in our methods of operation.

Our manufacturing processes and raw materials emphasise sustainability.

We are accredited to ISO 14001 Environmental Management, OHSAS 18001 Health and Safety Management, and ISO 9001 Quality Management Systems.

Other products

Passivent markets a range of ventilation and daylighting products for commercial and domestic buildings including:

Natural ventilation systems

Aircool ventilators for windows, curtain walling and walls

Airstract roof terminals for passive stack and other natural ventilation systems

Airscoop wind-driven ventilation terminals

Litevent combined ventilator and rooflight

iMEV intelligent mechanical extract ventilation

Soundscoop® acoustic transfer ventilation products

PASSIVENT

North Frith Oasts, Ashes Lane, Hadlow, Kent TN11 9QU Tel: 01732 850770 Fax: 01732 850949
Email: projects@passivent.com Web: www.passivent.com

Passivent maintains a policy of continuous development and reserves the right to amend product specifications without notice.



A division of Building Product Design Ltd. Company Registration No; 3944123

